

Pacific Gas and Electric Company

**Residential HVAC Market Transformation
Market Characterization and Baseline Study**

Final Report

Prepared by:
Opinion Dynamics Corp.

Submitted to:
Pacific Gas and Electric Company
Customer Research
123 Mission Street, Mail Code H28A
San Francisco, CA 94105

Submitted on:
May 28, 1999

Pacific Gas and Electric Company
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**Contractor Survey
Final Research Report**

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Manufacturer & Distributor In-depth Interviews
Final Research Report

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**Secondary Research
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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilating, and air conditioning (HVAC) market. Research was conducted with HVAC equipment consumers, contractors, distributors and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes all of the primary and secondary research that was conducted as part of this project. Specifically, this report draws together key findings from five other research reports describing the results of: 1) the Contractor Survey; 2) the Customer Survey; 3) the Manufacturer & Distributor In-depth Interviews; 4) the Contractor In-depth Interviews; and 5) the Secondary Research.

The primary objective of this report is to help PG&E understand the views of manufacturers, distributors, contractors and consumers and their perspectives on the production, distribution, sales, installation and maintenance of residential HVAC equipment and systems. The primary focus of this research effort is the installation of HVAC equipment in existing single family, owner-occupied dwellings. A better understanding of the barriers to the installation of energy efficient equipment and related services among these market actors will lead to market transformation efforts targeting the residential HVAC market. All respondents interviewed for this study manufacture, distribute, install, service or purchase HVAC equipment, systems or related services for installation in the residential sector in Northern and Central California.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs. Within the residential sector, two PG&E programs currently have some impact on the HVAC business. These programs are the PG&E Comfort Home Program in the new construction market and the PG&E Home Energy Savings Loan Program in the existing home / remodeling market.

Market Transformation Framework

Today, market transformation has emerged as a central policy objective of future publicly funded energy-efficiency programs in California. Market transformation has been defined as “a reduction in market barriers due to a market intervention, as evidenced by a set of market effects that last after the intervention has been withdrawn, reduced, or changed.”² In order to adapt to this policy change, PG&E is pursuing detailed market research regarding the California residential heating, ventilating, and air-conditioning (HVAC) market. This research is designed to improve PG&E's understanding of the barriers to the installation of energy efficient heating and cooling equipment and related services in the residential sector—leading to future market transformation efforts targeting the residential HVAC market.

² For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

Secondary Research

The secondary research defined market segments, identified issues involving the timing and funding of purchases, provided background information on household spending trends, explored the replacement of HVAC units during home remodeling, examined prior studies of the replacement of central air conditioners, profiled the distribution of remodeling activity, provided background information on market actors' attitudes, behaviors and characteristics, and identified some barriers reported in the literature.

Primary Research

This report summarizes the results of a multi-faceted primary market research effort designed to address the residential HVAC market. The overall research process includes in-depth interviews with HVAC contractors, HVAC equipment and component part distributors, and HVAC manufacturers. The research also includes quantitative surveys with residential customers of PG&E who have recently purchased HVAC equipment as well as residential HVAC contractors who are located within PG&E's service territory.

Project Team Members

Patricia Lawrence, Senior Project Manager in PG&E's Customer Research Section was the project lead for PG&E. Members of the PG&E Residential Energy Management Team contributed their subject area knowledge, expertise and experience in framing research issues. Rick Winch, Vice President and Jack Jenkins, Senior Project Manager, led the research effort for Opinion Dynamics Corporation.

Section III: Objectives

The overall goal of this multi-faceted research effort is to characterize the residential HVAC market in Northern California in order to inform the design of a comprehensive market transformation strategy in the single-family, owner-occupied housing market. This characterization includes establishing a baseline of consumer, contractor, distributor, and manufacturer opinions, attitudes, and practices relative to energy efficient residential HVAC products and services.

The research process began with a secondary market research project. The emphasis of this initial secondary research effort was to assist PG&E in the formulation of a primary market research plan that would address the “informational gaps” that exist within the available industry information. In short, the research team was not comfortable moving forward with a primary market research effort given the fact that a thorough review of available industry information and past research efforts had not been completed. Understanding the range and type of secondary information available ensured that the primary market research effort advanced PG&E’s knowledge of the residential HVAC market—guarding against the collection of information that was already available. Findings from the secondary research effort, when relevant and applicable, are cited throughout this report.

This primary market research effort is geared toward the “market actors” who are closest to the actual HVAC purchase decision in the single-family, owner-occupied retrofit or replacement markets.³ The focus of the effort was to look for insights on how to successfully stimulate the demand for energy efficient HVAC products and services among customers, HVAC contractors, HVAC distributors, and HVAC manufacturers. The major objective of the overall primary market research effort is to inform the design of a comprehensive market transformation strategy for the residential HVAC market for a 3-year program. Overall issues of interest to the research team are outlined below.

³ Although some limited (primary sales) information was gathered on the new construction market, the primary

- Document the size of the single-family, owner-occupied housing HVAC market (e.g., emergency replacement, early or planned replacement, etc.);
- Determine market penetration rates, market share, and unit sales of HVAC products and services by distribution channel. At least initially, this includes summaries of both the new construction and retrofit/replacement/renovation markets;
- Establish a baseline of HVAC equipment efficiency, systems, and services in the new construction and retrofit/replacement/renovations markets;
- Provide insight into the impact of various market actors — consumers, contractors, distributors, manufacturers — on the Northern California residential HVAC market;
- Establish a baseline of consumers purchase decision process and key influences;
- Provide insight into the incremental cost of targeted HVAC equipment;
- Provide insight into the structure of the residential HVAC market, from manufacturers through distributors, contractors/dealers, to customers;
- Understand the barriers to the purchase and installation of energy efficient HVAC equipment and whole house system energy services;
- Identify marketing strategies to eliminate or reduce barriers;
- Understand the influence of various market actors (e.g., customers, HVAC contractors/dealers, builders, distributors, manufacturers) on equipment and whole house system services decision making;
- Explore the role financing plays in the equipment selection and purchasing process.

emphasis of this effort was on the existing home market.

Section IV: Methodology

This market research project is designed to address a diverse set of research objectives through a multi-faceted research approach. In order to address the research objectives, we completed research with HVAC manufacturers, distributors, and contractors. We also completed research with residential customers of PG&E who have recently purchased HVAC equipment. The research completed with each of these groups is summarized in individual “mini-reports.” The reader is encouraged to review the “mini-reports” if more detailed information on the individual research methodologies or research findings are desired. A brief overview of each of the individual research methodologies is outlined below.

HVAC Distributors and Manufacturers. Twenty-four in-depth interviews were completed with HVAC distributors and manufacturers. The distributors were identified by PG&E staff as those actively serving contractors in their territory. We identified major manufacturers and obtained contact names for most during the distributor interviews. The in-depth interviews with 20 distributors and 4 manufacturers, which averaged one hour in duration, ranged from 30 minutes to 95 minutes, and were completed between April 16 and May 13, 1999. The individual “mini-report,” entitled “Residential Market Transformation-Manufacturer and Distributor In-depth Interviews” can be found in the Appendix.

HVAC Contractor In-depth Interviews. Twenty in-depth interviews were completed with HVAC contractors located in PG&E’s service territory. These contractors all perform at least some work within the residential sector. These HVAC contractors were identified through listings of licensed “C20” contractors obtained through the State of California Contractors State Licensing Board (CSLB). The in-depth interviews, which ranged from 25 to 120 minutes, were completed between March 17 and May 6, 1999. Contractors who participated in this aspect of the research project were given an incentive of \$100. The individual “mini-report,” entitled “Residential Market Transformation-Contractor In-depth Interviews” can be found in the Appendix.

HVAC Contractor Quantitative Survey. We completed 227 quantitative telephone surveys with HVAC contractors located within PG&E’s service territory. All of these contractors perform at least some work within the residential sector. These HVAC contractors were identified through listings of licensed “C20” contractors obtained through the State of California Contractors State Licensing Board (CSLB). The quantitative surveys, which averaged 28 minutes, were completed between April 19, 1999 and May 5, 1999. Contractors who participated in this aspect of the research project were given an incentive of \$50. The individual “mini-report,” entitled “Residential HVAC Market Transformation-Contractor Survey” can be found in the Appendix.

Consumer Quantitative Survey. We completed 803 quantitative telephone surveys with PG&E residential customers who live in and own a single-family dwelling and who have recently (within past 5 years) purchased heating or cooling equipment. Interviews were completed with a random sample of customers across PG&E’s service area, ranging from the hot Desert/Mountain climate zones to the cool, Coastal climate zones. The quantitative surveys, which averaged 17 minutes, were completed between March 19, 1999 and April 21, 1999. The individual “mini-report,” entitled “Residential HVAC Market Transformation-Customer Survey” can be found in the Appendix.

Section V: Findings

This section of the report is divided into thirteen sub-sections. The first two sub-sections describe the structure of the Northern and Central California residential HVAC market and summarize 1998 HVAC equipment sales by efficiency level and climate zone. This is followed by sub-sections which discuss the incremental cost of energy-efficient HVAC equipment, the role of financing, the equipment installation timing, the contractor and equipment selection process, and customer concerns and satisfaction with HVAC projects. The section continues with sub-sections that discuss HVAC and ductwork sizing, service and maintenance, and PG&E HVAC programs. The report concludes with two sub-sections discussing utility interactions with the HVAC industry and identifying the market barriers to energy efficiency products and services.

Market Structure

This sub-section describes the structure of the Northern California residential HVAC market.⁴ As illustrated in Figure 1 (the Forced Air Furnace Market) and Figure 2 (the Central Air Conditioning Market), the HVAC equipment distribution process is very “traditional.” HVAC equipment typically makes its way to a customer by passing from manufacturer to distributor to contractor. As outlined in both figures, there are only a few exceptions to this rule. First, in the new construction market, many large production builders negotiate the purchase of HVAC equipment directly with manufacturers. Although production builders may negotiate pricing with a manufacturer, the physical units usually continue to flow through distributors. Second, a few companies (e.g., Lennox) bypass the typical distribution process and ship units directly from their manufacturing facility to their dealer base. As previously stated, these situations (which are denoted with dashed lines on Figure 1 and 2), are truly exceptions to the rule. Key findings relative to residential HVAC market structure are outlined below.

- **The residential HVAC market is dominated by a few (about 8) large manufacturers and relatively few (perhaps as few as 10) large local distributors.** Currently, manufacturers produce products for a nation-wide market. Distributors are typically independently owned (not manufacturer owned) although they often carry products for a single manufacturer.
- **The HVAC contractor segment of the market is highly fragmented.** Most HVAC contractors serving the residential market are small, independent, local firms providing services only to residential and light commercial customers. The average respondent who participated in the quantitative contractor survey has 7 employees. Many HVAC contractors are one-person shops—they have no other employees. Thus, most residential HVAC contractors have limited internal resources and limited access to external support. And, although smaller firms have the greatest needs for technical, sales and management training, they will be the least likely to be able to make time for such development activities.

⁴ This study concentrated on single-family, owner-occupied housing.

- **As outlined in Figure 1, an estimated 116,677 forced air furnaces were installed in single-family, owner-occupied homes within PG&E’s service territory during 1998.** This consists of an estimated 36,543 units installed in newly constructed homes, 34,689 emergency or breakdown replacements within existing homes, 23,352 planned replacements within existing homes, and 22,093 units installed in existing homes that did not previously have a forced air furnace.⁵
- **As outlined in Figure 2, an estimated 84,352 central air conditioners were installed in single-family, owner-occupied homes within PG&E’s service territory during 1998.** This consists of 17,442 units installed in newly constructed homes, 28,965 emergency or breakdown replacements within existing homes, 19,498 planned replacements within existing homes, and 18,447 units installed in homes that did not previously have central air conditioning.⁶

⁵ The following sources were used to estimate and check the furnace installation numbers:

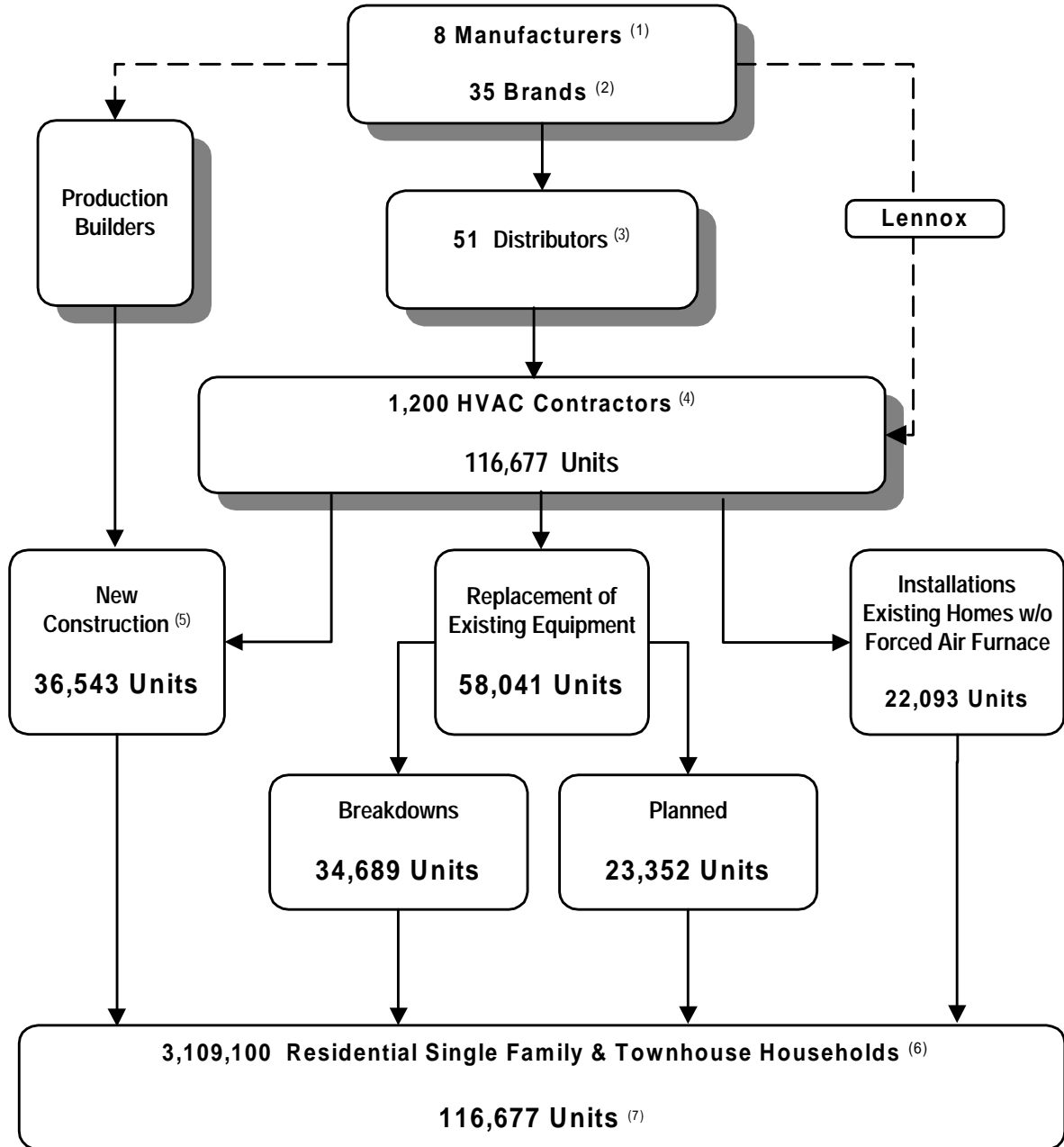
- the total number of furnaces was estimated from the installation rates obtained from the Customer Survey multiplied by the total number of single family dwellings and town houses (3,108,000 in 1994) from the PG&E 1994 Residential Energy Survey Report;
- the total was cross-checked against GAMA data showing 288,624 furnaces shipped to all of California;
- new construction installations were based on the number of permits for single family dwellings and duplexes for all counties served by PG&E (50,265) from the Construction Industry Research Board multiplied by the reported percentage of new homes that have a forced air furnace (72.7%);
- the information from the contractor survey was used to split existing homes into replacement of existing units (72%) and installations in homes without central units (“additions” 28%).
- the split of replacements into breakdown (60%) and planned (40%) replacements was based on information from the Contractor Survey.

⁶ The following sources were used to estimate and check the central air conditioner installation numbers:

- the total number of central air conditioners was estimated from the installation rates obtained from the Customer Survey multiplied by the total number of single family dwellings and town houses (3,108,000 in 1994) from the PG&E 1994 Residential Energy Survey Report;
- the total was cross-checked against ARI data showing 267,000 unitary air conditioners shipped to all of California;
- new construction installations were based on the number of permits for single family dwellings and duplexes for all counties served by PG&E (50,265) from the Construction Industry Research Board multiplied by the reported percentage of new homes that have a central air conditioner (34.7%);
- the information from the contractor survey was used to split existing homes into replacement of existing units (72%) and installations in homes without central units (“additions” 28%).
- the split of replacements into breakdown (60%) and planned (40%) replacements was based on information from the Contractor Survey.

Figure 1: Forced air furnace market flow diagram

(Market flows based on information obtained through the Contractor Telephone Survey except as noted.)



¹ Eight major manufacturers dominate the United States unitary product market.

² Thirty-five brands were identified from responses to the Contractor Survey.

³ Fifty-one distributors were identified in the Contractor Survey.

⁴ Between 1060 and 1400 active HVAC contractors serving PG&E residential customers estimated from Contractor Survey.

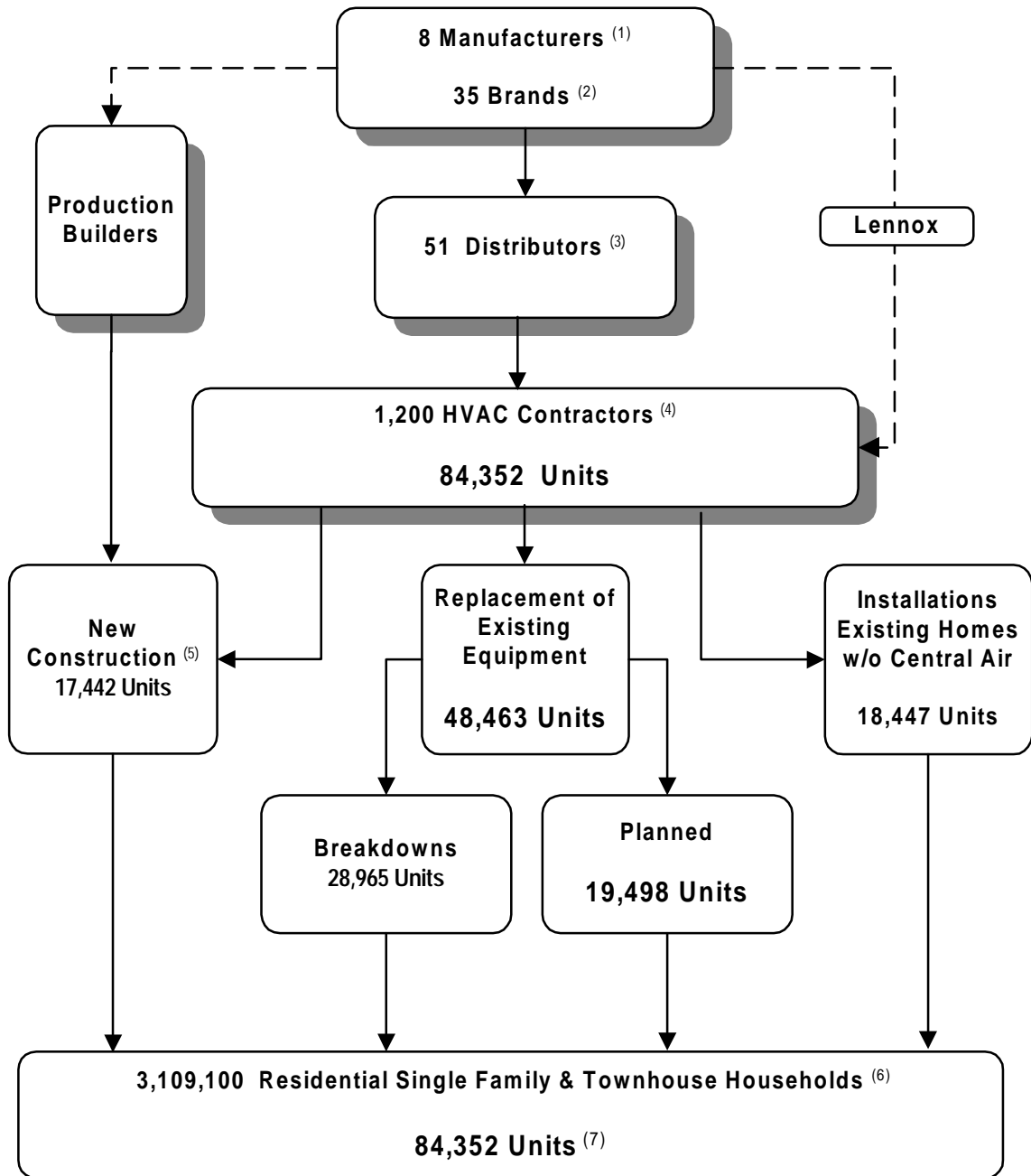
⁵ Product of 1998 Construction Industry Research Board (CIRB) residential new home and duplex construction activity in PG&E service territory (50,265) and 1994 PG&E RES reported percentage of new homes within PG&E service territory that have a forced air furnace (72.7%).

⁶ 1994 PG&E RES Report

⁷ Estimated total unit sales based upon quantitative Customer Survey.

Figure 2: Central air conditioning market flow diagram

(Market flows are based upon information obtained through the Contractor Telephone Survey except as noted.)



¹ Eight major manufacturers dominate the United States unitary product market.

² Thirty-five brands were identified from responses to the Contractor Survey.

³ Fifty-one distributors were identified in the Contractor Survey.

⁴ Between 1060 and 1400 active HVAC contractors serving PG&E residential customers estimated from Contractor Survey.

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⁶ 1994 PG&E RES Report

⁷ Estimated total unit sales based upon quantitative Customer Survey.

Sales by Efficiency Level

Establishing a baseline of HVAC equipment sales in the residential new construction and existing home markets is a key project objective. This baseline will allow PG&E to reliably track the impact of future residential HVAC market transformation efforts. Manufacturers, distributors, and contractors were asked to provide their 1998 unit sales information by market (e.g., new construction, existing home replacements, etc.) and by efficiency level. Most manufacturers refused to provide this information and many distributors were unable to provide the information in the desired format. We found, however, that the 227 residential HVAC contractors who participated in the quantitative survey were both willing and able to provide detailed sales information. In addition to finding out what contractors are selling, we asked them to tell us what efficiency level they consider to be energy efficient. Where appropriate, responses in this sub-section are weighted by each respondent's residential HVAC equipment unit sales volume.⁷ (*Weighted responses are indicated when used in the findings.*) Key 1998 residential HVAC equipment sales information is summarized below.

- **Approximately 80 percent of 1998 forced air furnace sales within PG&E's service territory have efficiency or A.F.U.E. ratings of 80-89%.** As illustrated in Table 1, 79% of new construction units sales and 83% of existing home unit sales across PG&E's service territory have efficiency or A.F.U.E. ratings of 80-89%. *These percentages are weighted by HVAC contractor survey respondents' new construction and existing home forced air furnace unit sales volumes, respectively.*
- **The market share of high efficiency forced air furnaces is highest among survey respondents located in the Desert/Mountain climate zone.** As illustrated in Table 1, 46% of new construction unit sales and 32% of existing home units sales in the Desert/Mountain climate zone have A.F.U.E. ratings of 90% or higher. These market shares are approximately twice as high as those in the Valley, Coastal, and Hill climate zones. *These percentages are weighted by HVAC contractor survey respondents' new construction and existing home forced air furnace unit sales volumes, respectively.*

⁷ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

Table 1: 1998 forced air furnace sales by efficiency level and climate zone¹

	Percent of 1998 Forced Air Furnace Unit Sales				
	Desert/ Mountain	Valley	Coastal	Hill	PG&E Territory
<i>New Construction</i>					
80-89% A.F.U.E.	54%	79%	84%	86%	79%
90% A.F.U.E. or higher	46%	21%	16%	14%	21%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
<i>(Contractor Units Sales)</i>	<i>(874)</i>	<i>(3,785)</i>	<i>(1,169)</i>	<i>(2,454)</i>	<i>(8,282)</i>
<i>Existing Homes</i>					
80-89% A.F.U.E.	68%	83%	87%	83%	83%
90% A.F.U.E. or higher	32%	17%	13%	17%	17%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
<i>(Units)</i>	<i>(797)</i>	<i>(4,985)</i>	<i>(2,324)</i>	<i>(4,403)</i>	<i>(12,509)</i>

¹ Weighted by HVAC contractor survey respondents' new construction and existing home forced air furnace unit sales volumes, respectively.

- **Approximately 50 percent of 1998 central air conditioning sales in PG&E's service territory just meet the minimum federal standard for energy efficiency—they have SEER ratings of 10.** As illustrated in Table 2, 56% of unit sales in the new construction market and 50% of unit sales in the existing homes market have SEER ratings of 10. *These percentages are weighted by HVAC contractor survey respondents' new construction and existing home central air conditioning unit sales volumes, respectively.*
- **Over 40% of both overall new construction and overall existing home central air conditioning sales have SEER ratings of 12 or higher.** As illustrated in Table 2, 41% of new construction sales and 44% of existing home sales have SEER ratings of 12 or higher. The table also illustrates some variability in the percentage of units with SEER ratings of 12 or higher across climate zones for both new construction, and to a higher degree, existing homes. *These percentages are weighted by HVAC contractor survey respondents' new construction and existing home central air conditioning unit sales volumes, respectively.*

Table 2: 1998 central air conditioning sales by efficiency level and climate zone¹

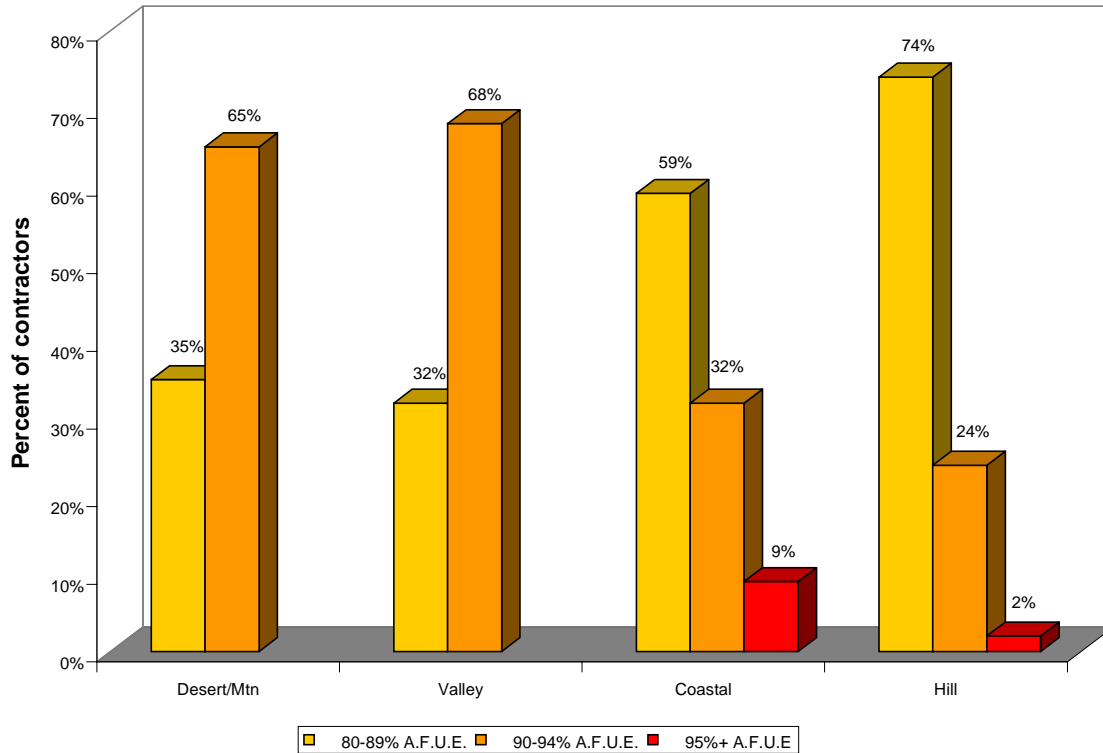
	Percent of 1998 Central Air Conditioning Unit Sales				
	Desert/ Mountain	Valley	Coastal	Hill	PG&E Territory
<i>New Construction</i>					
10 SEER	55%	55%	69%	55%	56%
11 SEER	3%	2%	11%	3%	3%
12 SEER or higher	42%	43%	20%	42%	41%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
<i>(Contractor Unit Sales)</i>	<i>(1,136)</i>	<i>(4,005)</i>	<i>(375)</i>	<i>(1,860)</i>	<i>(7,376)</i>
<i>Existing Homes</i>					
10 SEER	47%	44%	67%	59%	50%
11 SEER	4%	4%	15%	8%	6%
12 SEER or higher	49%	52%	18%	33%	44%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
<i>(Contractor Unit Sales)</i>	<i>(1,194)</i>	<i>(5,584)</i>	<i>(581)</i>	<i>(2,950)</i>	<i>(10,309)</i>

¹ Weighted by HVAC contractor survey respondents' new construction and existing home forced central air conditioning unit sales volumes, respectively.

For both new construction forced air furnace and central air conditioning equipment sales, we also asked HVAC contractors who participated in the quantitative telephone survey what efficiency level (i.e., A.F.U.E. rating for furnaces and SEER rating for central air conditioning equipment) they “consider” to be energy efficient. Key findings across climate zones are outlined below.

- **Approximately two-thirds of HVAC contractor survey respondents located in the Desert/Mountain and Valley climate zones consider furnaces with 90-94% A.F.U.E. ratings to be energy efficient.** As illustrated in Figure 3, this compares to only about one-third of survey respondents located in the Coastal and Hill climate zones who consider furnaces with 90-95% A.F.U.E. ratings to be energy efficient *Percentages are weighted by HVAC contractor survey respondents' furnace sales volume.*

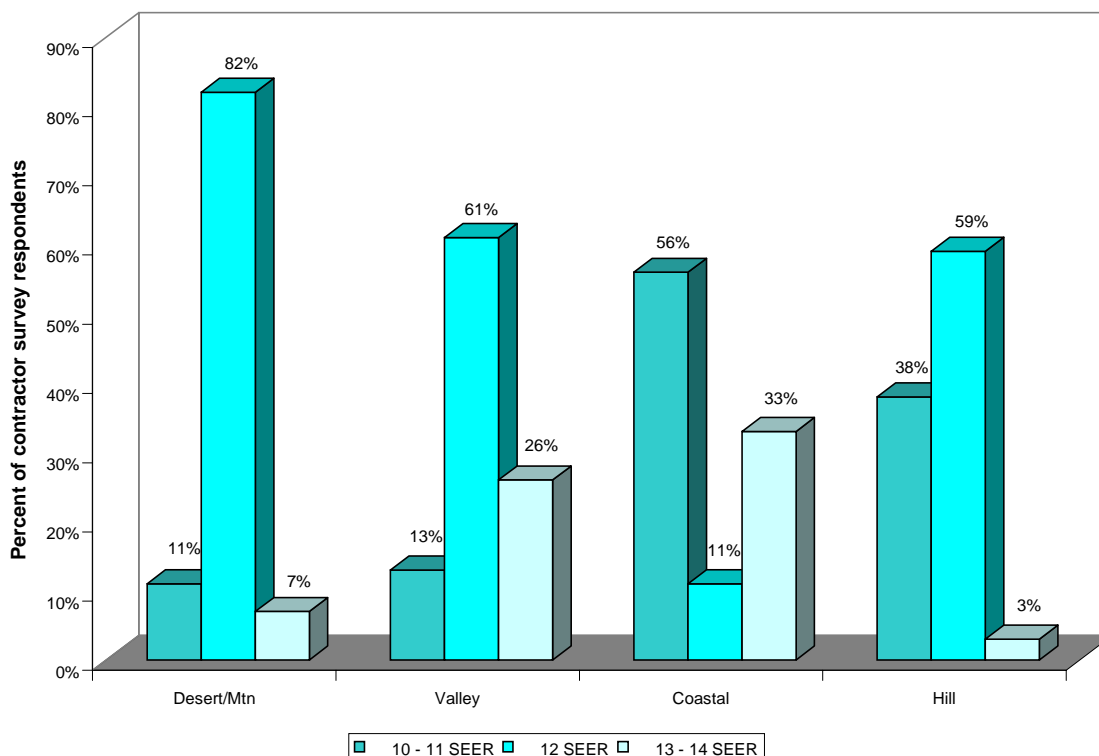
Figure 3: Forced air furnace efficiency level considered to be efficient¹



¹ Weighted by HVAC contractor survey respondents' forced air furnace unit sales volume.

- **The central air conditioning energy efficiency level (or SEER rating) that HVAC contractor survey respondents consider to be energy efficient varies considerably across climate zones.** As illustrated in Figure 4, few survey respondents in the Desert/Mountain and Valley climate zones consider 10-11 SEER units to be energy efficient. However, in comparison, 56% of respondents in the Coastal climate zone and 38% of respondents in the Hill climate zone consider 10-11 SEER units to be energy efficient. *Percentages are weighted by HVAC contractor survey respondents' central air conditioning unit sales volume.*

Figure 4: Central air conditioning efficiency level considered to be efficient¹



¹ Weighted by HVAC contractor survey respondents' central air conditioning unit sales volume.

- **Distributors, manufacturers and contractors agree that energy-efficient products provide greater revenues, higher profit margins and greater reliability, quality and comfort for consumers.** However, energy-efficient products are still not widely sold and are often positioned as “niche” products.
- **Distributors and manufacturers identified a number of sales tools to help HVAC sales people demonstrate to customers the benefits and total monthly electricity and gas bill savings of energy-efficient equipment.** Distributors and manufacturers generally agree that getting contractors to take the time (and convincing contractors that they have the time) is often problematic.
- **Manufacturers and distributors have “minimal” interest in developing energy-efficient products for the hot / dry climates in the Southwest U.S.** Manufacturers see this as a small “niche” market and distributors noted that existing evaporative cooling provides a solution for these hot / dry climates.

Incremental Costs of Energy-Efficient Equipment

Understanding the incremental (or increased) cost of energy efficient equipment over standard efficiency equipment is important when trying to understand both contractor recommendations and, ultimately, consumer decision making. In order to provide insight into this issue, we asked HVAC contractor survey respondents for the increased customer cost (both equipment and labor) of selling and installing high efficiency forced air furnaces and central air conditioners over standard efficiency equipment. We also asked them about the profitability of selling HVAC equipment versus selling labor hours. Where appropriate, responses in this sub-section are weighted by HVAC contractor survey respondents' total residential equipment unit sales volume.⁸ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Compared to standard efficiency forced air furnaces (i.e., 80% A.F.U.E.), forced air furnaces with 90% and 95%+ A.F.U.E. ratings cost customers an average of \$601 and \$810 more to install (including equipment and labor), respectively.** As illustrated in Table 3, the median increased cost is \$550 for 90% A.F.U.E. units and \$800 for 95%+ A.F.U.E. units. *Costs are weighted by HVAC contractor survey respondents' total furnace sales, excluding top and bottom 10% of responses.*

⁸ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

Table 3: Average incremental cost of high efficiency forced air furnace¹

	80% to 90% A.F.U.E.	80% to 95% A.F.U.E.
Mean	\$601	\$810
Median	\$550	\$800
	(n = 141) ²	(n = 103) ³

¹ Weighted by total HVAC contractor survey respondents' furnace sales, excluding top and bottom 10% of responses.

² A total of 225 contractors were asked this question. Forty-eight responses were eliminated because contractor did not sell furnaces, did not know difference in cost, or refused to answer. Thirty-six responses were eliminated because they fell in the upper or lower 10% of the distribution.

³ A total of 225 contractors were asked this question. Ninety-two responses were eliminated because contractor did not sell furnaces, did not know difference in cost, or refused to answer. Thirty responses were eliminated because they fell in the upper or lower 10% of the distribution.

- **Compared to standard efficiency units (i.e., 10 SEER), 3 ton central air conditioners with 12, 13, and 14 SEER ratings cost customers an average of \$530, \$776, and \$1,078 more to install⁹, respectively.** Table 4 also shows the increased cost (by efficiency level) for 3 ton split systems and packaged systems. As shown in the table, increasing the efficiency level of split systems is more expensive than packaged systems. *Costs are weighted by HVAC contractor survey respondents' total central air conditioning sales, excluding top and bottom 10% of responses.*

⁹ This increased installation cost includes both equipment and labor cost.

Table 4: Average incremental cost of high efficiency central air conditioning¹

	3 Ton Unit		
	From 10 to 12 SEER	From 10 to 13 SEER	From 10 to 14 SEER
Packaged²			
Mean	\$496	\$577	\$865
Median	\$500	\$643	\$900
	(n = 22)	(n = 12)	(n = 9)
Split³			
Mean	\$539	\$852	\$1131
Median	\$500	\$831	\$1200
	(n = 74)	(n = 53)	(n = 33)
Overall⁴			
Mean	\$530	\$776	\$1078
Median	\$500	\$800	\$1000
	(n = 142) ⁵	(n = 97) ⁶	(n = 72) ⁷

¹ Weighted by HVAC contractor survey respondents' total air conditioning sales, excluding top and bottom 10 % of responses.

² Includes data from HVAC contractor survey respondents' who 'usually' install packaged units.

³ Includes data from HVAC contractor survey respondents' who 'usually' install split systems.

⁴ Includes data from HVAC contractor survey respondents' who 'usually' install packaged units, 'usually' install split systems, or install both equally.

⁵ A total of 220 contractors were asked this question. Forty-six responses were eliminated because contractor did not know difference in cost or refused to answer. Thirty-two responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁶ A total of 220 contractors were asked this question. Ninety-six responses were eliminated because contractor did not know difference in cost or refused to answer. Twenty-seven responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁷ A total of 220 contractors were asked this question. One hundred twenty-five responses were eliminated because contractor did not know difference in cost or refused to answer. Twenty-three responses were eliminated because they fell in the upper or lower 10% of the distribution.

- **The highest percentage of HVAC contractor survey respondents (45%) said they make the same amount of profit on their markup of the equipment they install as they do on the markup of labor.** Responses to this question are highly varied, with 27% of contractor survey respondents saying they make more profit on the markup of equipment sales and 28% saying they make more profit on the markup of labor.
- **However, some distributors disagree that contractors make as much profit on their labor as on the equipment they install.** They believe a chronic problem among HVAC contractors is charging too little for labor.

- **Contractors, distributors, and manufacturers generally agree that the increased (or incremental) cost of energy-efficient HVAC equipment is a major barrier to adoption.** However, many of them pointed out that energy efficient models also include many “premium” features and components that provide valuable additional benefits to customers. These benefits include reduced operating noise levels, increased reliability, better comfort, and better warranties.

Role of Financing

This sub-section addresses issues related to the role of financing in the purchase of HVAC equipment. We asked HVAC contractor survey respondents whether or not they offer financing programs to residential customers and how important such offerings are from a competitive standpoint. We also asked customers how they paid for their equipment purchase, and if they used financing, where they got their loan. Where appropriate, contractor survey responses in this sub-section are weighted by their total residential HVAC equipment unit sales volume.¹⁰ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **About half (49%) of all contractor survey respondents offer their residential customers financing for the purchase of HVAC equipment.** *When weighted by contractor survey respondents' total residential HVAC equipment unit sales volume, 67% offer financing for HVAC equipment purchase.*
- **The “equipment manufacturer” is the most frequently offered source of financing for HVAC purchases.** As illustrated in Table 5, 42% of contractor survey respondents (who offer financing) offer the “equipment manufacturer” as a customer-financing source. The second most frequently offered source of financing is a “local financing company” (32%). A complete list of financing sources mentioned by 5% or more of the contractor survey respondents who offer financing is included in Table 5. *When weighted by contractor survey respondents' total residential HVAC equipment unit sales volume, percentages are very similar.*

¹⁰ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

Table 5: Sources of contractor provided customer financing for HVAC purchases¹

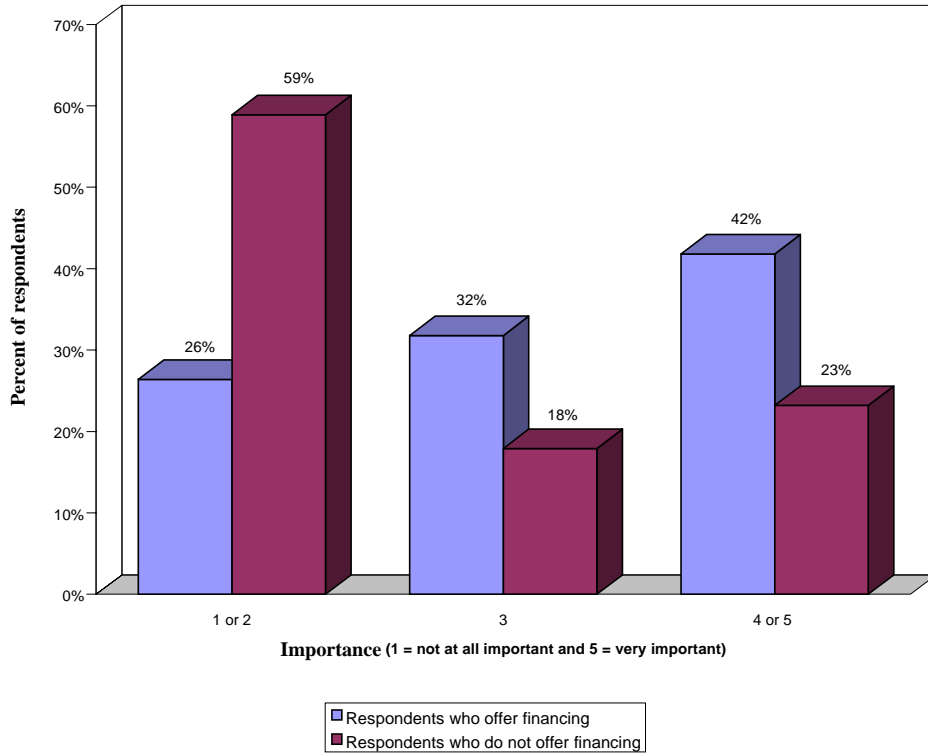
Sources	Percent of contractor survey respondents	Percent of market activity ²
Equipment manufacturers	42%	43%
Local financing company	32%	38%
Equipment distributors	19%	24%
Nation-wide financing company	18%	22%
Contractor's company	12%	13%
Local bank	9%	10%
Nation-wide bank	7%	7%
	(n = 106)	(n = 106)

¹ Only responses mentioned by 5% or more of the contractor survey respondents are listed.

² Responses are weighted by each respondent's total residential HVAC equipment unit sales volume.

- Very few residential customers use contractor-provided financing services.** Nearly 80% of customers said they paid for their HVAC equipment with their own money. Only 11% mentioned receiving financing to pay for their equipment. Of those who did receive financing, only 10% obtained it through the contractor.
- Contractor survey respondents who offer customer-financing indicate that offering financing is very important from a competitive standpoint, while those who do not offer financing indicate that it is not very important.** Contractor survey respondents were asked to rate the importance of financing (from a competitive standpoint) on a scale of 1 to 5 with 1 being 'not every important' and 5 being 'very important.' As illustrated in Figure 5, 42% of the contractor survey respondents who offer financing indicate an importance level of 4 or 5, while only 23% of those who do not offering financing indicate an importance level of 4 or 5.

Figure 5: Importance of offering financing from a competitive standpoint



Equipment Installation Timing

In this sub-section we explore the possibility that the timing of equipment replacements and additions may be a barrier to the purchase and installation of energy efficient HVAC equipment. We asked customer survey respondents about the reason for their HVAC equipment purchase, and we asked both contractor and customer survey respondents about the timing of HVAC equipment installations. We also asked distributors and manufacturers for their perspectives on the equipment installation process. Where appropriate, contractor survey responses in this sub-section are weighted by their residential HVAC equipment unit sales volume.¹¹ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Remodeling projects rarely drive the purchase of HVAC equipment, whether it is a replacement or an addition.** Only 8% of customer survey respondents added or replaced equipment as part of a home-remodeling project.
- **HVAC contractors report they seldom coordinate their work with remodeling projects.** They work on a job at the same time as a remodeler 29% of the time. Of those jobs, the remodeling project is improving energy efficiency 47% of the time. Of those projects, they receive information in time to size the furnace or air conditioner 57% of the time. The total percentage *where all three of these conditions exist* is 8%.¹²
- **Customers who *replace* HVAC equipment have a more urgent need for their equipment than do customers who *add* HVAC equipment.** Table 6 compares the customer-reported timing for HVAC replacements and additions. As illustrated in the table, customers report that 25% of replacements are needed within three days, while only 9% of additions are needed in that time frame.

¹¹ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

¹² We weighted contractor responses as follows: All of the time=90% of the time; Most=60%; Occasionally=30%; Not very often=15%; Never=0%. We multiplied responses (in percent) by these weights and summed the products for an estimate of the overall percent of time each occurred.

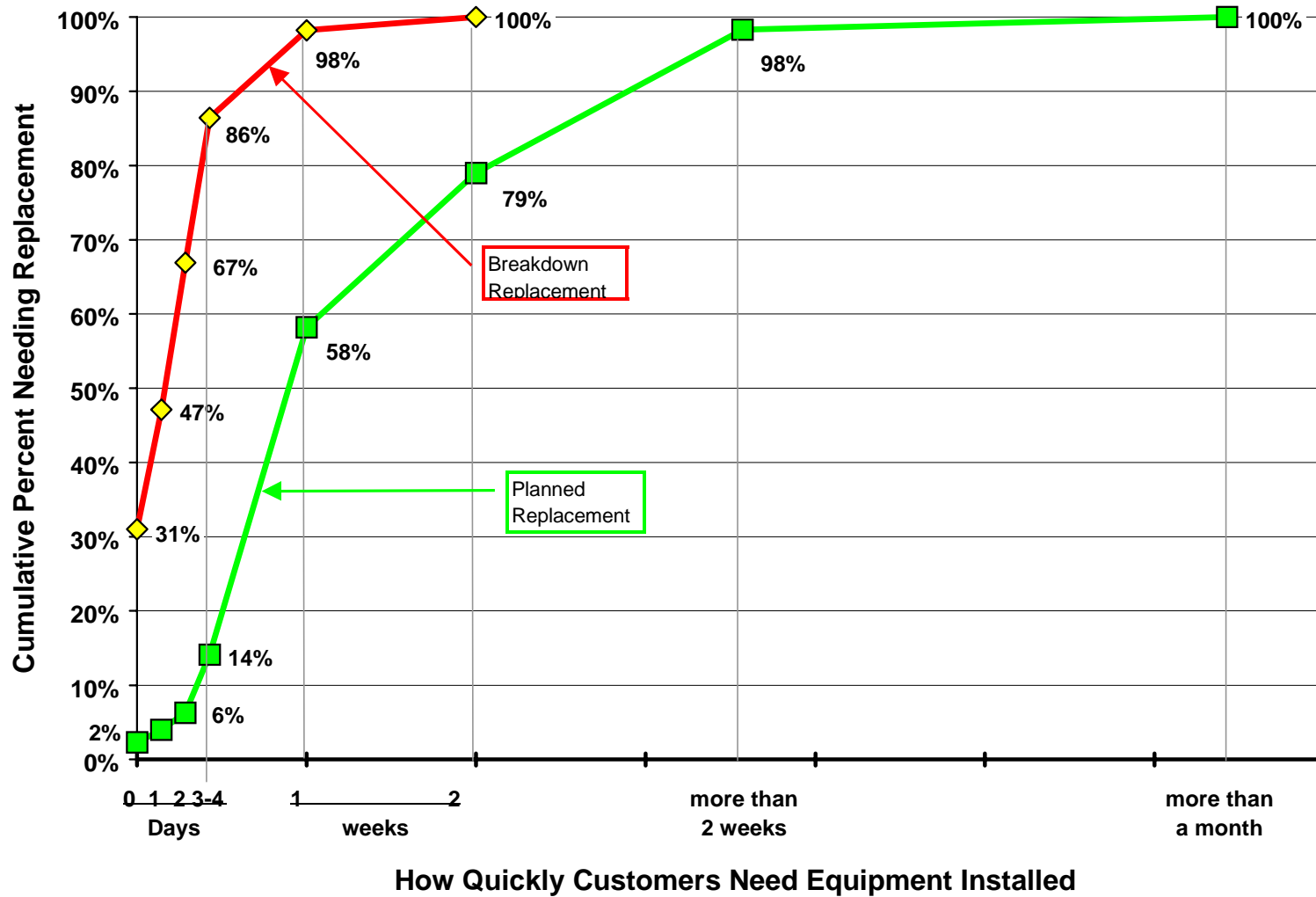
Table 6: Comparison of customer timeframe for replacing or adding equipment

Timeframe	Cumulative percent of customer survey respondents	
	Replacements	Additions
Within three days	25%	9%
Within one week	38%	17%
Within two weeks	45%	23%
Within a one month	54%	30%
	(n = 506)	(n = 383)

- **The primary reason that customers *add* either a furnace or an air conditioner is “because they do not have one.”** According to 383 customer survey respondents who added HVAC equipment, 24% did so because they did not have an air conditioner, 20% did so for “comfort” and 14% did so because they did not have a furnace.
- **End-of-life reasons dominate customer *replacement* of residential HVAC equipment.** According to 506 customer survey respondents who replaced HVAC equipment, 85% of all replacements are made for “end-of-life” reasons. These include “breakdown,” “unit getting old,” “unit needing repairs,” “inspector recommendation,” “contractor convinced purchaser,” “afraid unit would breakdown,” and “utility red-tag.”
- **Overall, distributors estimated that 77% of all replacements are not done until breakdown.** A typical description they gave of customer behavior was, “Nobody thinks ahead . . . [even if they have some idea that] when dealers are busy it will be more expensive.”
- **Looking at shipment data, a manufacturer commented that customers who need to replace past the middle of the season just “baby the unit along” and wait until the next year.**
- **Contractors are under pressure to install equipment quickly when a customer’s HVAC equipment “breaks down.”** Replacements made because of “breakdown” of existing equipment are more urgent than replacements made for other reasons. As illustrated in Figure 6, contractor survey respondents indicate that 86% of breakdown replacements are needed in four days or less, compared with only 14% of planned replacements needed in that time frame.

- **Contractors reported (during in-depth interviews) that more than half of customers with broken down equipment want it replaced within 3 days.** In addition, customers want an immediate response to their call, a quick proposal, and next day service. Contractors feel they do not have as much opportunity to discuss options when equipment breaks down during the middle of the cooling or heating season.

Figure 6: “Breakdown” and “Planned” HVAC Replacements Timeframe Comparison¹



¹ Weighted by contractor survey respondents’ total HVAC equipment *breakdown* and *planned replacement* unit sales volumes, respectively.

- **Contractor survey respondents generally indicate a greater urgency for replacements due to breakdowns than do customers.** Table 7 compares contractor and customer reported timing for breakdown and planned replacements. As illustrated in Table 7, 31% of contractor survey respondents¹³, contrasted with 18% of customer survey respondents, indicate equipment replacements due to breakdowns are needed the same day as the breakdown occurs. A total of 86% of contractor survey respondents, contrasted with 38% of customer survey respondents, indicate replacements due to breakdowns are needed within four days. These apparent differences in urgency can be attributed to several factors:
 - ⇒ Customer’s perception that replacement took longer than it actually did.
 - ⇒ Customers may not contact contractors immediately when breakdown occurs, so they have already been without equipment for a day or two.
 - ⇒ Several customers (7%) said they didn’t know how long it took.
 - ⇒ Contractor survey respondents may perceive that the timeframe was shorter because they felt an urgency to get the equipment installed.
- **Few contractor survey respondents or customer survey respondents indicate a need for replacement equipment within 3-4 days when they have a *planned replacement*.** As illustrated in Table 7, only 14% of surveyed customers and 14%¹⁴ of surveyed contractors indicate a replacement is needed within four days for a *planned replacement*.
- **Information collected from distributors and manufacturers supports the contractor and customer findings—they view the residential HVAC market as “full of procrastinating customers.”** Distributors estimated that 77% of equipment replacements are due to breakdown. While slightly higher than contractor estimates (60%), it is generally consistent.
- **During an in-depth interview, a manufacturer cautioned that, “Many people think that customers buy real fast, but they take more time than many think.** The contractor is in a hurry—they want a quick sell. They don’t offer more. If the salesperson will take the time, features will sell.”

¹³ Weighted by contractor survey respondents’ residential HVAC equipment *breakdown replacement* unit sales volume.

¹⁴ Weighted by contractor survey respondents’ residential HVAC equipment *planned replacement* unit sales volume.

Table 7: Customer and contractor survey respondents' reported urgency of equipment replacement

Timeframe	Breakdown replacement		Planned replacement	
	Cumulative % (Customers)	Cumulative % market activity ¹ (Contractors)	Cumulative % (Customers)	Cumulative % market activity ² (Contractors)
Same day	18%	31%	8%	2%
Next day	24%	47%	9%	5%
2 days	34%	67%	12%	6%
3 to 4 days	38%	86%	14%	14%
1 week	55%	98%	22%	58%
2 weeks	63%	100%	29%	79%
3 to 4 weeks	72%		38%	98%
More than 4 weeks	93%		85%	100%
Don't know	100%		100%	

¹ Weighted by contractors' residential HVAC equipment *breakdown replacement* unit sales volume.

² Weighted by contractors' residential HVAC equipment *planned replacement* unit sales volume.

Contractor and Equipment Selection Process

An important aspect of characterizing the residential HVAC market is understanding, from a customer or purchaser perspective, the contractor and equipment selection process. This spans from documenting how customers select an HVAC contractor to what they take away (or learn) from the conversations they have with HVAC sales staff. As will be discussed in this sub-section, customers' choice of a contractor and the interactions they have with HVAC sales staff have important implications on the equipment that is actually installed. During the research process, we asked both contractor survey respondents and consumer survey respondents to discuss the HVAC purchasing process. We found that contractors understand their residential customers very well. In fact, when asked to describe the “typical” customer decision making process, contractors (as a group) described a decision making process which closely mirrors customer self-reports. Because of this similarity in response, and in order to simplify the presentation, only results from the customer survey are reported within this sub-section. Key findings are outlined below.

- **According to customer survey respondents, the choice of a contractor is the most important element of the decision making process when adding or replacing HVAC equipment.** Thirty-two percent of customer survey respondents said the contractor is the most important aspect of the decision making process, 24% said it is price and terms, 18% said it is the make or brand, and 16% said it is specific model features.
- **When selecting an HVAC contractor, customer survey respondents most frequently (61% of the time) rely on their own past experience or word-of-mouth referrals from friends, relatives, or neighbors.** Few customers rely solely on contractor advertising when making the selection decision. For example, only 20% of those replacing or adding equipment look to the yellow pages or phone book to help them identify contractors. As outlined in Table 8, a contractor's reputation and the trust they are able to build up with residential customers is central to both retaining and expanding their business.

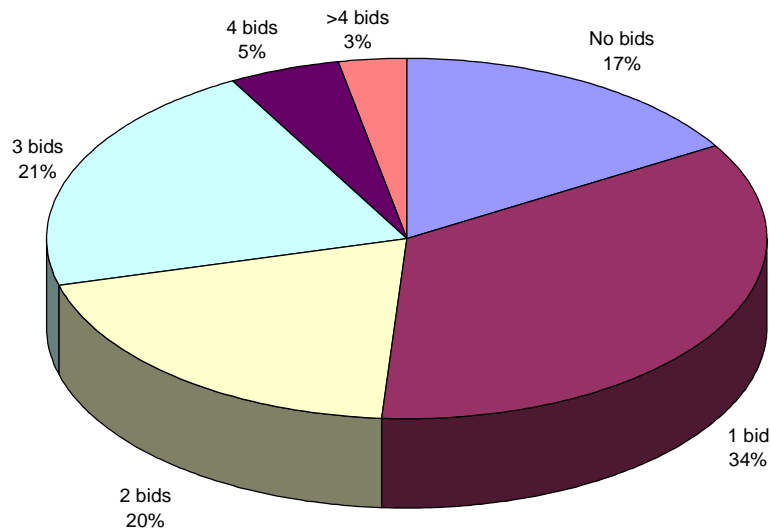
Table 8: Respondent reasons for selecting a specific contractor¹

Reason	Percent of respondents		
	Gave as first reason	Gave as additional reasons	Total
Reputation	41%	26%	48%
Trusted contractor	14%	42%	24%
Best price	12%	10%	15%
Friend or relative recommended	6%	3%	7%
Balance of price and other features	3%	7%	5%
Helped me/went out of way	2%	14%	5%
	N = 748	N = 182	N = 748

¹ Only those responses mentioned by 5% or more of the respondents are listed.

- **Over one-half of consumers simply call a single HVAC contractor and have them do the work, requesting no bids or only one bid (Figure 7).** The average HVAC purchaser obtains 1.8 bids as part of the contractor and equipment selection process.

Figure 7: Number of bids obtained when replacing or adding equipment



- **According to customer survey respondents, “energy efficiency” is the topic mentioned most frequently by contractor sales staff.** Reliability, reputation of contractor/brand, and total cost of installation are the next most frequently mentioned topics. Table 9 outlines other topics customer survey respondents recall HVAC salespeople discussing during the sales process.

Table 9: Salesperson emphasis in equipment replacements and additions¹

Topics emphasized	Percent of respondents		
	Replacements and additions	Replacements	Additions
Energy efficiency	27%	26%	29%
Reliability	15%	16%	16%
Reputation of contractor/brand	13%	15%	12%
Total cost of installation	11%	12%	9%
Warranty	8%	9%	7%
Improved comfort	8%	7%	9%
Sized properly for home	6%	6%	7%
Speed of installation	5%	7%	2%
	N = 709	N = 488	N = 310

¹ Respondents may have given more than one response. Only those responses mentioned by 5% or more of respondents are listed.

- **A manufacturer’s reputation is the most frequently mentioned reason for customer selection of a specific brand or make of HVAC equipment.** Many customer survey respondents rely upon their “time tested” contractor to advise them on which manufacturers’ products are of the best quality for the price paid. In other words, while customer survey respondents say the manufacturer’s reputation is important they often rely on the contractor to advise them on the relative strengths and weaknesses of various brands.

Customer Concerns and Satisfaction with HVAC Projects

In order to better understand the consumer perspective on the HVAC purchasing process, we specifically asked customer survey respondents about concerns that arose during the purchasing process. We found that customer survey respondent concerns vary somewhat by the reason they purchased HVAC equipment—breakdown of existing equipment versus planned replacement of existing equipment versus adding equipment they did not previously have. In addition to asking customer survey respondents about their concerns, we also asked them how satisfied they are with the results of the HVAC project. In addition to customers, manufacturers, and distributors were asked for their perspectives on what “drives” customer satisfaction. Key findings are outlined below.

- ***Equipment Replacements.*** “Energy efficiency” (or a desire to reduce energy costs) is the most frequently mentioned concern residential consumers have when replacing heating and cooling equipment. As illustrated in Table 10, “reliability” and “comfort” are other major concerns that consumers have when replacing heating and cooling equipment.

Table 10: Customer survey respondent concerns when replacing heating or cooling equipment¹

Main Concerns	Percent of respondents ²
Energy efficiency/lower energy costs	35%
Reliability/durability	18%
Comfort	16%
Need quickly/timing	8%
Proper size for home	8%
Safety	7%
Cost of unit	7%
Total respondents	511

¹ Respondents may have given more than one *unaided* response. Only response categories given by 5% or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air).

- **Replacements Due to Breakdown.** Customer survey respondents replacing heating and cooling equipment due to breakdown are more concerned with getting a replacement unit installed quickly and at an affordable price (it is an unexpected expenditure). Table 11 illustrates that “breakdown” purchasers are generally less concerned about energy efficiency and lowering their energy costs as compared to respondents replacing for other reasons.

Table 11: Customer survey respondent concerns when replacing HVAC equipment – breakdowns versus other replacements

Main Concerns	Percent of respondents with concern	
	Breakdown	Other
Save energy/energy efficiency/reduce operating costs	28%	41%
Need quickly/timing	13%	4%
Cost of unit	10%	4%
Total respondents	243	268

¹ Respondents may have given more than one response. Only those response categories where substantial differences exist are listed.

- **Adding HVAC Equipment.** “Comfort” and “energy efficiency” (or a desire to reduce energy costs) are the most frequently mentioned concerns customer survey respondents have when adding heating or cooling equipment. As illustrated in Table 12, consumers who are adding central air conditioning only are keenly aware of and concerned about “comfort.” Forty-six percent of consumers who added central air conditioning only said their main concern was “comfort.” This compares to only 19% of consumers who purchased a forced air furnace only.

Table 12: Main concerns when adding heating or cooling equipment¹

Main Concerns	Percent of respondents with concern			
	All Additions ²	Furnace and AC	Furnace Only	AC Only
Comfort	31%	29%	19%	46%
Energy efficiency/lower energy costs	23%	24%	24%	23%
Proper size for home	12%	20%	17%	10%
Reliability/durability	11%	11%	8%	13%
Cost of unit	11%	11%	6%	18%
Total respondents	329	66	79	125

¹ Some respondents gave more than one response. Only response categories mentioned by 5 % or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air) and combinations of additions, not just those categories listed in the final three columns on the right.

- **Customer survey respondents who have replaced or added HVAC equipment are highly satisfied with the comfort provided, the quality of the installation work, and the reliability of the equipment installed.** Overall, 74% of customer survey respondents said they were satisfied with the comfort provided, 74% said they were satisfied with the installation work, and 80% said they were satisfied with equipment reliability.
- **Customer survey respondents are most dissatisfied with the energy costs of running their new or replacement equipment.** However, it is difficult to tell if this dissatisfaction is primarily driven by what some might see as relatively high electricity rates or by dissatisfaction with the level of savings they expected.
- **Both contractors and distributors list “greater customer satisfaction” as one of the major benefits they gain from selling energy-efficient equipment.** Many contractors—especially smaller ones—rely on word-of-mouth referrals. Dealers want customers satisfied with the brand of equipment they installed to help them build the brand’s image for efficiency, quality, and reliability.

Sizing HVAC Equipment

Proper sizing of HVAC equipment is an important aspect of delivering a service that helps customers maximize efficiency and minimize their overall energy costs. In order to address research objectives, we asked customer survey respondents if the salesperson emphasized proper sizing of their HVAC equipment purchase. We asked contractor survey respondents to describe how they currently size HVAC equipment for installations in existing homes and how frequently they use the method. For new homes, we asked contractor survey respondents to comment on the role Title-24 (i.e., California state building code) has on their equipment sizing decisions. *Contractor reported findings in this sub-section are weighted by either contractor survey respondents' total residential HVAC equipment existing home, new construction, or total unit sales volume.*¹⁵ Key findings are outlined below.

- ***Customer concern with proper sizing of HVAC equipment is greater than customer-reported salesperson emphasis on correct sizing.*** Table 13 illustrates the percentage of customer survey respondents who indicated (in an unaided question that elicits a unique response) a concern with proper sizing of their HVAC equipment as well as customer-reported salesperson emphasis on proper sizing of equipment during the purchase process. As illustrated in Table 13, the percentage of customer survey respondents who reported a concern about sizing is greater for all combinations of furnace and air conditioning purchases with the exception of “replacing both the air conditioner and furnace.”

¹⁵ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

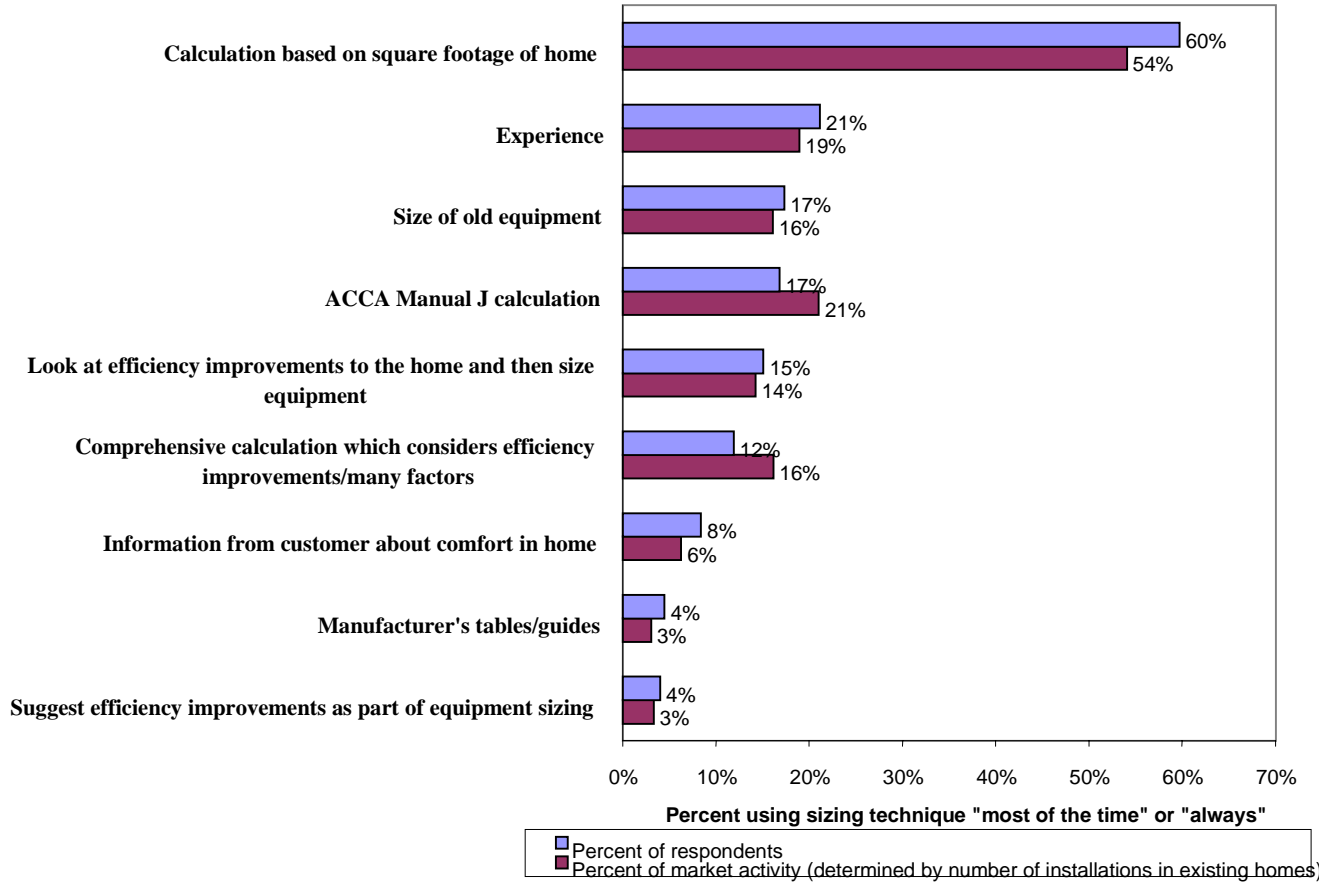
Table 13: Customer-reported concerns and customer-reported salesperson emphasis on proper sizing of HVAC equipment¹

HVAC purchase	Percent of customer survey respondents reporting concern about sizing		Percent of customer survey respondents reporting sales person emphasis on sizing	
Add air conditioner and furnace	20%	(n = 66)	8%	(n = 64)
Add furnace only	17%	(n = 79)	6%	(n = 72)
Add air conditioner only	10%	(n = 125)	7%	(n = 121)
Replace air conditioner only	10%	(n = 40)	8%	(n = 38)
Replace air conditioner and furnace	9%	(n = 109)	16%	(n = 101)
Replace furnace only	8%	(n = 294)	3%	(n = 285)
All additions	12%	(n = 329)		
All replacements	8%	(n = 511)		
All replacements or additions			6%	(n = 709)

¹ Response to unaided questions (eliciting unique individual responses).

- **While only 6% of customer survey respondents indicate (in an unaided response) the salesperson *emphasized* proper sizing of their HVAC equipment during the purchase process, when asked specifically if the salesperson *mentioned* properly sizing equipment, 73% of the respondents said “yes.”**
- **Sixty percent of contractor survey respondents said they size HVAC equipment through a calculation “based on the square footage of a home” ‘most of the time’ or ‘always.’** As illustrated in Figure 8, nearly three times as many contractor survey respondents use this technique compared to the next most frequently used technique (“experience”). The third and fourth most frequently used techniques include sizing the new equipment “based on the size of the old equipment” (17%) and “ACCA Manual J calculations” (17%). *Figure 8 also shows the percent of market activity for each sizing method, which is determined by weighting based upon the number of installations in existing homes.*
- **Overall, it appears that although many contractors ‘know’ that proper sizing is necessary for most efficient operation of furnaces and air conditioners, they are not doing what may be required to properly size every installation.** Their investigations of existing conditions and their calculation procedures are too informal.

Figure 8: Method used to size HVAC equipment



- ***When weighted by their new construction HVAC sales, 81% of contractor survey respondents working within the new construction market said they “generally” receive a Title-24 calculation that gives them the HVAC equipment size for new construction jobs.***
- ***When weighted by their new construction HVAC sales, only 10% of contractor survey respondents working within the new construction market said that Title-24 HVAC sizing calculations are ‘always’ correct. Another 49% said the calculations are correct ‘most of the time.’ In total, 39% or respondents said that Title-24 calculations are correct ‘occasionally,’ ‘not very often,’ or ‘never.’***
- ***When weighted by their new construction HVAC sales, nearly two-thirds of contractor survey respondents said that when Title-24 calculations seem incorrect it is usually because they think the Title-24 recommended HVAC equipment is undersized. In other words, these contractor survey respondents feel that larger equipment is necessary in order to adequately meet the heating or cooling load of the newly constructed home.***

Ductwork Sizing and Related Services

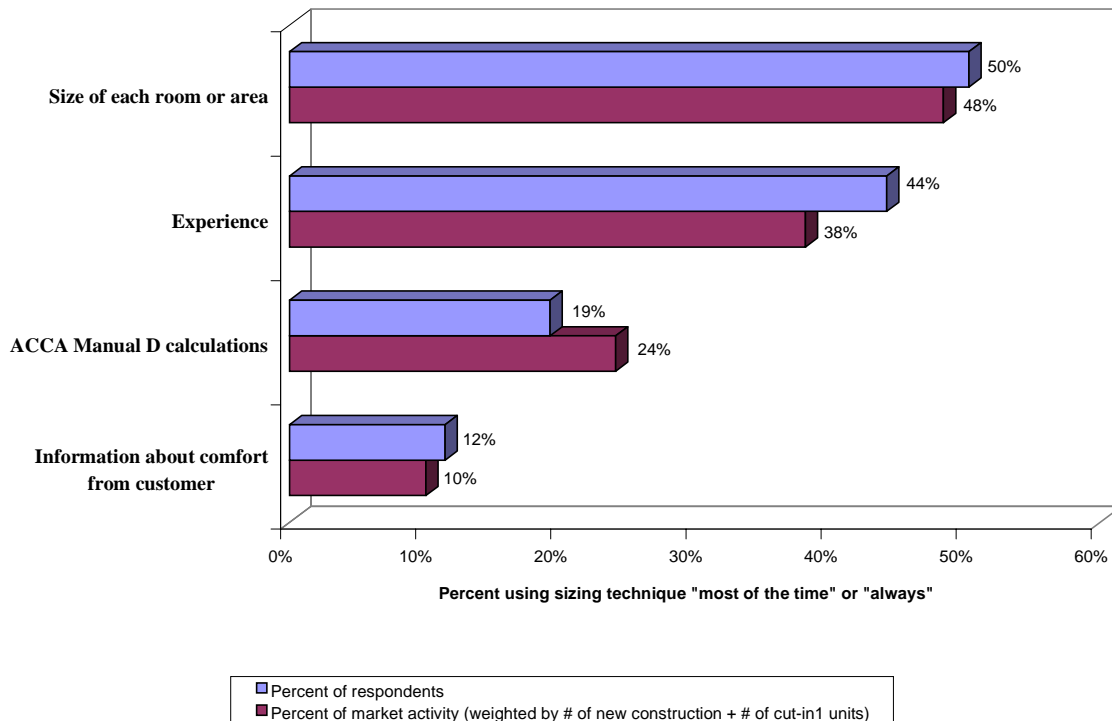
Proper sizing of ductwork is an important aspect of delivering a service that helps customers maximize efficiency and minimize their overall energy costs. We asked contractor survey respondents who install ductwork to describe how they currently size and lay out the ductwork in homes and, for each method mentioned, how often they use the method. Contractor survey respondents were also asked if they provide duct-cleaning services. We asked those who provide duct repair and sealing services if the materials they use meet UL 181 requirements. Finally we asked contractor survey respondents how often they replace ductwork during installation jobs in existing homes and the reasons for making the replacements. Where appropriate, responses in this sub-section are weighted by each contractor respondent's total residential HVAC equipment unit sales volume.¹⁶ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Half (50%) of the contractor survey respondents said they size and lay out ductwork in homes “based upon room or area sizes” ‘most of the time’ or ‘always.’** As illustrated in Figure 9 the next most frequently used techniques for sizing and laying out ductwork are “experience” (44%), “ACCA Manual D calculations” (19%), and “information about comfort from customer” (12%). *Figure 9 also shows the percent of market activity (determined by weighting contractor survey respondents' total number of new construction plus cut-in¹⁷ unit sales volume).*
- **As with equipment sizing, while many contractors ‘know’ the proper duct sizing and lay out are required for proper operation of furnaces and air conditioners, it appears that they are not doing what may be required to properly size ductwork.** The use of “experience” by almost half of the contractors is notable.

¹⁶ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

¹⁷ Cut-ins are installations in existing homes without central heating or cooling.

Figure 9: Technique used to size and lay out ductwork.



¹ A “cut-in” is an installation in an existing home without central heating or cooling.

- **Most (91%) contractor survey respondents provide duct repair or sealing service, but very few (15%) provide duct-cleaning service.** *When weighted by contractor survey respondents’ total residential HVAC equipment unit sales volume, 94% provide duct repair or sealing service and 28% provide duct-cleaning service.*
- **Many contractors who responded to in-depth interviews and do not offer duct-cleaning made negative comments about the service.** “Fifty percent of the ducts that get cleaned don’t need it. It’s a sales gimmick.” “It’s a bad idea—tears things apart. Spend a little more for new ductwork. Most providing duct cleaning now are not qualified.” “Some environments may call for it, but most of the time it’s a rip-off.”
- **Three-fourths of the contractors interviewed in-depth perform some duct repairs, most often while installing replacement units.** However, several of those offering duct repair and sealing *services do not believe they can make money on these services.*

- **Almost two-thirds of the contractor survey respondents who do ductwork use both tape and mastic to seal the ducts.** When asked if they used tape, mastic, or both to seal ducts, 64% indicate they use both tape and mastic, 25% indicate they use tape, and 11% indicate they use mastic. *Percentages are similar when weighted by contractor survey respondents' total residential HVAC equipment unit sales volume.*
- **Almost all (97%) of the contractor survey respondents who do ductwork indicate the tape and mastic both meet UL 181 requirements.** *Percentages are similar when weighted by contractor survey respondents' total residential HVAC equipment unit sales volume.*
- **Contractor survey respondents indicate the reasons for replacing ductwork are because the ductwork is deteriorating (54%), undersized (27%), or uninsulated (19%).** (Contractor survey respondents were asked to indicate the percent of the time that their replacements were for the above reasons and these percentages represent an average of those responses.) *Percentages are similar when weighted by contractor survey respondents' total number of replacements of existing equipment.*
- **Fifty-three percent (53%) of surveyed customers indicate contractors mention checking or repairing ductwork when replacing or adding HVAC equipment.**
- **Two-thirds of the contractors responding to the in-depth interview, said they measure airflow.** However, almost one-half of those contractors said they rarely do this for residential jobs. And, one-half said they have flow hoods or anemometers.
- **When asked during the in-depth interview how they checked for proper refrigerant charge, contractors gave many different answers.** Some responses indicate proper methods; other responses clearly indicate inaccurate methods. Overall, it appears that many methods do not ensure a proper charge. (Note: this tends to confirm the Proctor study that found 40% of heat pumps and air conditioners in a large inspection program, did not have the proper charge.)¹⁸

¹⁸ Proctor, J., Amy Polack. "Pacific Gas & Electric Company Appliance Doctor Pre-Production Test," ACEEE 1992 Summer Study on Energy Efficiency in Buildings. Page 5.112.

Service and Maintenance

This sub-section addresses issues related to service or maintenance agreements that may be offered by HVAC contractors. We asked customer survey respondents if the contractor offered them a service agreement and if they bought one. We asked 184 contractor survey respondents (who offer service and maintenance services) a series of questions about their service and maintenance services and practices. The line of inquiry ranges from questions regarding whether or not the contractor offers service and maintenance agreements for new or existing homes to the type of services provided as part of such agreements. We also asked contractor survey respondents how much they charge for two specific service offerings: checking airflow and refrigerant charge. Where appropriate, responses in this sub-section are weighted by each contractor survey respondent's level of service and repair activity.¹⁹ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **While 76% of contractor survey respondents (of the 81% of contractors who provide service and maintenance services) indicate they offer service agreements, only 53% of customer survey respondents indicate they were offered a service agreement.**
- **Service and maintenance contracts are sold more frequently for installations in existing homes than for installations in new construction.** As illustrated in Table 14, according to contractors service agreements are sold 'always' or 'most of the time' in 40% of existing home installations and 25% of new construction installations. *Responses are weighted by each respondent's level of service and repair activity.*
- **Most service agreements include “checking for sufficient airflow across the indoor coil” and “checking for proper refrigerant charge” when there is an air conditioner or heat pump.** Contractor survey respondents indicate that “checking airflow” is included in service agreements 92% of the time, and “checking refrigerant charge” is included 95% of the time. *When weighted by each respondent's level of service and repair activity, “checking airflow” is included in service agreements 82% of the time, and “checking refrigerant charge” is included 83% of the time.*

¹⁹ We calculated weights by multiplying the total number of employees in the firm by the percent of overall business activity dedicated to service and repair.

Table 14: How often service agreements are sold by contractors who offer maintenance and repair services¹

	Percent of installations	
	Existing homes	New construction
Always	5%	10%
Most of the time	35%	15%
Occasionally	41%	13%
Not very often	14%	18%
Never	5%	44%
	(n = 138)	(n = 137)

¹ Responses are weighted by each respondent’s level of service and repair activity.

- **The average fee for “checking for sufficient airflow across the indoor coil” and for “checking proper refrigerant” is \$60.** (*Fees are weighted by each respondent’s level of service and repair activity.*)
- **“Check the manufacturer’s information and measure pressures and temperatures” is the most frequently mentioned way to determine the correct refrigerant charge in air conditioners and heat pumps.** Sixty-one (61%) of the contractor survey respondents indicate that “checking the manufacturer’s information and measuring pressures and temperatures” is the way they determine correct refrigerant charge. Other methods mentioned by 5% or more of the contractor survey respondents include “superheat” (41%) and “sight window/gage” (28%). *When weighted by each respondent’s level of service and repair activity, percentages are very similar.*
- **We explored seven of contractors’ other HVAC-related product and service offerings during the in-depth interviews.** (These products and services include: programmable thermostats, zoned systems, electronic air filters, measuring airflow across indoor coils, checking for proper refrigerant charge, testing ducts for leaks, testing for carbon monoxide) Their responses suggest that few of the contractors are applying these products and services in all appropriate situations or applying them correctly when they do use them. It also appears that few contractors believe the benefits these products and services could deliver to their customers are worth the effort to sell and install them.

Interest in PG&E HVAC Possible Market Interventions

This sub-section assesses the interest and participation in PG&E HVAC programs. We asked customer survey respondents if they have participated in past PG&E energy efficiency programs or have ever called the PG&E Smarter Energy Line. We asked contractor survey respondents if they have participated in past PG&E air conditioning programs. We also asked contractor survey respondents about their interest in participating in a number of potential programs under consideration by PG&E. Where appropriate, responses in this sub-section are weighted by contractor survey respondents' total residential HVAC equipment unit sales volume.²⁰ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Over one-third (38%) of customer survey respondents report participation in a PG&E energy efficiency programs and 19% have called the PG&E Smarter Energy Line.** Almost two-thirds (64%) of customer survey respondents who have participated in a PG&E energy efficiency program could not remember the name of the program.
- **There is significant interest among contractor survey respondents in participating in efficiency improvement programs.** Contractor survey respondents were asked to rate their interest in efficiency improvement programs using a scale of 1 to 5, with 1 being 'not at all interested' and 5 being 'very interested.' Table 15 shows the percent of contractor survey respondents with an interest level of 4 or 5. *As illustrated in Table 15, when the interest level is weighted by contractor survey respondents' total residential HVAC equipment unit sales volume, the estimated interest level is even higher.*
- **There is more interest in a program on "central air conditioning efficiency improvement" than any of the other programs.** As illustrated in Table 15, 70% of the contractor survey respondents indicate an interest in "central air conditioning efficiency improvement." *When the interest level is weighted by contractor survey respondents' total residential HVAC equipment unit sales volume, estimated interest is at 79%.*

²⁰ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

Table 15: Contractors’ Interest in Energy Efficiency Programs¹

Efficiency Program	Percent of contractor survey respondents	Percent of market activity²
Central air conditioning efficiency improvement	70%	79%
Furnace efficiency improvement	65%	70%
Air conditioner sizing and installation improvement	64%	75%
Furnace sizing and installation improvement	62%	68%
Air conditioner maintenance and service improvement	56%	63%
Duct design and installation improvement	56%	65%
	(n = 225)	(n = 225)

¹ Based upon a responses of ‘4’ or ‘5’ on a scale of ‘1’ (not at all interested) to ‘5’ (very interested).

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

- **Over one-third (39%) of the contractor survey respondents indicate they have participated in a PG&E air conditioning program within the past five years.** *When weighted by contractor survey respondents’ total residential HVAC equipment unit sales volume, estimated participation in air conditioning programs is 57%.*
- **There was more participation in the “Home Energy Savings Loan Program” than any of the other PG&E programs mentioned.** *As illustrated in Table 16, 46% of the 70 contractor survey respondents who participated in an air conditioning program indicate they participated in the “Home Energy Savings Loan Program.” The percentage is very similar when weighted by contractor survey respondents’ total residential HVAC equipment unit sales volume.*

Table 16: PG&E air conditioning program with most contractor participation¹

Program	Percent of contractor survey respondents	Percent of market activity²
Home Energy Savings Loans	46%	50%
Express Efficiency(commercial AC program)	29%	33%
Energy Partners (low-income program that included AC)	17%	29%
Appliance Rebate	11%	16%
EGIA	9%	11%
Duct design	6%	2%
	(n = 70)	(n = 70)

¹ Only responses mentioned by 5% or more of the contractor survey respondents (who participated in any of the air conditioning programs) are listed.

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

- Contractor survey respondents suggest that PG&E should “offer customer rebates” when designing programs to improve residential energy efficiency.** When asked if there is anything else that PG&E should consider when designing programs to improve residential energy efficiency, 21% of the contractor survey respondents indicate they should “offer customer rebates.” Other suggestions mentioned by 5% or more of the contractor survey respondents include “educate the customers and advertise” (11%), “simplify paper work” (6%), “provide financing” (6%), and “make them available to all contractors” (5%).

Utility Interactions with HVAC Industry

Lead Time for Stocking

Production times are shortening, but filling the entire distribution channel with a different mix of products still takes time. The consensus is that distributors must order a minimum of 90 days before the date when sales are planned to begin. Utilities should share news of programs that may affect sales of energy-efficient equipment well before that deadline. That will allow distributors to discuss the possible program influence with manufacturers in time to make decisions about orders.

- **Until recently, stocking decisions have usually been made 90 days in advance of need.**
- **Now with “demand flow” and “just in time production,” lead times for some manufacturers have been reduced to 60 days.**
- **One manufacturer in the Midwest clarified that production would only take 21 days.**

However, distribution would still take time and shipping to California takes the longest.

In addition, while some units would reach distributors within 4 to 6 weeks, it would take 3 to 6 months until the entire channel was fully stocked and supported.

Lead Time for Communications

Manufacturers and distributors endorsed the concept of discussing utility programs and promotional plans far enough in advance for cooperation and coordination to occur.

Planning should take place six to nine months before a campaign is to begin.

- **Manufacturers and distributors suggested that coordination of utility and manufacturer / distributor preseason promotions would require planning discussions during the first quarter for pre-heating season promotions and during the fourth quarter for pre-cooling season promotions.**
- **The preseason promotions for cooling start in March or April and end in May. Those for heating are usually during September and October.**
- **The promotion budgets for manufacturers are set in September and October for the following year.**

Sales Tracking

There was a mixed reaction to the concept of having a Northern and Central California (or California-wide) HVAC equipment sales tracking system. Many distributors noted that they get information now from ARI and GAMA. Most acknowledged that it did not give them detail by efficiency level. Some would need approval from higher levels within their firm; others would need approval from their manufacturer. Some expect it may need to be done by regulation. Others would prefer that, if done at all, it be done through their industry.

Barriers to Energy-Efficient Product and Service Acceptance

Incremental cost of equipment

Almost all manufacturers and distributors believe the major barrier is the high incremental cost of stepping up from equipment that just meets the Federal minimum requirements to more energy-efficient equipment. Several distributors noted modest savings, long paybacks, and the still significant costs of energy:

- **Awareness of benefits is there, but savings are modest and paybacks are longer than in other parts of the country.**
- **One distributor estimates payback in California at 5 to 6 years** (going from a SEER 10 to a 12 or 13). Another says payback is longer than 10 years. And, another says flatly that investment return on higher SEER is not there, *unless rebated*.
- **However, others note that energy is a significant part of the total cost of owning and operating a system.** It could be used to help sell high efficiency equipment.

Low energy cost combined with mild climate

- **A distributor cited the low cost of energy and the mild California climate as major barriers.**

Low consumer awareness

- **A manufacturer noted that overall consumer awareness of HVAC products is low.**
Furnaces and air conditioners are out of sight and out of mind.
Most people do not even maintain their furnaces or air conditioners until they have a problem.
- **A distributor described his understanding of customers' view of air conditioning, "It's an intangible product, not a necessity. It is not a 'fun purchase.' The customer relies on a contractor for the information and 'education' they need to make a purchase."**
- **Another manufacturer pointed out the discrepancy between attitudes and behavior, "Consumers say they are interested in energy efficiency and reliability, but they do not buy energy-efficient products."**

- **A manufacturer explained reasons for bundling energy efficiency with other product features.**

Energy efficiency is packaged with other premium features in many products. In a national market manufacturers must make products that offer several features to appeal to a broad range of customers.

Consumers make many trade-offs in each purchase. Give them a choice of features and benefits and more will buy the premium units—not all for the same reasons.

Customers are shortsighted and give up more than higher efficiency when choosing a lower priced unit.

- **Customers have low expectations for comfort in their homes.** One reason is they have little experience being really comfortable. They don't know how comfortable they could be, so they don't know how uncomfortable they are.

Contractor / dealer behavior

- **A distributor pointed out that one manufacturer's research shows that "consumers would buy more if offered."**

Contractors want to sell with low bids and are wary of trying to upsell. Selling better value is too much of a challenge, especially when they are busy. They may try when not as busy.

Thus, high efficiency sales drop off during the peak seasons when they are busy [and when most units are replaced].

- **In general, there is little knowledge of energy efficiency among the sales staff and how to sell energy-efficient units.**

Contractors are entrenched in their old ways and reluctant to learn new things.

There is also a lack of education and training in how to overcome the price objection.

There is also a high turnover in staff. Selling air conditioning equipment is seasonal in the Central Valley.

- **One manufacturer makes a lot of "Kenmore" products for Sears. He noted that "They have a sales force that does a better job selling options and benefits."**

- **Contractor development is desperately needed.**

Contractors are very independent and it is hard to get them to training and business development sessions.

Consolidators are offering their dealers development support.

Lack of sales approaches

- **A distributor identified the lack of effective methods to explain the long-term benefits and savings from installing energy-efficient units as a major barrier.**

“You need to discuss energy costs and savings and show them a lower monthly cost.”

“You also need to emphasize comfort and better reliability in talking long-term benefits.”
- **One distributor suggested that the major barrier was that marketing and sales approaches have not addressed the high mobility [and short average tenure in one home] of California homeowners.** Specific approaches need to be used to show which benefits can be realized, depending on how long the owner expects to remain in the home.

Barriers in new home construction

- **A distributor described new construction as a tough sell, with the builder / general contractor a major barrier.**

Builders do not want to spend extra on HVAC. They install the lowest efficiency units they can get away with.

Builders do not even want to get involved in offering HVAC upgrades—they just want to sell the home. They let us put a small display on the counter in the kitchen and something by the thermostat.

Custom homebuilders may install energy-efficient units, if the owner is knowledgeable enough to insist on it.

Piecemeal implementation, not a total system approach

- **One distributor was emphatic, “Consumers are paying for energy-efficient equipment, but usually are only replacing the outdoor unit—not the indoor coil.”**
- **He continued, ‘Duct leakage is also a big problem that is not addressed.’** He added that their manufacturer was addressing air leakage by tightening up the seals on furnace doors. This will have noticeable effects wherever furnaces are installed in unheated part of a home [such as in California].
- **Other distributors also noted that installation practices are not up to par for energy-efficient equipment.**

Section VI: Summary and Conclusions

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, extend from research, to educational programs, to various types of up-stream and down-stream incentive programs. Today market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.²¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilating, and air conditioning (HVAC) market. The primary objective of this research is to enhance PG&E's understanding of barriers to the purchase and installation of energy efficient HVAC equipment. A better understanding of the barriers to the installation of energy efficient equipment and related services among these market actors will lead to market transformation efforts targeting the residential HVAC market.

To address the research issues, Opinion Dynamics Corporation (ODC) conducted in-depth telephone interviews with four HVAC manufacturers, 20 HVAC distributors, and 20 residential HVAC contractors (located within PG&E's service territory). In addition, ODC surveyed 227 HVAC contractors who provided sales and services to residential customers and 803 residential customers who have purchase HVAC equipment in the past five years. The major objectives of the research are to: (1) identify barriers to the purchase and installation of energy efficient HVAC equipment among all of the key market players; (2) baseline HVAC contractor sales and services practices; (3) identify distributors and manufacturers' marketing activities related to energy efficient products; (4) explore the residential customers' decision making process when purchasing HVAC equipment; and (5) identify ways in which PG&E may influence the residential HVAC market. The overall research findings which follow are summarized over 13 topic areas.

²¹ For a general discussion of market transformation issues, see "A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

Summary

Market Structure

- **The residential HVAC market is dominated by a few (about 8) large manufacturers and relatively few large local distributors.**
- **Most HVAC contractors serving the residential market are small, independent, local firms providing services only to residential and light commercial customers.** The average respondent who participated in the quantitative contractor survey has 7 employees. Many HVAC contractors are one-person shops—they have no other employees.
- **An estimated 116,677 forced air furnaces were installed in single-family, owner-occupied homes within PG&E's service territory during 1998.** This consists of an estimated 36,543 units installed in newly constructed homes, 34,689 emergency or breakdown replacements within existing homes, 23,352 planned replacements within existing homes, and 22,093 units installed in existing homes that did not previously have a forced air furnace.
- **An estimated 84,352 central air conditioners were installed in single-family, owner-occupied homes within PG&E's service territory during 1998.** This consists of 17,442 units installed in newly constructed homes, 28,965 emergency or breakdown replacements within existing homes, 19,498 planned replacements within existing homes, and 18,447 units installed in homes that did not previously have central air conditioning.

Sales by Efficiency Level

- **Approximately 80 percent of forced air furnace sales within PG&E's service territory have efficiency or A.F.U.E. ratings of 80-89%.**
- **The market share of high efficiency forced air furnaces is highest among survey respondents located in the Desert/Mountain climate zone.** Forty-six percent (46%) of new construction unit sales and 32% of existing home units sales in the Desert/Mountain climate zone have A.F.U.E. ratings of 90% or higher. These market shares are approximately twice as high as those in the Valley, Coastal, and Hill climate zones.
- **Over 40% of both overall new construction and overall existing home central air conditioning sales have SEER ratings of 12 or higher.** Approximately 50 percent of central air conditioning sales in PG&E's service territory just meet the minimum federal standard for energy efficiency with a SEER ratings of 10.

- **Distributors, manufacturers and contractors agree that energy-efficient products provide greater revenues and higher profit margins as well as greater reliability, quality, and comfort for consumers.** However, energy-efficient products are still not widely sold and are often positioned as “niche” products.
- **Manufacturers and distributors have “minimal” interest in developing energy-efficient products for the hot / dry climates in the Southwest U.S.** Manufacturers see this as a small “niche” market and distributors noted that existing evaporative cooling provides a solution for these hot / dry climates.

Incremental Cost of Energy Efficient Equipment

- **Compared to standard efficiency forced air furnaces (i.e., 80% A.F.U.E.), forced air furnaces with 90% and 95%+ A.F.U.E. ratings cost an average of \$601 and \$810 more to install (including equipment and labor), respectively.**
- **Compared to standard efficiency units (i.e., 10 SEER), 3 ton central air conditioners with 12, 13, and 14 SEER ratings cost an average of \$530, \$776, and \$1,078 more to install²², respectively.**
- **Contractors, distributors, and manufacturers generally agree that the increased (or incremental) cost of energy-efficient HVAC equipment is a major barrier to adoption.** They also stressed that most energy-efficient models also include other “premium” features and components. These provide consumers with many added benefits, including reduced operating noise levels, increased reliability, better comfort, and better warranties.

Role of Financing

- **About half (49%) of contractor survey respondents offer their residential customers financing for the purchase of HVAC equipment.** *When weighted by contractor survey respondents’ total residential HVAC equipment unit sales volume, 67% offer financing for HVAC equipment purchase.*
- **Only 11% of residential customers indicate they finance HVAC purchases.**

²² This increased installation cost includes both equipment and labor cost.

Equipment Installation Timing

- **Remodeling projects rarely drive the purchase of HVAC equipment, whether it is a replacement or an addition.** Only 8% of customer survey respondents added or replaced equipment as part of a home-remodeling project.
- **End-of-life reasons dominate customer *replacement* of residential HVAC equipment.** According to 506 customer survey respondents who replaced HVAC equipment, 85% of all replacements are made for “end-of-life” reasons.
- **Overall, distributors estimated that 77% of all replacements are not done until “breakdown.”**
- **Contractor survey respondents generally indicate a greater urgency for replacements due to breakdowns than do customers.** Thirty-one percent (31%) of contractor survey respondents²³, contrasted with 18% of customer survey respondents, indicate equipment replacements due to breakdowns are needed the same day as the breakdown occurs. A total of 86% of contractor survey respondents, contrasted with 38% of customer survey respondents, indicate replacements due to breakdowns are needed within four days
- **Few contractor survey respondents or customer survey respondents indicate a need for replacement equipment within 3-4 days when they have a *planned replacement*.** Only 14% of surveyed customers and 14%²⁴ of surveyed contractors indicate a replacement is needed within four days for a *planned replacement*.
- **Distributors and manufacturers view the residential HVAC market as “full of procrastinating customers.”**

Contractor and Equipment Selection Process

- **The choice of a contractor is the most important element of the residential customer decision making process when adding or replacing HVAC equipment.**
- **When selecting an HVAC contractor, customer survey respondents most frequently (61% of the time) rely on their own past experience or word-of-mouth referrals from friends, relatives, or neighbors.**

²³ Weighted by contractor survey respondents’ residential HVAC equipment *breakdown replacement* unit sales volume.

²⁴ Weighted by contractor survey respondents’ residential HVAC equipment *planned replacement* unit sales volume.

- **Over one-half of consumers simply call a single HVAC contractor and have them do the work, requesting no bids or only one bid.** The average HVAC purchaser obtains 1.8 bids as part of the contractor and equipment selection process.
- **According to customer survey respondents, “energy efficiency” is the topic mentioned most frequently by contractor sales staff.** Reliability, reputation of contractor/brand, and total cost of installation are the next most frequently mentioned topics.
- **While customer survey respondents say the manufacturer’s reputation is important, they often rely on the contractor to advise them on the relative strengths and weaknesses of various brands.**

Customer Concerns and Satisfaction with HVAC Projects

- **“Energy efficiency” (or a desire to reduce energy costs) is the most frequently mentioned concern residential consumers have when *replacing* heating and cooling equipment.** Customers replacing heating and cooling equipment due to “breakdown” are more concerned with getting a replacement unit installed quickly and at an affordable price.
- **“Comfort” and “energy efficiency” (or a desire to reduce energy costs) are the most frequently mentioned concerns consumers have when *adding* heating or cooling equipment.**
- **Most customers who have replaced or added HVAC equipment are highly satisfied with equipment installation, reliability, and comfort.** They are least satisfied with the energy costs of running their new or replacement equipment.
- **Both contractors and distributors list “greater customer satisfaction” as one of the major benefits they gain from selling energy-efficient equipment.**

Sizing HVAC Equipment

- **While only 6% of customer survey respondents indicate the salesperson *emphasized* proper sizing of their HVAC equipment during the purchase process, when asked specifically if the salesperson *mentioned* properly sizing equipment, 73% of the respondents said “yes.”**

- **Sixty percent of contractor survey respondents said they size HVAC equipment through a calculation “based on the square footage of a home” ‘most of the time’ or ‘always.’** The next most frequently used sizing techniques are experience (21%), sizing the new equipment based on the size of the old equipment (17%) and ACCA Manual J calculations (17%).
- **Although many contractors ‘know’ that proper sizing is necessary, they are not using proper sizing techniques on every installation.**
- **When weighted by their new construction HVAC sales, only 10% of contractor survey respondents working within the new construction market said that Title-24 HVAC sizing calculations are ‘always’ correct.** Another 49% said the calculations are correct ‘most of the time.’ In total, 39% of respondents said that Title-24 calculations are correct ‘occasionally,’ ‘not very often,’ or ‘never.’

Ductwork Sizing and Related Services

- **Half (50%) of the contractor survey respondents said they size and lay out ductwork in homes based upon room or area sizes ‘most of the time’ or ‘always.’** The next most frequently used techniques for sizing and laying out ductwork are experience (44%), ACCA Manual D calculations (19%), and information about comfort from customer (12%).
- **Contractors ‘know’ that proper duct sizing and lay out are required for proper operation of furnaces and air conditioners, however it appears that they are not doing what may be required to properly size ductwork.** The use of “experience” by almost half of the contractors is notable.
- **Most (91%) contractor survey respondents provide duct repair or sealing service, but very few (15%) provide duct-cleaning service.** However, several contractors who offer duct repair and sealing services are only doing what they have to do as part on an installation. They do not offer it as a stand-alone service because they do not believe they can make money on these services.
- **Almost two-thirds of the contractor survey respondents who do ductwork use both tape and mastic to seal the ducts.** When asked if they used tape, mastic, or both to seal ducts, 64% indicate they use both tape and mastic, 25% indicate they use tape, and 11% indicate they use mastic.
- **Contractor survey respondents indicate the reasons for replacing ductwork are because the ductwork is deteriorating (54%), undersized (27%), or uninsulated (19%).**

- **Fifty-three percent (53%) of surveyed customers indicate contractors mention checking or repairing ductwork when replacing or adding HVAC equipment.**

Service and Maintenance

- **While 76% of contractors (who provide service and maintenance services) indicate they offer service agreements, only 53% of HVAC purchasers indicate they were offered a service agreement.**
- **Service and maintenance contracts are sold more frequently for installations in existing homes than for installations in new construction.** According to contractors, service agreements are sold ‘always’ or ‘most of the time’ in 40% of existing home installations and 25% of new construction installations.
- **Most service agreements include “checking for sufficient airflow across the indoor coil” and “checking for proper refrigerant charge.”** However, the in-depth interviews with contractors revealed that many contractors are not performing these services correctly.
- **Few contractors are applying products and services that could enhance HVAC equipment energy-efficiency because they do not see sufficient value for the customer or themselves.** These services include programmable thermostats, zoned systems, electronic air filters, testing ducts for leaks, and testing for carbon monoxide.

Interest in PG&E HVAC Program Offerings

- **Over one-third (38%) of customers report participation in a PG&E energy efficiency program and 19% have called the PG&E Smarter Energy Line.**
- **There is significant interest among contractors in participating in efficiency improvement programs.** There is more interest in a program on “central air conditioning efficiency improvement” than interest in any of the other programs. Over one-third (39%) of the contractor survey respondents indicate they have participated in a PG&E air conditioning program within the past five years.
- **There was more participation in the “Home Energy Savings Loan Program” than any of the other PG&E programs mentioned.** About half (46%) of the 70 contractor survey respondents who participated in an air conditioning program indicate they participated in the “Home Energy Savings Loan Program.”
- **Contractors suggest that PG&E should “offer customer rebates” when designing programs to improve residential energy efficiency.**

Utility Interactions with HVAC Industry

- **The consensus is that distributors must order a minimum of 90 days before the date when sales are planned to begin.**
- **Manufacturers and distributors suggested that coordination of utility and manufacturer / distributor preseason promotions would require planning discussions during the first quarter for pre-heating season promotions and during the fourth quarter for pre-cooling season promotions.**
- **There was a mixed reaction to the concept of having a Northern and Central California (or California-wide) HVAC equipment sales tracking system.** Many distributors noted that they get information now from ARI and GAMA. Most acknowledged that it did not give them detail by efficiency level. Some would need approval from higher levels within their firm; others would need approval from their manufacturer. Some expect it may need to be done by regulation. Others would prefer that, if done at all, it be done through their industry.

Barriers to Energy-Efficient Product and Service Acceptance

- **Financial barriers include “high” incremental costs and low savings.** High incremental costs, low energy costs, and mild weather combine to produce lengthy payback periods. This is the principal barrier, in fact or in the perception of millions of homeowners.
- **Low consumer awareness is, in part, based on the generally mild climatic conditions.** Heating and cooling energy costs are not large costs for the majority of homeowners in PG&E’s service territory. In addition, the location of HVAC equipment and ductwork in most California homes makes HVAC equipment literally “out-of-sight and out-of-mind.”
- **A mobile society means that the average tenure in homes is short, between 5 and 8 years.** This limits the return on a homeowners investment to the period she or he continues to own the home and pay the reduced utility bills.
- **Lack of sales approaches is driven in part by the first three barriers.** The financial picture is not compelling, HVAC sales people have a hard time getting homeowners to care until their existing HVAC unit fails, and then customers’ expectations of realizing the possible return are often decreased by plans to move.
- **Piecemeal implementation is a problem created by both the consumer and the contractor.** Consumers do not want to contract for a complete job and few contractors offer or deliver a top quality, exhaustively thorough installation.

- **Other contractor / dealer behavior also limits the energy-efficiency concepts that are sold, the frequency with which they are offered and the quality of the resulting work when they are purchased.**

Conclusions

The following conclusions draw on all of the research efforts completed for this market characterization and baseline study. Responses from national manufacturers, Northern California distributors, contractors, and customers provide some surprising information on both the status of the residential HVAC market and also the attitudes and behavior of suppliers and consumers.

Relatively high penetration of energy-efficient equipment has been achieved.

The relatively high penetration rate of energy efficient HVAC equipment within PG&E's service territory (especially for central air conditioning) suggests that further increases in energy efficient market share may be difficult to achieve. Market shares of energy efficient equipment appear to reflect the markets' assessment of cost-effective efficiency in each climate zone.

The industry needs to move beyond efficient 'boxes' to energy-efficient systems.

Historically, the HVAC industry and utilities have focused on "equipment," especially equipment efficiencies. Distributors and manufacturers recognize the need to 'move' the industry beyond this historical focus. Many 'industry thinkers' see the need for a 'systems approach' to ensure the energy-efficient equipment is installed properly and then serviced and maintained properly. Contractors and customers must be encouraged to see the benefits of looking beyond selling / purchasing efficient 'boxes.'

It is time to shift spending from equipment to system improvements.

The incremental cost of energy-efficient equipment involves significant dollars that many respondents from the HVAC industry believe could be better spent on system efficiency improvements. System efficiency improvements could span from sizing equipment and ductwork properly to sealing and repairing ductwork to checking for proper refrigerant charge.

Customer satisfaction can be improved by pursuing broader “system improvement” goals.

This research has shown that while they are highly satisfied with most aspects of HVAC equipment installations, a relatively high percentage of recent HVAC purchasers are not happy with their utility bill savings. Distributors and manufacturers agree that greater satisfaction could be achieved through a systems approach. A narrow focus replacing a failed ‘unit’ with a more efficient ‘box’ achieves only a small portion of the overall potential energy savings.

Contractors believe they face fierce competition for every job, but customers disagree.

Contractors’ view of the customer purchase decision making process is not consistent with customer-reported behaviors. Contractors firmly believe that they must compete on cost and on how quickly they can respond and install replacement units. More than one-half of all customers, on the other hand, report that they get no bids or only one bid (*the process is not that competitive*). Customers also report they give contractors a reasonable amount of time (*faster is not necessarily better*), they are willing to discuss other issues such as comfort, noise reduction, and indoor air quality (*their personal environment is important*), and they are willing to rely on contractors’ recommendations regarding the value of energy-efficient products and services (*they rely on the contractor’s advice*).

A low level of customer awareness exists.

Manufacturers, distributors, and contractors reported that few customers pay much attention to their heating and cooling systems. The generally mild climate in PG&E’s service territory contributes to this lack of awareness (in all but the Valley and Desert / Mountain climate zones). In addition, most heating and cooling equipment is literally “out of sight” and thus also “out of mind.”

This lack of awareness contributes to the distributors' estimate that 77% of HVAC equipment is not replaced as it ages—*only when it finally breaks down*. Distributors also complain that few customers have their equipment maintained regularly. Similarly, even fewer homeowners who remodel, include any upgrade or replacement of their heating and cooling systems in their project planning.

Based on the customers' reported installation rates, purchasing any central heating or air conditioning equipment is almost a once-in-a-lifetime experience. Because of this, they have little first-hand knowledge and usually know few "experts" they can consult. Thus, most people rely on the first HVAC contractor they contact to provide all the advice they will get before making a several thousand dollar purchase.

Incremental costs also include costs for additional features that provide added benefits.

Manufacturers, distributors and contractors all mentioned that "energy efficient" models usually include additional, "premium" features and components. These provide consumers with many added benefits, including reduced operating noise levels, increased reliability, better comfort, and better warranties. The incremental costs we have identified are the total costs to customers of installed units. Obviously, these costs include the costs associated with energy efficiency improvements *and the costs of providing the other added features not found on standard units*.

Opinion Dynamics recommends that PG&E conduct further research to quantify the costs of these other, added features and their value to consumers. Further, we recommend that PG&E communications materials point out the added benefits to customers. This will help overcome the "incremental cost barrier."

Qualified, well-trained HVAC employees—and managers—are in short supply.

A serious barrier to improving energy efficiency is the shortage of qualified, well-trained personnel across the HVAC industry. The shortage of technicians affects the quality of service and repair work and limits some contractors from offering maintenance services. The use of inadequately trained installers results in lower efficiency of completed systems, even if energy-efficient equipment is purchased. Connecting good equipment to old, leaky ducts; not charging air conditioning systems with the proper quantity of refrigerant; not ensuring proper airflow and temperature drop across the indoor coil and other mistakes result in serious loss of efficiency. Owners and sales people with inadequate training in efficiency improvement options do not offer customers the best options for their circumstances. Nor do they present all of the benefits of some options, thus keeping customers from making fully-informed choices.

Current training providers welcome others offering support, improvements and certification.

Manufacturers and distributors now provide most of the ‘continuing education’ of HVAC industry personnel. They focus on product-related technical and sales training and welcome utility support for training on energy-efficient, “whole system” approaches. Almost everyone in the industry who was interviewed supported efforts to improve training and offer certification.

Certification will create “brand recognition” of qualified, trained personnel and firms.

Certification of HVAC personnel will provide recognition of their qualifications to complete energy-efficient installations and to provide proper service and repairs to maintain efficiency over system lifetimes. ACCA’s “ACE” certification or other proposed credentialing efforts will create “brand recognition” of HVAC personnel and the contractors for whom they work. Many in the industry see this as important to justifying increases in wage rates and attracting more people to enter the HVAC industry.

To find industry-wide perspectives, look among the larger ‘players’ in the industry.

To find well-informed individuals with an overall perspective on the HVAC industry, one must look to management personnel at distributors and manufacturers. Few contractors have or make the time to keep abreast of industry issues and trends in customer needs. Most contractors own and manage small firms in a highly fragmented industry. The larger distributors and most manufacturers have staff tasked with marketing responsibilities that include identifying and tracking trends.

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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilating, and air conditioning (HVAC) market. Research was conducted with HVAC equipment consumers, contractors, distributors, and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes research conducted with the contractor segment. The primary objective of this report is to help PG&E understand the equipment purchase and installation process from the perspective of residential HVAC contractors. A better understanding of the barriers to the installation of energy efficient HVAC equipment and related services among HVAC contractors will lead to market transformation efforts targeting the residential HVAC market. All respondents in this study provide HVAC equipment or services to the residential sector.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs. Today, market transformation has emerged as a central policy objective of future publicly funded energy-efficiency programs in California. Market transformation has been defined as "a reduction in market barriers due to a market intervention, as evidenced by a set of market effects that last after the intervention has been withdrawn, reduced, or changed."² In order to adapt to this policy change, PG&E is pursuing detailed market research regarding the California residential heating, ventilating, and air-conditioning (HVAC) market. This research is designed to improve PG&E's understanding of barriers to installation of energy efficient heating and cooling equipment and related energy services in the residential sector – leading to market transformation efforts targeting the residential HVAC market.

This report is part of a comprehensive market research project designed to address the residential heating and cooling market.³ The report summarizes the key findings from a quantitative survey of 227 heating and cooling (or HVAC)⁴ contractors. These contractors, all of whom work within PG&E's service territory, provide at least some HVAC-related services to the residential sector.

² For a general discussion of market transformation issues, see "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs" (Eto, et.al., July 1996)

³ The overall research project includes interviews with 1) HVAC manufacturers, 2) HVAC equipment and component part distributors, and 3) consumers who have recently replaced or added HVAC equipment. It also includes secondary research on the residential HVAC market.

⁴ These contractors are often referred to as Heating, Ventilating, and Air Conditioning or "HVAC" contractors, although in residences they primarily install, service, and replace heating and air-conditioning units and systems.

Section III: Objectives

The primary objectives of this contractor research are to understand the barriers to the purchase and installation of energy efficient residential HVAC equipment and whole house system energy services, identify marketing and program strategies which may help to eliminate or reduce barriers, and understand the influence that residential HVAC contractors have on the equipment and whole house system services choices of residential customers.

Specifically, the residential heating and cooling contractor survey seeks to:

- Document residential HVAC equipment sales by equipment type (e.g., forced air furnace, central air conditioning), efficiency level (e.g., by air-conditioning SEER level) and market sector (e.g., new construction, replacement);
- Document the reason(s), from a contractor's perspective, why residential customers are replacing or adding HVAC equipment;
- Explore the HVAC equipment purchasing process from the perspective of contractors;
- Understand contractor attitudes toward, perceptions of, and practices relative to energy efficient equipment and related services (including how they define efficiency);
- Understand the type and range of HVAC services which are "typically" offered to residential customers and what processes are used to ensure quality;
- Estimate the incremental cost of high efficiency HVAC equipment;
- Explore the role that financing plays in the equipment selection and purchasing process; and
- Explore contractor interest in various residential energy-efficiency program concepts.

Section IV: Methodology

To address the research objectives, 227 telephone interviews were completed with residential HVAC contractors who work within PG&E's service territory. These telephone interviews immediately followed the implementation, analysis, and synthesis of HVAC contractor in-depth interviews.⁵ The contractor in-depth interviews assisted the project team in refining the set of issues, possible survey questions and response categories (the final design) of the telephone survey. Structurally, the primary difference between the survey and in-depth interview instrument is the fact that the survey is more closed-ended. The primary purpose of this more quantitative effort is to allow the project team to accurately describe the characteristics (e.g., size, focus, sales, etc.) of the residential HVAC contractor community in Northern and Central California.

The original goal of this quantitative survey effort was to complete 400 surveys with residential HVAC contractors from across PG&E's diverse service territory. However, significant changes were made to the original goal and sampling procedures. The original goal was scaled back due to the large number of research efforts being conducted in connection with program planning and evaluation efforts both within PG&E service territory and also at the statewide level. Some aspect of nearly all these efforts focused on interviewing HVAC contractors. Furthermore, as we reviewed files made available by the State of California Contractors State Licensing Board (CSLB) and identified contractors in the files, we realized that there were fewer residential contractors than anticipated when the interview goals were established with each research team.⁶ In addition, our in-depth interview process gave us an early warning that many currently licensed Warm-Air Heating, Ventilating and Air-Conditioning contractors (those with "C20" licenses) had no telephone number, were no longer in business, or were focusing on other contracting activities (e.g., plumbing, architectural sheet metal, etc.)

⁵ These contractor in-depth interviews are summarized in separate report.

⁶ The files were obtained from the State of California Contractors State Licensing Board. We chose contractors with a "C20" license (warm-air heating, ventilating and air conditioning) as the most appropriate group.

Opinion Dynamics Corporation (ODC) facilitated drawing samples of contractors for five other statewide measurement and evaluation research projects. We mapped the contractor listings to identify those located in PG&E's service territory and labeled each record with the PG&E climate zone.⁷

For this Residential HVAC Market Characterization Study, ODC was allocated 1,544 licensed contractor records from a population of 3,533 contractors within PG&E's service territory. Table 1 shows the geographic distribution of the population of contractors and survey completions by climate zone. As illustrated in Table 1, the percentage of survey completions by climate zone closely mirrors the percentage of contractors in the overall population by climate zone within an acceptable range.

Table 1: Distribution of contractor population and survey completions

Climate Zone	Population		Survey Completions	
	Number	Percentage	Number	Percentage
Desert / Mountain (R)	535	15.1%	35	15.4%
Valley (S)	1,274	36.1%	94	41.4%
Coastal (T)	627	17.7%	34	15.0%
Hill (X)	1,097	31.1%	64	28.2%
Total	3,533	100.0%	227	100.0%

⁷ The four climate zones are Desert/Mountain (R), Valley (S), Coastal (T), and Hill (X). See Figure 1 in the Customer Survey Report for PG&E climate zone map.

Contractors who participated in the survey received an incentive of \$50. The telephone interviews, which averaged 28 minutes, were completed between April 19, 1999 and May 5, 1999. As outlined in Table 2, we completed 227 telephone surveys from valid sample of 523 contractors, which is a 44% response rate. A copy of the survey instrument is included in Appendix A.

Table 2: Response rate

	Sample Points	Percent of Valid Sample
Starting Sample	1,544	
Less: Out-of-sample		
Disconnected/Wrong number	673	
Not a Residential HVAC Contractor	179	
Duplicate Phone Number	67	
Not a HVAC Contractor	40	
Residential phone	25	
Would Not Report Type of Work Done	19	
Computer tone	18	
Valid Sample	523	
Survey completions	227	44%
Initial refusal	117	22%
Phone number continually busy	69	13%
No answer/Answering machine/Busy	65	12%
Schedule a callback	42	8%
Mid-interview terminate	3	1%

Section V: Findings

This section of the report is divided into eleven sub-sections. These sub-sections generally follow the order in which various issues were discussed during the interview process. The first two sub-sections describe the characteristics of the HVAC contractors who participated in the research including their collective sales information by efficiency level. This is followed by sub-sections that address the timing of HVAC equipment replacements, the role of HVAC in the remodeling market, the role of energy efficiency in the contracting process, and how contractors size equipment and ductwork. Further sub-sections document the incremental cost of forced air furnaces and central air conditioners and the role of service and maintenance agreements in the purchasing process. Also included are sub-sections that review the role that financing plays in the sales process and contractor reaction to a number of residential HVAC program concepts.

Contractor Firmographics

This sub-section describes the current⁸ characteristics of the 227 HVAC contractors who participated in the quantitative telephone survey. Within the sub-section, we describe contractors by their level of business activity in each customer segment served (e.g., residential, light commercial, large commercial and industrial) and by the number and job classifications of their employees. We also outline the equipment brands that these contractors are offering and from which distributors they purchase this equipment. Where appropriate, responses in this sub-section are weighted by each respondent's total residential HVAC equipment unit sales volume.⁹ (*Weighted responses are indicated when used in the findings.*) Key findings relative to the firmographic characteristics of participating contractors are outlined below. As previously indicated, all contractors who participated in the survey do at least some work within the residential HVAC market.

⁸ Based upon research conducted April 19, 1999 to May 4, 1999.

⁹ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

- **Virtually all of the 227 contractors who participated in the telephone survey are independent businesses; only two are a subsidiary of another business.**
- **The residential sector accounts for 72% of the average respondent's overall business activity.** As illustrated in Table 3, the light commercial sector accounts for nearly all (23%) of the average respondents remaining business activity—only 5% of the average respondents business activity is in the large commercial or industrial sector.

Table 3: Business activity by customer segment¹

	Percent of business activity		
	Mean	Median	Mode
Residential	72%	80%	90%
Light commercial	23%	20%	10%
Large commercial or industrial	5%	0%	0%
	(n = 227)	(n = 227)	(n = 227)

¹ Described using the average (mean), middle (median), and most frequent (mode) responses.

- **Collectively, contractors who participated in the telephone survey have 1,658 employees with the largest number of employees (824) classified as HVAC installers.** As illustrated in Table 4, the average respondent said their firm has 4 installers, 2 technicians, and 2 sales staff. The average total number of employees per survey respondent is 7.

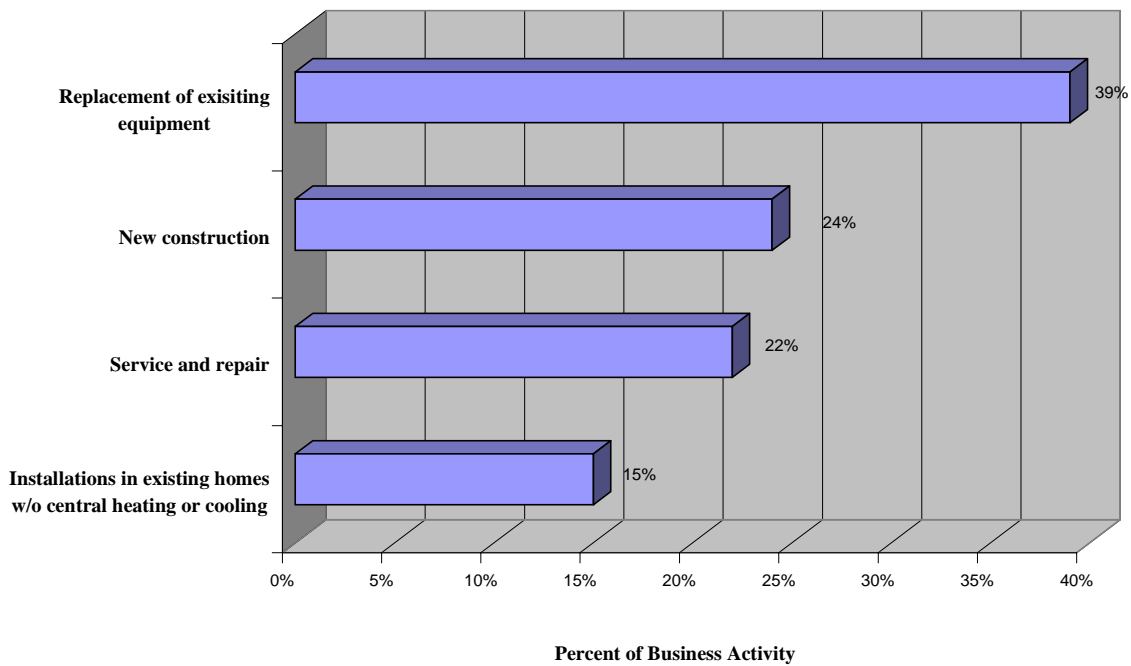
Table 4: Number of employees by job title

	Number of employees			
	Installers	Technicians	Sales Staff	Total ¹
Total	824	557	352	1,658
Mean	4	2	2	7
Median	2	2	1	4
Mode	1	1	1	1
	(n = 227)	(n = 227)	(n = 227)	(n = 227)

¹ The mean, median and mode for the total employee group does not equal the sum of the mean, median and mode for installers, technicians, and sales staff.

- Over one-third (39%) of residential HVAC activity involves the “replacement of existing equipment.”** As illustrated in Figure 1, “new construction” accounts for the next largest percentage of residential HVAC activity (24%). This is closely followed by “service and repair activity” (22%) which is followed by “installations in existing homes without central heating or cooling equipment” (15%). *The above percentages are weighted by respondents’ total residential HVAC equipment unit sales volume.*

Figure 1: Residential HVAC business activity by market sector¹



¹ Weighted by respondents’ total residential HVAC equipment unit sales volume.

- Contractors who participated in the telephone survey collectively installed 8,539 furnaces, 7,383 central air conditioners, 668 heat pumps, and 1,442 evaporative coolers in newly constructed homes in 1998.** As illustrated in Table 5, the average survey respondent installed 40 furnaces, 34 central air conditioners, 3 heat pumps, and 6 evaporative coolers in newly constructed homes in 1998.

- **Contractors who participated in the telephone survey collectively installed 12,764 furnaces, 10,551 central air conditioners, 1,332 heat pumps, and 997 evaporative coolers in existing homes in 1998.** As illustrated in Table 5, the average survey respondent installed 61 furnaces, 50 central air conditioners, 6 heat pumps, and 5 evaporative coolers in existing homes in 1998.

Table 5: 1998 residential HVAC sales activity by market sector

	1998 Unit Sales	
	Total	Mean
New Construction		
Furnaces	8,539	40
Central Air Conditioning	7,383	34
Heat Pump	668	3
Evaporative Cooler	1,442	6
<i>Sub-Total New Construction</i>	<i>18,032</i>	
Existing Homes		
Furnaces	12,764	61
Central Air Conditioning	10,551	50
Heat Pump	1,332	6
Evaporative Cooler	997	5
<i>Sub-Total Existing Homes</i>	<i>25,644</i>	
Total Unit Sales	43,676	

- **The most frequently mentioned brands that survey respondents offer are Carrier and Bryant, which are each offered by 34% of survey respondents.** As outlined in Table 6, the next most frequently offered brands are Trane (offered by 25% of respondents), Rheem (23%), and York (21%)

Table 6: Brands offered by survey respondents¹

	Percent of respondents²
Carrier	34%
Bryant	34%
Trane	25%
Rheem	23%
York	21%
Ruud	15%
American Standard	12%
Coleman	12%
Payne	11%
Day & Night	11%
Heil	8%
Lennox	6%
Tempstar	5%

¹ Only brands mentioned by 5% or more of respondents are listed.

² Respondents were allowed to list more than one brand.

- **Slakey Brothers is the distributor mentioned most frequently by survey respondents as a source from whom they purchase HVAC equipment.** As illustrated in Table 7, Slakey Brothers is mentioned over three times more often than the next most frequently mentioned distributor. They are clearly a dominant player in the HVAC equipment distribution business in Northern California.

Table 7: Distributors used by survey respondents¹

	Percent of respondents²
Slakey Brothers	41%
E.B. Ward & Company	13%
Westburne Supply	12%
CFM Equipment Distributor	11%
Familian Pipe and Supply	11%
Western Air Systems & Controls	11%
Heating and Cooling Supply, Inc.	10%
The Trane Company	8%
Specialty AC Products	7%
York Heating & Air Conditioning	7%
Pameco	7%
Johnstone	6%
Geary Pacific	6%
Lennox	6%
Valair ³	6%
Heieck Supply	5%

¹ Only distributors mentioned by 5% or more of respondents are listed.

² Respondents were allowed to list more than one distributor.

³ Valair is a division of E.B. Ward & Co.

1998 Sales by Efficiency Level

The purpose of this sub-section is to summarize contractor-reported forced air furnace and central air conditioning sales information by efficiency level. In addition to finding out what contractors are selling, we asked them to tell us what they consider to be energy efficiency equipment. Where appropriate, responses in this sub-section are weighted by each respondent's residential HVAC equipment unit sales volume.¹⁰ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Approximately 80 percent of all survey respondents' 1998 forced air furnace sales have efficiency or A.F.U.E. ratings of 80-89%.** As illustrated in Table 8, 79% of new construction unit sales and 83% of existing home unit sales across PG&E's service territory have efficiency or A.F.U.E. ratings of 80-89%. *These percentages are weighted by respondents' new construction and existing home forced air furnace unit sales volumes, respectively.*
- **As illustrated in Table 8, 18% of 1998 forced air furnace unit sales for new construction and 15% of unit sales for existing homes have A.F.U.E. ratings of 90% to 94%.**
- **As illustrated in Table 8, only 3% of new construction and 2% of 1998 existing home forced air furnace unit sales have A.F.U.E. ratings of 95% or higher.** *These percentages are weighted by respondents' new construction and existing home forced air furnace unit sales volumes, respectively.*

¹⁰ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

Table 8: 1998 forced air furnace sales by efficiency level¹

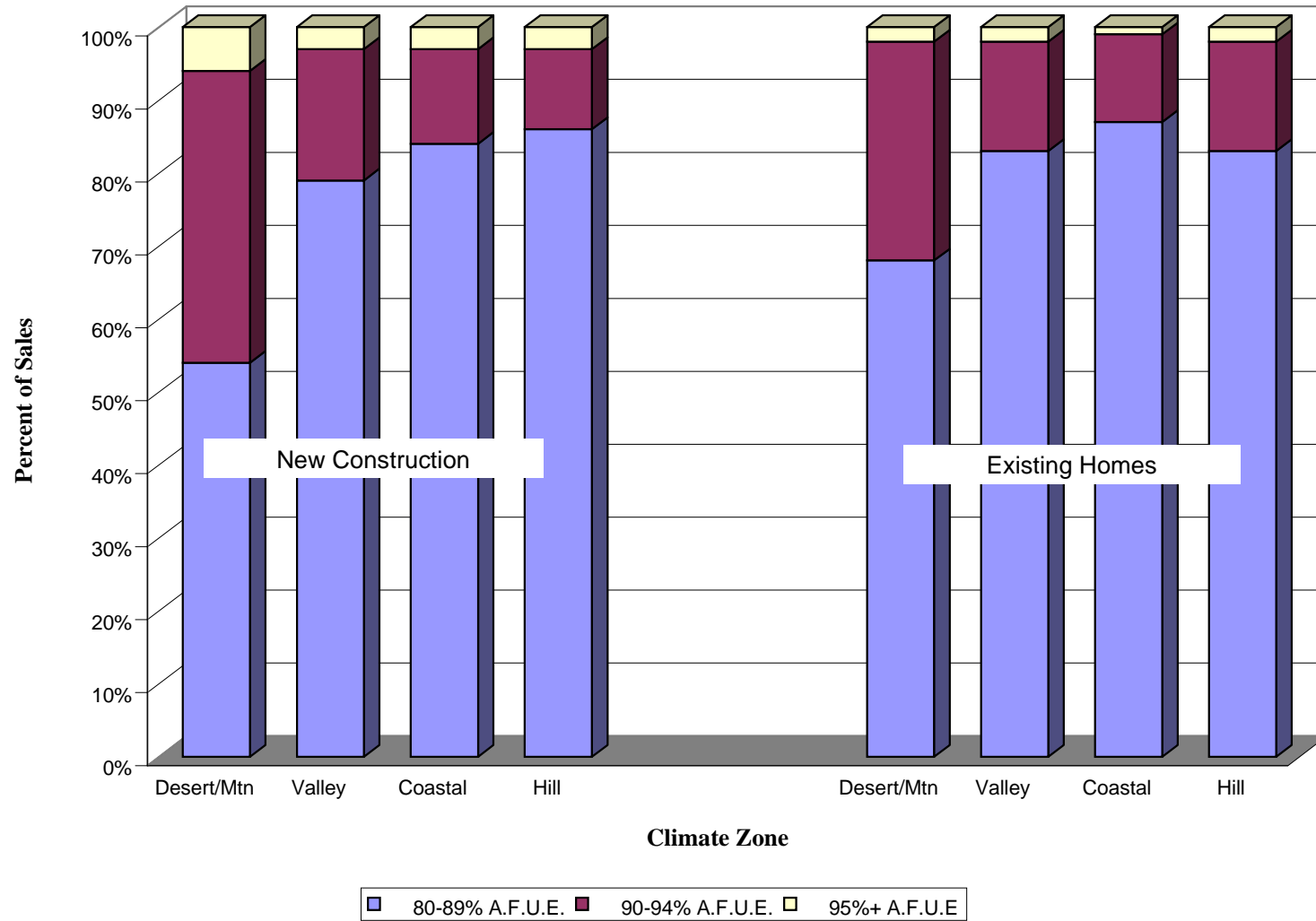
	Percent of 1998 Forced Air Furnace Unit Sales				
	Desert/ Mountain	Valley	Coastal	Hill	PG&E Territory
<i>New Construction</i>					
80-89% A.F.U.E.	54%	79%	84%	86%	79%
90-94% A.F.U.E.	40%	18%	13%	11%	18%
95%+ A.F.U.E.	6%	3%	3%	3%	3%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
(Units)	(874)	(3,785)	(1,169)	(2,454)	(8,282) ²
<i>Existing Homes</i>					
80-89% A.F.U.E.	68%	83%	87%	83%	83%
90-94% A.F.U.E.	30%	15%	12%	15%	15%
95%+ A.F.U.E.	2%	2%	1%	2%	2%
	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
(Units)	(797)	(4,985)	(2,324)	(4,403)	(12,509) ²

¹ Weighted by respondents' new construction and existing home forced air furnace unit sales volumes, respectively.

² Does not add up to previously reported total unit sales as a small number of contractors could not or would not break out sales by efficiency levels.

- **The market share of high efficiency forced air furnaces is highest among survey respondents located in the Desert/Mountain climate zone.** As illustrated in Figure 2, 46% of new construction unit sales and 32% of existing home units sales in the Desert/Mountain climate zone have A.F.U.E. ratings of 90% or higher. These market shares are approximately twice as high as those are in the Valley, Coastal, and Hill climate zones. *Percentages are weighted by unit sales volumes.*
- **Approximately 4 of every 5 forced air furnaces sold in the Valley, Coastal, and Hill climate zones (new construction and existing homes) have A.F.U.E. ratings of 80-89%.** As illustrated in Figure 2, the market share of units with 80-89% A.F.U.E. ratings ranges from 79% of new construction sales in the Valley climate zone to 87% of existing home sales in the Coastal climate zone. *Percentages are weighted by unit sales volumes.*

Figure 2: 1998 Forced air furnace sales by efficiency level and climate zone



¹ Percentages are weighted by respondents' new construction and existing home forced air furnace unit sales volumes, respectively.

- **Approximately 50 percent of all survey respondent's 1998 central air conditioning sales just meet the minimum federal standard for energy efficiency—they have SEER ratings of 10.** As illustrated in Table 9, 56% of unit sales in the new construction market and 50% of unit sales in the existing homes market have SEER ratings of 10. *Percentages are weighted by unit sales volumes.*
- **Over 40% of both overall 1998 new construction and overall 1998 existing home central air conditioning sales have SEER ratings of 12 or higher.** As illustrated in Table 9, 41% of new construction sales and 44% of existing home sales have SEER rating of 12 or higher. *Percentages are weighted by unit sales volumes.*

Table 9: 1998 central air conditioning sales by efficiency level¹

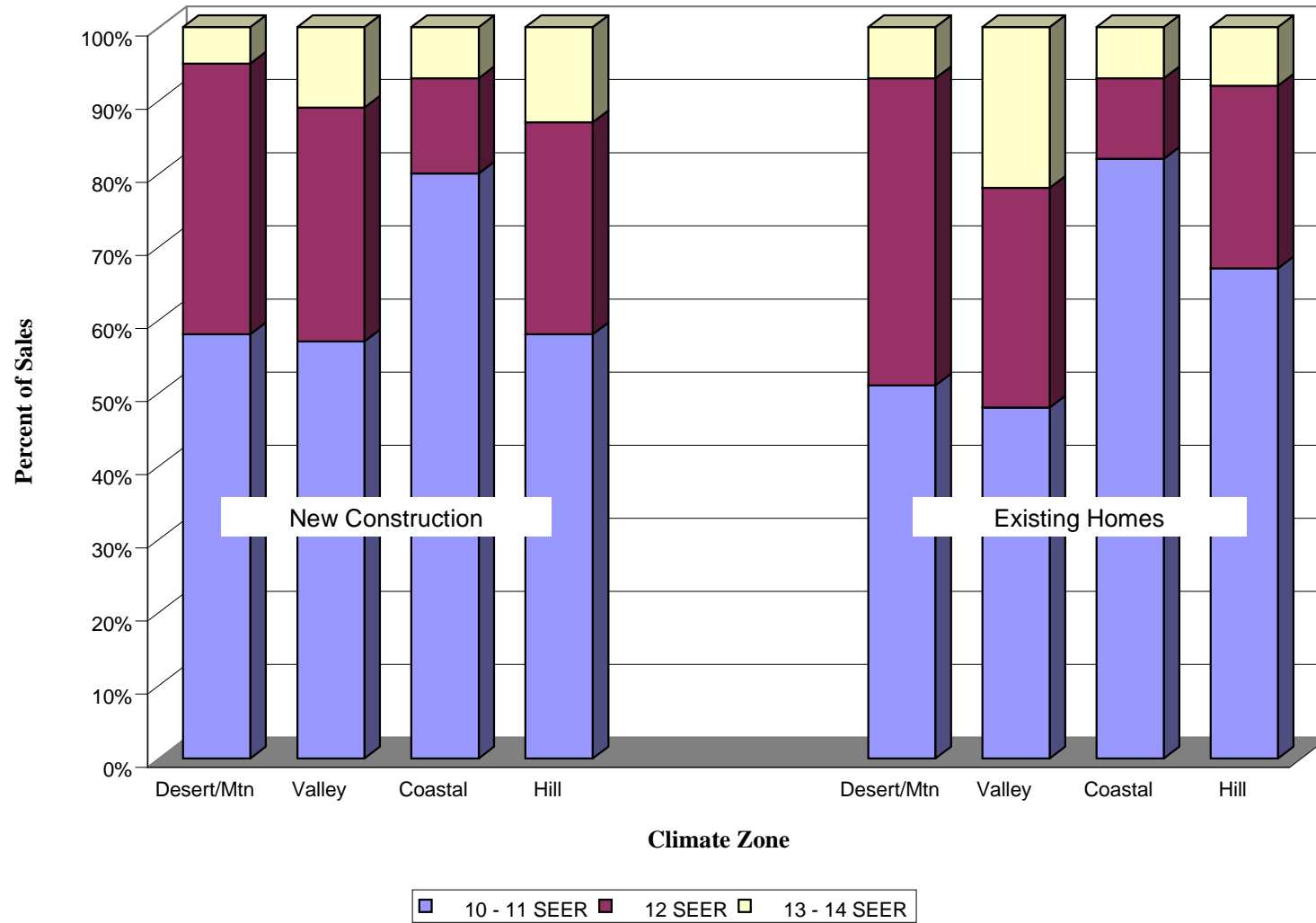
	Percent of 1998 central air conditioning unit sales				
	Desert/ Mountain	Valley	Coastal	Hill	PG&E Territory
<i>New Construction</i>					
10 SEER	55%	55%	69%	55%	56%
11 SEER	3%	2%	11%	3%	3%
12 SEER	37%	32%	13%	29%	31%
13 SEER	4%	9%	6%	11%	9%
14 SEER	1%	2%	1%	2%	1%
	100%	100%	100%	100%	100%
<i>(Units)</i>	<i>(1,136)</i>	<i>(4,005)</i>	<i>(375)</i>	<i>(1,860)</i>	<i>(7,376)²</i>
<i>Existing Homes</i>					
10 SEER	47%	44%	67%	59%	50%
11 SEER	4%	4%	15%	8%	6%
12 SEER	42%	30%	11%	25%	29%
13 SEER	5%	19%	6%	5%	13%
14 SEER	2%	3%	1%	3%	2%
	100%	100%	100%	100%	100%
<i>(Units)</i>	<i>(1,194)</i>	<i>(5,584)</i>	<i>(581)</i>	<i>(2,950)</i>	<i>(10,309)²</i>

¹ Weighted by respondents' new construction and existing home forced central air conditioning unit sales volumes, respectively.

² Does not add up to previously reported total unit sales as a small number of contractors could not or would not break out sales by efficiency levels.

- **With the exception of the Coastal climate zone, the market share of high efficiency central air conditioning equipment (12+ SEER rating) in the new construction market is just over 40% across climate zones.** As illustrated in Figure 3, high efficiency central air conditioning equipment market shares (12+ SEER rating) are nearly identical in the Desert/Mountain (42%), Valley (43%), and Hill (42%) climate zones. The market share in the Coastal climate zone is only 20%. *Percentages are weighted by unit sales volumes.*
- **The market share of high efficiency central air conditioning equipment (12+ SEER rating) in the existing home market varies considerably across climate zones.** As illustrated in Figure 3, high efficiency central air conditioning market shares (12+ SEER rating) vary from a high of 52% in the Valley climate zone to a low of 18% in the Coastal climate zone. *Percentages are weighted by unit sales volumes.*

Figure 3: 1998 Central air conditioner sales by efficiency level and climate zone¹

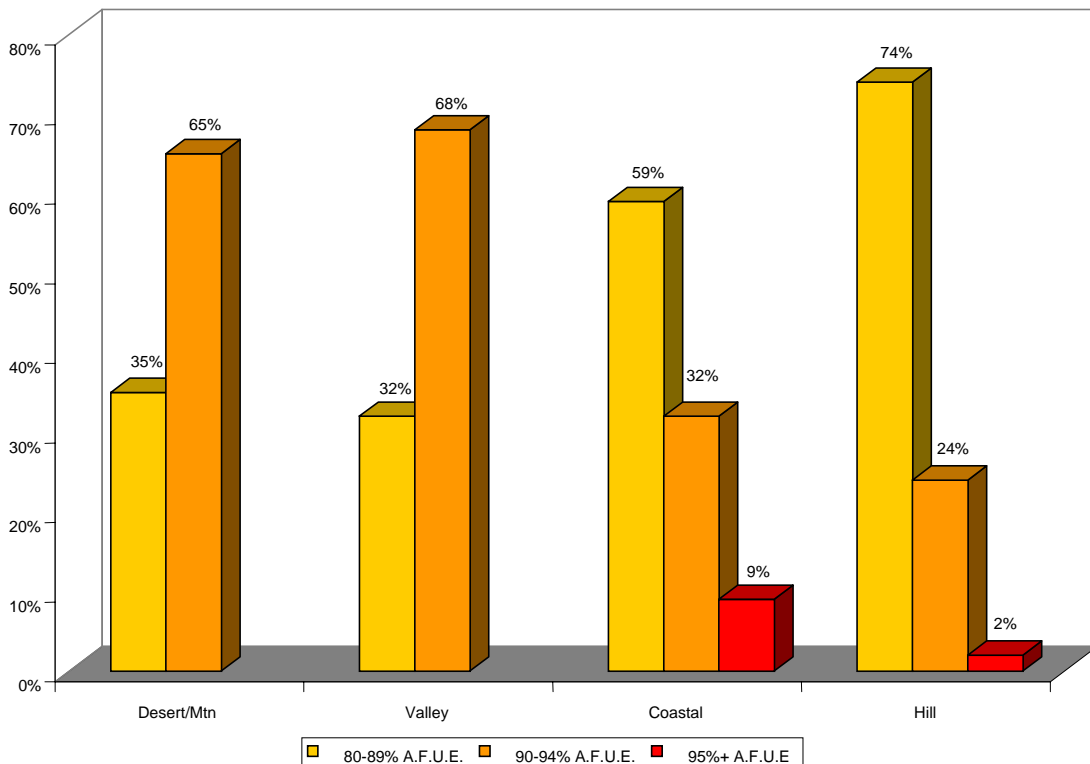


¹ Weighted by respondents' new construction and existing home forced central air conditioning unit sales volumes, respectively.

For both forced air furnaces and central air conditioning equipment, we asked survey respondents working in the new construction market what efficiency level (i.e., A.F.U.E. rating for furnaces and SEER rating for central air conditioning equipment) they “consider” to be energy efficient. Key findings across climate zones are outlined below.

- Approximately two-thirds of survey respondents located in the Desert/Mountain and Valley climate zones consider furnaces with 90-94% A.F.U.E. ratings to be energy efficient.** As illustrated in Figure 4, this compares to only about one-third of survey respondents located in the Coastal and Hill climate zones who consider furnaces with 90-94% A.F.U.E. ratings to be energy efficient *Percentages are weighted by furnace sales volume.*

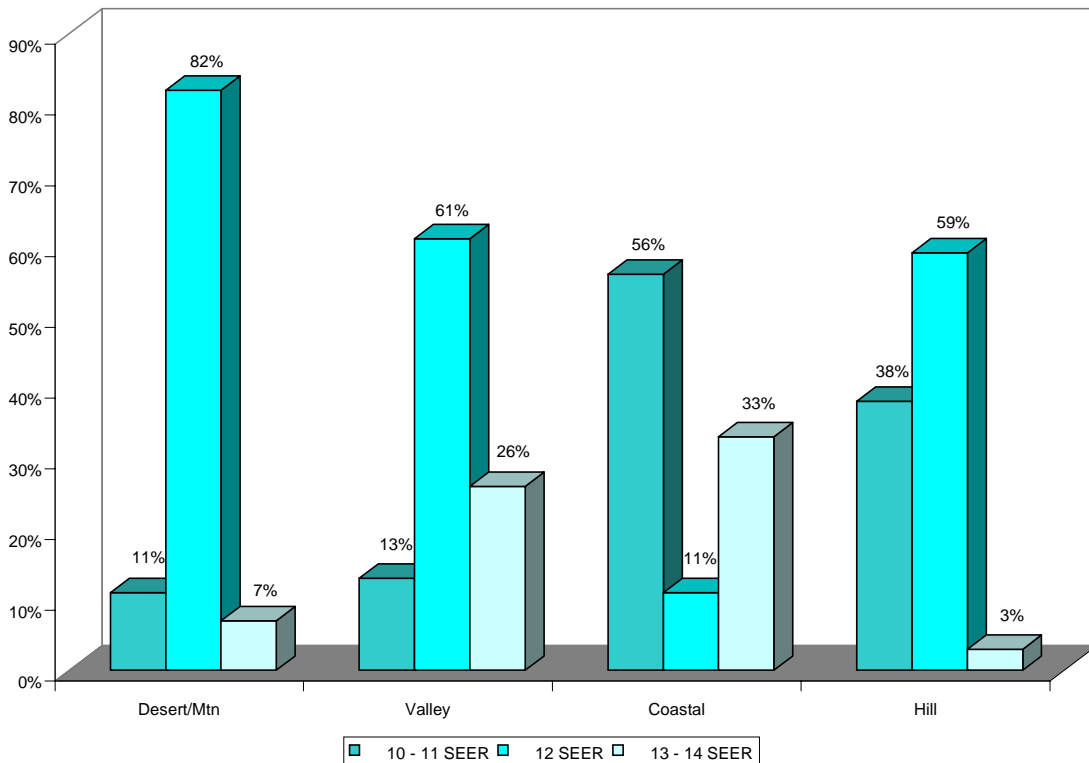
Figure 4: Forced air furnace efficiency level considered to be efficient¹



¹ Weighted by respondents’ forced air furnace unit sales volume.

- The central air conditioning energy efficiency level (or SEER rating) that survey respondents consider to be energy efficient varies considerably across climate zone.** As illustrated in Figure 5, few survey respondents in the Desert/Mountain and Valley climate zones consider 10-11 SEER units to be energy efficient. However, in comparison, 56% of respondents in the Coastal climate zone and 38% of respondents in the Hill climate zone consider 10-11 SEER units to be energy efficient. With the exception of the Coastal climate zone, most respondents consider 12 SEER to be energy efficient. As illustrated in Figure 5, 82% of Desert / Mountain, 61% of Valley, and 59% of Hill climate zones consider 12 SEER to be energy efficient. *Percentages are weighted by respondents' forced central air conditioning unit sales volume.*

Figure 5: Central air conditioning efficiency level considered to be efficient¹



¹ Weighted by respondents' forced central air conditioning unit sales volume.

- According to surveyed contractors, 60% of all 1998 HVAC equipment replacements were because of equipment breakdowns.** As illustrated in Table 10, according to survey respondents, the remaining replacements (40%) can be classified as "planned." *Percentages are weighted by unit sales volumes.*

Table 10: Total 1998 HVAC replacements – breakdowns versus planned¹

	All HVAC Replacements	
	Units	Percentage
Type of replacement		
Breakdowns	11,101	60%
Planned	7,473	40%
<i>Total Replacements</i>	<i>18,574</i>	<i>100%</i>

¹ Includes all HVAC equipment replacements: forced air furnaces, central air conditioners, heat pumps, and evaporative coolers. Percentages are weighted by unit sales volumes.

Replacement Equipment Timing

The purpose of this sub-section is to summarize what contractors say about the timing of consumer replacement decisions. Specifically, for both breakdowns and planned replacements, we asked contractors how long they generally have to replace equipment once a consumer has made the replacement decision. Where appropriate, responses in this sub-section are weighted by each respondent's residential HVAC equipment unit sales volume.¹¹ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- About one-third of the respondents indicate that customers need replacement equipment the 'same day' when they have an *equipment breakdown*.** As illustrated in Table 11, 31% of respondents indicate the replacement is needed the same day. Eighty-one percent (81%) of respondents indicate customers need the breakdown replacement in four days or less. *When weighting responses by each respondent's breakdown replacement unit sales volume, the percentage needing breakdown replacements remains approximately the same with 31% needing the replacement the same day and 86% needing the replacement in four days or less.*

¹¹ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

- **Few respondents indicate that customers need replacement equipment within 3-4 days when they have a *planned replacement*.** As illustrated in Table 11, respondents indicate that 3% of customers need *planned replacements* on the same day, and only 18% of customers need *planned replacements* in four days or less. *When weighting responses by each respondent's planned replacement unit sales volume, the percentage needing planned replacements remains approximately the same with 2% needing the replacement the same day and 14% needing the replacement in four days or less.*

Table 11: How quickly customers need replacement equipment

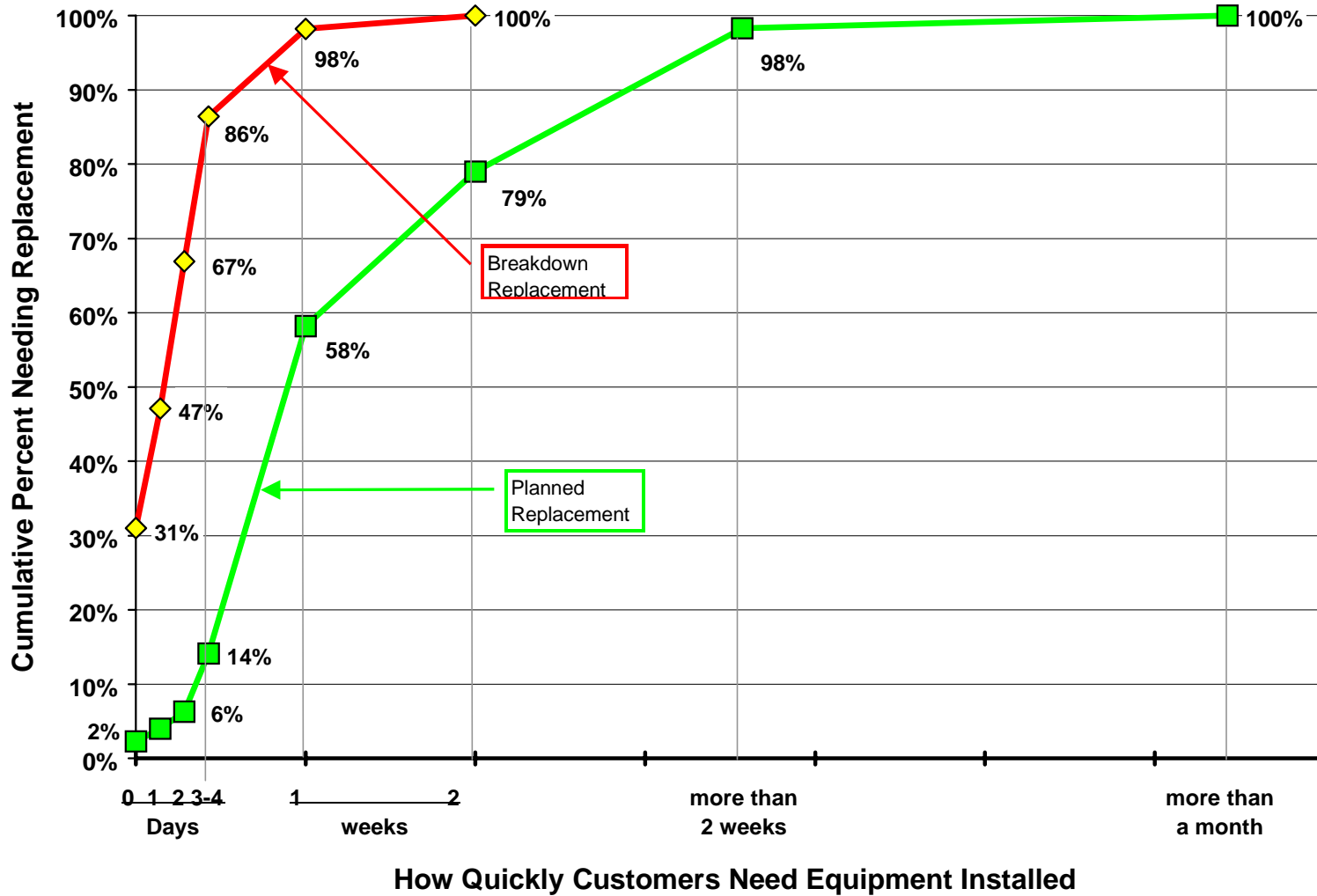
Timeframe	Breakdown replacement		Planned replacement	
	Percent of respondents	Percent of market activity ¹	Percent of respondents	Percent of market activity ²
Same day	31%	31%	3%	2%
Next day	17%	16%	2%	2%
2 days	20%	20%	4%	2%
3 to 4 days	13%	19%	9%	8%
1 week	17%	12%	33%	44%
2 weeks	2%	2%	26%	21%
2 to 4 weeks			18%	19%
More than 4 weeks			5%	2%
	(n = 220)	(n = 220)	(n = 180)	(n = 180)

¹ Responses are weighted by each respondent's total HVAC equipment *breakdown replacement* unit sales volume.

² Responses are weighted by each respondent's total HVAC equipment *planned replacement* unit sales volume.

Figure 6 on page 23 is a graphical comparison of the timeframe for *breakdown replacements* and *planned replacements*.

Figure 6: “Breakdown” and “Planned” HVAC replacements timeframe comparison¹



¹ Weighted by respondents’ total HVAC equipment *breakdown* and *planned replacement* unit sales volumes, respectively.

The Role of HVAC in the Remodeling Market

We asked HVAC contractors how often they work on a job at the same time a remodeling contractor is working there. Additionally, we asked them how often the remodeling contractor’s work involves improvements to the energy efficiency level of the home. Finally, when energy efficiency improvements are being made by the remodeling contractor, we asked HVAC contractors how often they are given information on the improvements in time to use the information in sizing the furnace or air conditioner they are bidding on or installing. Where appropriate, responses in this sub-section are weighted by each respondent’s total residential HVAC equipment unit sales volume.¹² (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Just under one-half (45%) of survey respondents said they “occasionally” work on a job at the same time a remodeling contractor is working there.** *As illustrated in Table 12, percentages weighted by HVAC equipment unit sales volume are very similar.*
- **Thirty-nine percent (39%) of survey respondents said ‘never’ (10%) or ‘not very often’ (29%) when asked how often they work on a job at the same time a remodeling contractor is working there.** *As illustrated in Table 12, percentages weighted by HVAC equipment unit sales volume are very similar.*

Table 12: Frequency of working on job at same time remodeling contractor is present¹

Frequency	Percent of respondents	Percent of market activity¹
All of the time	2%	4%
Most of the time	14%	10%
Occasionally	45%	50%
Not very often	29%	29%
Never	10%	7%
	(n = 227)	(n = 227)

¹ Weighted by respondents’ total residential HVAC equipment unit sales volume.

¹² This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

- **Over one-half (53%) of survey respondents said that remodeling jobs improve the energy efficiency of a home ‘most of the time’ or ‘all of the time.’** As illustrated in Table 13, when weighted by respondents’ total residential HVAC equipment unit sales volume, this percentage decreases to 50%.

Table 13: Frequency with which remodeling jobs improve the energy efficiency of the home¹

Frequency	Percent of respondents	Percent of market activity²
All of the time	14%	14%
Most of the time	39%	36%
Occasionally	29%	33%
Not very often	14%	13%
Never	4%	4%
	(n = 193)	(n = 193)

¹ Does not include contractors who either 1) said they ‘never’ work on a job at the same time as a remodeling contractor, or 2) could not answer the question.

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

- **When asked, “how often are you given information on what energy efficiency improvements they (remodeling contractors) are making in time to use the information in sizing the furnace or air conditioner you are bidding on or installing,” 62% of survey respondents said ‘most of the time’ or ‘all of the time.’** As illustrated in Table 14, the other 38% of respondents said they are given this information in time ‘occasionally,’ ‘not very often,’ or ‘never.’

Table 14: Frequency with which information on home efficiency improvements is made available for sizing HVAC equipment¹

Frequency	Percent of respondents	Percent of market activity ²
All of the time	35%	39%
Most of the time	27%	23%
Occasionally	15%	18%
Not very often	14%	12%
Never	9%	8%
	(n = 193)	(n = 193)

¹ Does not include contractors who could not answer the question.

² Weighted by each respondents' residential HVAC equipment unit sales volume.

Role of Energy Efficiency

In this sub-section we address three issues that provide insight into the role that energy efficiency plays in conversations contractors have with current and prospective residential customers. First, we ask contractors to list the benefits they emphasize when talking to residential customers about high efficiency HVAC equipment. Then, for both forced air furnaces and central air conditioners, we ask contractors how often they provide customers with cost comparisons between high and standard efficiency equipment. Finally, we read contractors a list of factors which residential customers may consider when purchasing heating and cooling equipment and ask the contractors their opinion of the relative importance of each in the "typical" customer decision making process. Where appropriate, responses in this sub-section are weighted by each respondent's total residential HVAC equipment unit sales volume.¹³ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

¹³ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

- The most frequently mentioned benefit that is emphasized by contractors when talking with customers about high efficiency HVAC equipment is “low operating costs/lower utility bills.”** As illustrated in Table 15, 83% of respondents indicate that they mention “low operating costs/lower utility bills” when talking with customers about high efficiency equipment. Other benefits emphasized by 5% or more of the respondents are shown in Table 15. As illustrated in Table 15, weighted percentages are very similar.

Table 15: Benefits of high efficiency HVAC equipment frequently mention by contractors¹

Benefit	Percent of respondents	Percent of market activity¹
Low operating costs/lower utility bills	83%	78%
Better warranty	23%	24%
Reliability	23%	24%
Noise reduction	18%	22%
Better comfort	20%	22%
Low maintenance costs	16%	14%
Better for the environment	8%	10%
Energy efficiency	5%	7%
Don't mention high efficiency	5%	5%
	(n = 225)	(n = 225)

¹ Weighted by respondents' total residential HVAC equipment unit sales volume.

- Contractors frequently provide cost comparisons between high and standard efficiency furnaces as well as between high and standard efficiency central air conditioners.** As illustrated in Table 16, 61% of respondents ‘always’ or ‘most of the time’ provide cost comparisons for furnace purchases, and 67% of respondents ‘always’ or ‘most of the time’ provide cost comparisons for air conditioner purchases. *Weighted percentages are somewhat higher at 68% for furnace purchases and 78% for central air conditioning purchases.*

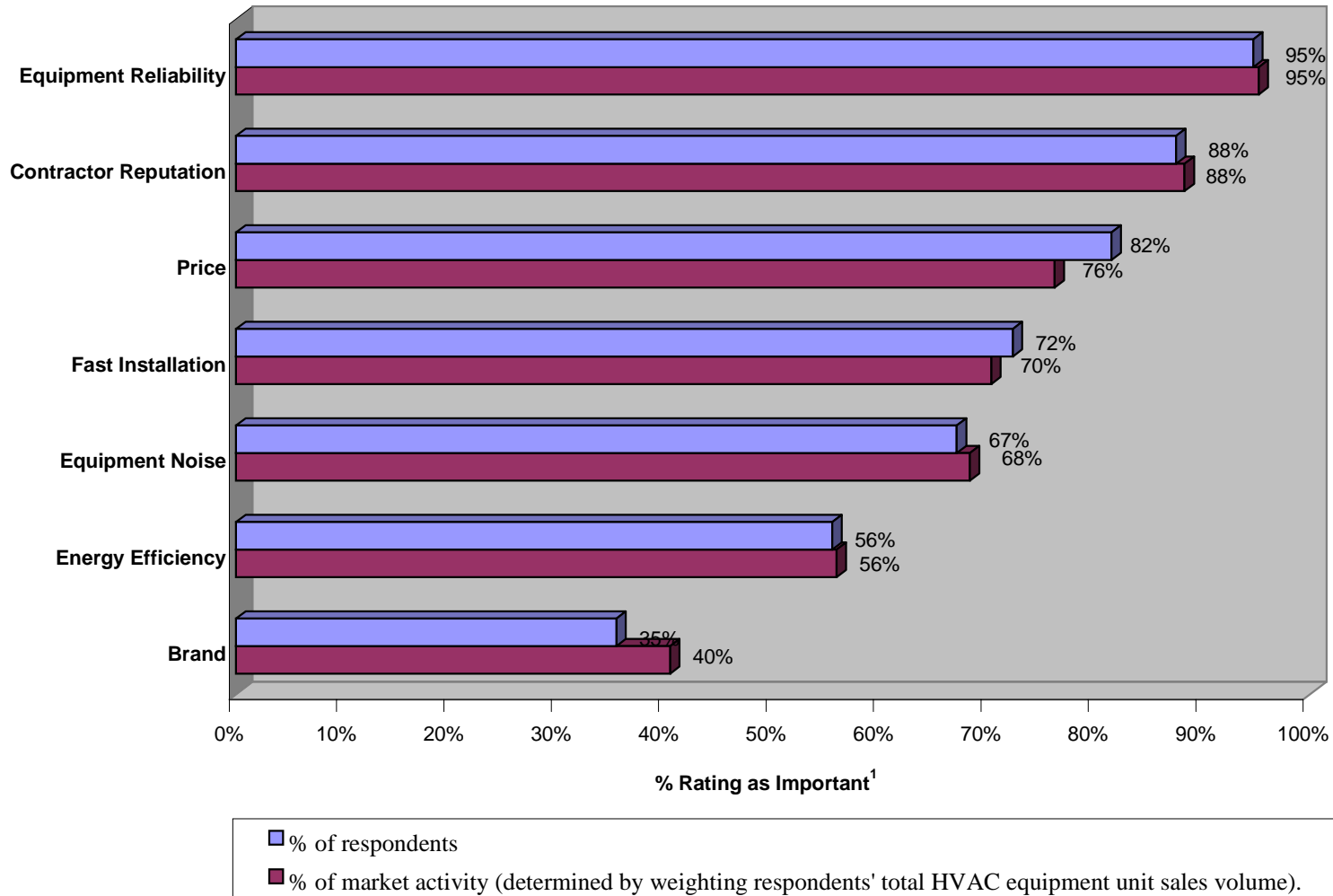
Table 16: How often cost comparisons between high and standard efficiency HVAC equipment are provided to customers¹

	Furnaces		Central air conditioners	
	Percent of respondents	Percent of market activity ¹	Percent of respondents	Percent of market activity ¹
Always	33%	35%	40%	43%
Most of the time	28%	33%	27%	33%
Occasionally	17%	15%	14%	12%
Not very often	13%	11%	11%	8%
Never	9%	6%	8%	4%
	(n = 226)	(n = 226)	(n = 226)	(n = 226)

¹ Weighted by respondents’ total residential HVAC equipment unit sales volume.

- Contractors indicate that “equipment reliability” and “contractor reputation” are the most important factors for customers making an HVAC purchase.** Respondents were asked to rank seven factors (on their importance to residential HVAC purchasers) using a scale of 1 to 5, where 1 = not at all important and 5 = very important. As illustrated in Figure 7, 95% of respondents rank “equipment reliability” as a ‘4’ or ‘5’ in importance to residential HVAC purchasers and 88% of respondents rank “contractor reputation” as a ‘4’ or ‘5’ in importance to residential HVAC purchasers *Weighted percentages are exactly the same.*
- “Energy efficiency” is ranked as the sixth most important factor in customer decision making when purchasing HVAC equipment.** As illustrated in Figure 7, 56% of contractors rank “energy efficiency” as a ‘4’ or ‘5’ in importance to residential HVAC purchasers.

Figure 7: Importance of factor to residential HVAC purchasers¹



¹ Percent who rank factor a '4' or '5' on a scale of 1 to 5 where 1 = not at all important and 5 = very important.

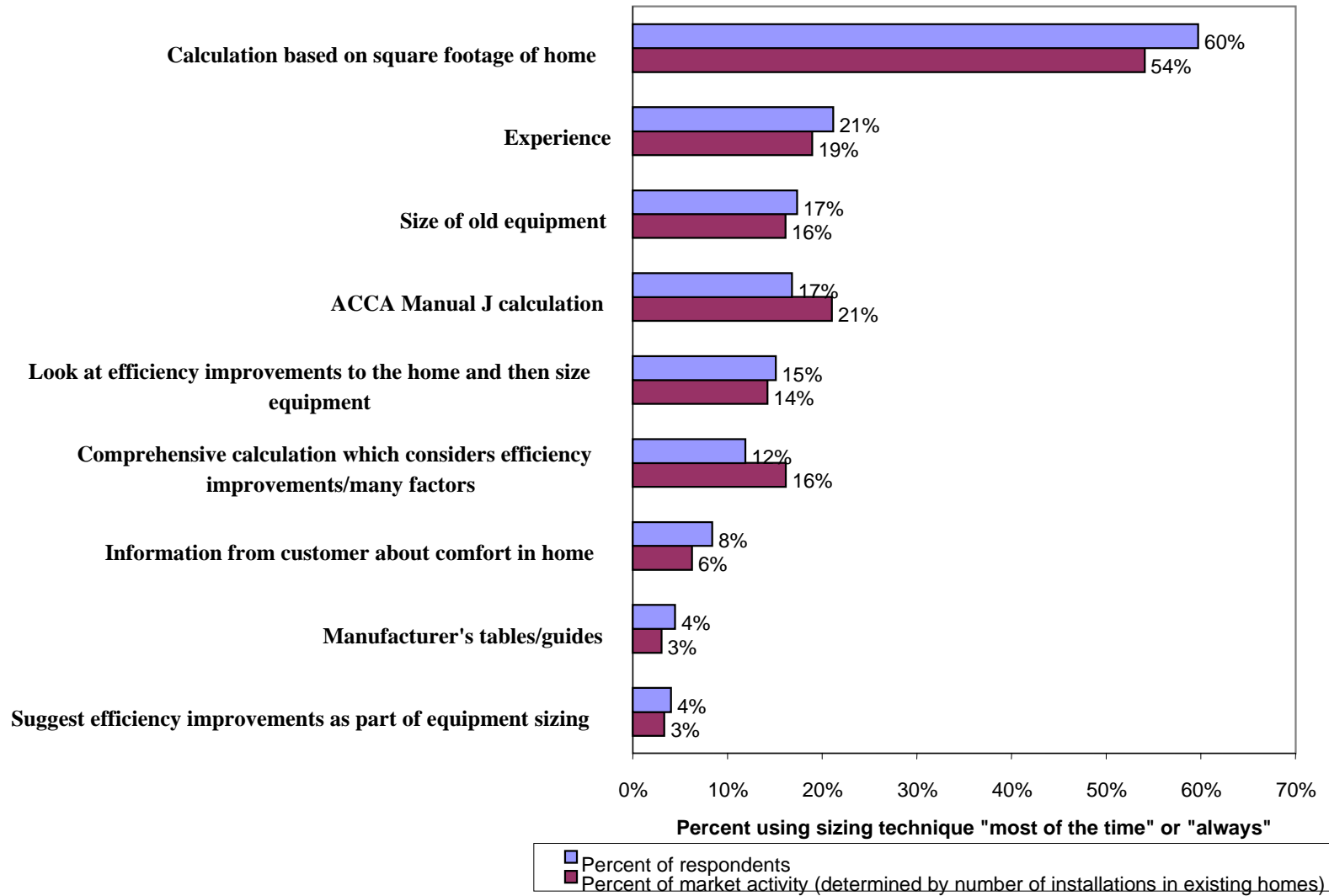
Sizing HVAC Equipment

Proper sizing of HVAC equipment is an important aspect of delivering a service that helps customers maximize efficiency and minimize their overall energy costs. In order to address issues related to sizing HVAC equipment, we asked contractors to describe how they currently size HVAC equipment for installations in existing homes. For each method mentioned, we asked contractors how often they use the method. Finally, for new homes, we asked contractors to comment on the role that Title-24 (i.e., California state building code) has on their equipment sizing decisions. All findings in this sub-section are weighted either by respondents' total residential HVAC equipment *existing home* or by respondents' total residential HVAC equipment *new construction* unit sales volume.¹⁴ Key findings are outlined below.

- **Sixty percent of respondents said they size HVAC equipment through a calculation “based on the square footage of a home” ‘most of the time’ or ‘always.’** As illustrated in Figure 8, nearly three times as many contractors use this technique compared to the next most frequently used technique (“experience”). The third and fourth most frequently used techniques include sizing the new equipment “based on the size of the old equipment” (17%) and “ACCA Manual J calculations” (17%).

¹⁴ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

Figure 8: Method used to size HVAC equipment



- ***When weighted by respondents' new construction HVAC sales, 81% of contractors working within the new construction market said they "generally" receive a Title-24 calculation that gives them the HVAC equipment size for new construction jobs.***
- ***When weighted by respondents' new construction HVAC sales, only 10% of survey respondents working within the new construction market said that Title-24 HVAC sizing calculations are 'always' correct. Another 49% said the calculations are correct 'most of the time.' In total, 39% of respondents said that Title-24 calculations are correct 'occasionally,' 'not very often,' or 'never.'***
- ***When weighted by respondents' new construction HVAC sales, nearly two-thirds of contractors said that when Title-24 calculations seem incorrect it is usually because they think the Title-24 recommended HVAC equipment is undersized. In other words, these contractors feel that larger equipment is necessary in order to adequately meet the heating or cooling load of the newly constructed home.***

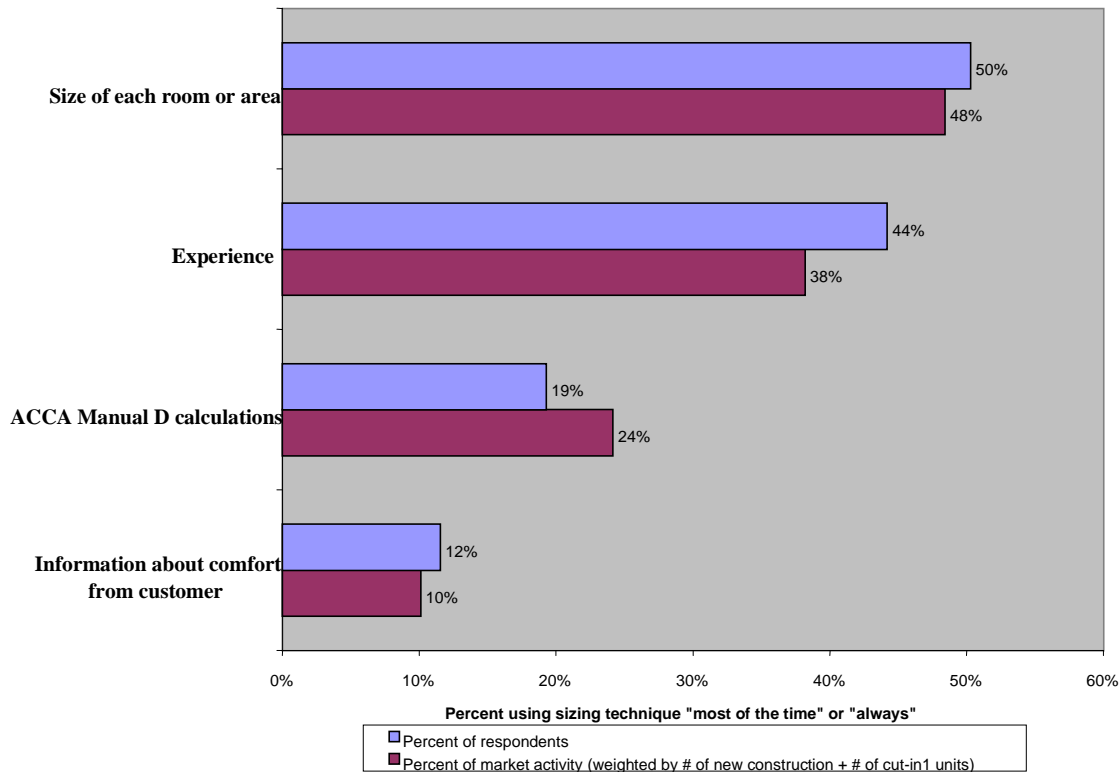
Ductwork Sizing and Related Services

Proper sizing of ductwork is an important aspect of delivering a service that helps customers maximize efficiency and minimize their overall energy costs. In order to address this issue, we asked contractors who install ductwork to describe how they currently size and lay out the ductwork in homes. For each method mentioned, we asked contractors how often they use the method. We asked respondents if they provided duct-cleaning services. We also asked respondents if they provide duct repair and sealing services, and if they do, we asked what they use to seal the ducts and if those materials meet UL 181 requirements. Finally we asked respondents how often they replace ductwork during installation jobs in existing homes. For those who do replace ductwork, we asked about the reasons for making the replacement. Where appropriate, responses in this sub-section are weighted by each respondent's total residential HVAC equipment unit sales volume.¹⁵ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

¹⁵ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

- Half (50%) of the survey respondents said they size and lay out ductwork in homes “based upon room or area sizes” ‘most of the time’ or ‘always.’** As illustrated in Figure 9, the next most frequently used techniques for sizing and laying out ductwork are “experience” (44%), “ACCA Manual D calculations” (19%), and “information about comfort from customer” (12%). *Figure 9 also shows the percent of market activity (determined by weighting respondents’ total number of new construction plus cut-in¹⁶ unit sales volume).*

Figure 9: Technique used to size and lay out ductwork.



- Most (91%) respondents provide duct repair or sealing service, but very few (15%) provide duct-cleaning service.** *When weighted by respondents’ total residential HVAC equipment unit sales volume, 94% provide duct repair or sealing service and 28% provide duct-cleaning service.*

¹⁶ Cut-ins are installations in existing homes without central heating or cooling.

- **Almost two-thirds of the respondents who do ductwork use both tape and mastic to seal the ducts.** When asked if they used tape, mastic, or both to seal ducts, 64% indicate they use both tape and mastic, 25% indicate they use tape, and 11% indicate they use mastic. *Percentages are similar when weighted by respondents' total residential HVAC equipment unit sales volume.*
- **Almost all (97%) of the respondents who do ductwork indicate the tape and mastic both meet UL 181 requirements.** *Percentages are similar when weighted by respondents' total residential HVAC equipment unit sales volume.*
- **Respondents indicate the reasons for replacing ductwork are because the ductwork is deteriorating (54%), undersized (27%), or uninsulated (19%).** (Respondents were asked to indicate the percent of the time that their replacements were for the above reasons and these percentages represent an average of those responses.) *Percentages are similar when weighted by respondents' total number of replacements of existing equipment.*

Incremental Costs of Energy Efficiency Equipment

Understanding the incremental (or increased) cost of energy efficiency equipment over standard efficiency equipment is important when trying to understand both contractor recommendations and, ultimately, consumer decision making. In order to provide insight into this issue, we asked contractors for the increased customer cost (both equipment and labor) of selling and installing high efficiency forced air furnaces and central air conditioners over standard efficiency equipment. We also asked them about the profitability of selling HVAC equipment versus selling labor hours. Where appropriate, responses in this sub-section are weighted by each respondent's total residential HVAC equipment unit sales volume.¹⁷ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

¹⁷ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes.

- **Compared to standard efficiency forced air furnaces (i.e., 80% A.F.U.E.), forced air furnaces with 90% A.F.U.E. ratings cost customers an average of \$601 more to install (including equipment and labor).** As illustrated in Table 17, the median increased cost is \$550. *Costs are weighted by total furnace sales, excluding top and bottom 10% of responses.*
- **Compared to standard efficiency forced air furnaces (i.e., 80% A.F.U.E.), forced air furnaces with 95% A.F.U.E. ratings cost customers an average of \$810 more to install (including equipment and labor).** As illustrated in Table 17, the median increased cost is \$800. *Costs are weighted by total furnace sales, excluding top and bottom 10% of responses*

Table 17: Incremental cost of high efficiency forced air furnace¹

	Move from 80% to 90% A.F.U.E.	Move from 80% to 95% A.F.U.E.
Mean	\$601	\$810
Median	\$550	\$800
	(n = 141) ²	(n = 103) ³

¹ Weighted by total furnace sales, excluding top and bottom 10% of distribution.

² A total of 225 contractors were asked this question. Forty-eight responses were eliminated because contractor did not sell furnaces, did not know difference in cost, or refused to answer. Thirty-six responses were eliminated because they fell in the upper or lower 10% of the distribution.

³ A total of 225 contractors were asked this question. Ninety-two responses were eliminated because contractor did not sell furnaces, did not know difference in cost, or refused to answer. Thirty responses were eliminated because they fell in the upper or lower 10% of the distribution.

- **Just over one-half of survey respondents said they ‘usually’ install split system (as opposed to packaged) central air conditioning units.** As illustrated in Table 18, 52% and 50% of respondents said they ‘usually’ install split systems when working with 3 ton and 5 ton units, respectively. The next highest percentage of respondents (for both 3 ton and 5 ton units) said they install split and packaged systems about equally.

Table 18: Frequency of *split* versus *packaged* central air conditioning installation

	Percent of Respondents		Percent of Market Activity ¹	
	3 Ton Units	5 Ton Units	3 Ton Units	5 Ton Units
Do Not Install	2%	5%	2%	3%
Packaged Units	16%	20%	13%	18%
Split Systems	52%	50%	54%	53%
Both Equally	29%	22%	29%	24%
Don't Know	1%	3%	2%	2%
	(n = 227)	(n = 227)	(n = 227)	(n = 227)

¹ Responses are weighted by respondents' total residential central air conditioning unit sales volume.

- Compared to standard efficiency units (i.e., 10 SEER), 3 ton central air conditioners with 12, 13, and 14 SEER ratings cost an average of \$530, \$776, and \$1,078 more to install¹⁸, respectively.** Table 19 also shows the increased cost (by efficiency level) for 3 ton split systems and packaged systems. As shown in Table 19, increasing efficiency level in split systems is more expensive than in packaged systems. *Costs are weighted by total central air conditioning sales, excluding top and bottom 10% of responses.*

¹⁸ This increased installation cost includes both equipment and labor cost.

Table 19: Incremental cost of high efficiency central air conditioning¹

	3 Ton Unit		
	Move from 10 to 12 SEER	Move from 10 to 13 SEER	Move from 10 to 14 SEER
Packaged²			
Mean	\$496	\$577	\$865
Median	\$500	\$643	\$900
	(n = 22)	(n = 12)	(n = 9)
Split³			
Mean	\$539	\$852	\$1131
Median	\$500	\$831	\$1200
	(n = 74)	(n = 53)	(n = 33)
Overall⁴			
Mean	\$530	\$776	\$1078
Median	\$500	\$800	\$1000
	(n = 142) ⁵	(n = 97) ⁶	(n = 72) ⁷

¹ Weighted by total air conditioning sales, excluding top and bottom 10 % of response distribution.

² Includes data from contractors who 'usually' install packaged units.

³ Includes data from contractors who 'usually' install split systems.

⁴ Includes data from contractors who 'usually' install packaged units, 'usually' install split systems, or install both equally.

⁵ A total of 220 contractors were asked this question. Forty-six responses were eliminated because contractor did not know difference in cost or refused to answer. Thirty-two responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁶ A total of 220 contractors were asked this question. Ninety-six responses were eliminated because contractor did not know difference in cost or refused to answer. Twenty-seven responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁷ A total of 220 contractors were asked this question. One hundred twenty-five responses were eliminated because contractor did not know difference in cost or refused to answer. Twenty-three responses were eliminated because they fell in the upper or lower 10% of the distribution.

- **Compared to standard efficiency units (i.e., 10 SEER), 5 ton central air conditioners with 12, 13, and 14 SEER ratings cost customers an average of \$634, \$859, and \$1187 more to install, respectively.** Table 20 also shows the increased cost (by efficiency level) for 5 ton split systems and packages systems. As shown in Table 20, increasing efficiency level in split systems is more expensive than in packaged systems. *Costs are weighted by total central air conditioning sales, excluding top and bottom 10% of responses.*

Table 20: Incremental cost of higher efficiency central air conditioning¹

	5 Ton Unit		
	10 to 12 SEER	10 to 13 SEER	10 to 14 SEER
Packaged²			
Mean	\$644	\$727	\$1216
Median	\$600	\$627	\$1454
	(n = 27)	(n = 15)	(n = 9)
Split³			
Mean	\$654	\$875	\$1199
Median	\$600	\$850	\$1200
	(n = 69)	(n = 52)	(n = 35)
Overall⁴			
Mean	\$634	\$859	\$1187
Median	\$600	\$864	\$1200
	(n = 127) ⁵	(n = 88) ⁶	(n = 61) ⁷

¹ Weighted by total air conditioning sales, excluding top and bottom 10% of responses.

² Includes data from contractors who 'usually' install packaged units.

³ Includes data from contractors who 'usually' install split systems.

⁴ Includes data from contractors who 'usually' install packaged units, 'usually' install split systems, or install both equally.

⁵ A total of 220 contractors were asked this question. Fifty-four responses were eliminated because contractor did not know difference in cost or refused to answer. Thirty-nine responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁶ A total of 220 contractors were asked this question. One hundred responses were eliminated because contractor did not know difference in cost or refused to answer. Thirty-two responses were eliminated because they fell in the upper or lower 10% of the distribution.

⁷ A total of 220 contractors were asked this question. One hundred thirty responses were eliminated because contractor did not know difference in cost or refused to answer. Twenty-nine responses were eliminated because they fell in the upper or lower 10% of the distribution.

- **The highest percentage of contractors (45%) said they make the same amount of profit on their markup of the equipment they install as they do on the markup of labor.** As illustrated in Table 21, responses to this question are highly varied, with 27% of contractors saying they make more profit on the markup of equipment sales and 28% saying they make more profit on the markup of labor.

Table 21: Make most profit on markup of equipment or labor?

	Percent of respondents
Equipment	27%
Labor	28%
Both equal	45%
	(n = 219)

Service and Maintenance

This sub-section addresses issues related to service or maintenance agreements that may be offered by HVAC contractors. We asked 184 contractors (who offer service and maintenance services) a series of questions about their service and maintenance services and practices. The line of inquiry ranges from questions regarding whether or not the contractor offers service and maintenance agreements for new or existing homes to the type of services provided as part of such agreements. We also asked contractors how much they charge for two specific service offerings: checking airflow and refrigerant charge. Where appropriate, responses in this sub-section are weighted by each respondent's level of service and repair activity.¹⁹ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **Most respondents (who provide service and maintenance services) offer service agreements.** Seventy-six percent (76%) of respondents who provide service and maintenance services, offer service agreements to residential customers.
- **Service and maintenance contracts are sold more frequently for installations in existing homes than for installations in new construction.** As illustrated in Table 22, service agreements are sold 'always' or 'most of the time' in 40% of existing home installations and 25% of new construction installations. *Responses are weighted by each respondent's level of service and repair activity.*

¹⁹ We calculated weights by multiplying the total number of employees in the firm by the percent of overall business activity dedicated to service and repair.

Table 22: How often service agreements are sold by contractors who offer maintenance and repair services¹

	Percent of installations	
	Existing homes	New construction
Always	5%	10%
Most of the time	35%	15%
Occasionally	41%	13%
Not very often	14%	18%
Never	5%	44%
	(n = 138)	(n = 137)

¹ Responses are weighted by each respondent’s level of service and repair activity.

- Most service agreements include “checking for sufficient airflow across the indoor coil” and “checking for proper refrigerant charge” when there is an air conditioner or heat pump.** Respondents indicate that “checking airflow” is included in service agreements 92% of the time, and “checking refrigerant charge” is included 95% of the time. *When weighted by each respondent’s level of service and repair activity, “checking airflow” is included in service agreements 82% of the time, and “checking refrigerant charge” is included 83% of the time.*
- The fee for “checking for sufficient airflow across the indoor coil” and for “checking proper refrigerant” is very similar.** As illustrated in Table 23, the fee (as described by the mean, median and mode) for either checking for sufficient airflow across the indoor coil or proper refrigerant is approximately \$60. *(Fees are weighted by each respondent’s level of service and repair activity.)*

Table 23: Fee for checking airflow and refrigerant charge¹

Service	Fee			Number of respondents
	Mean	Median	Mode	
Check airflow across indoor coil	\$62	\$60	\$60	(n = 152)
Check proper refrigerant	\$60	\$60	\$60	(n = 157)

¹ Weighted by each respondents’ level of service and repair activity.

- **“Check the manufacturer’s information and measure pressures and temperatures” is the most frequently mentioned way to determine the correct refrigerant charge in air conditioners and heat pumps.** Sixty-one (61%) of the respondents indicate that “checking the manufacturer’s information and measuring pressures and temperatures” is the way to determine correct refrigerant charge. Other methods mentioned by 5% or more of the respondents include “superheat” (41%) and “sight window/gage” (28%). *When weighted by each respondent’s level of service and repair activity, percentages are very similar.*

Role of Financing

This sub-section addresses issues related to the role of financing in the purchase of HVAC equipment. We asked HVAC contractors whether or not they offer financing programs to residential customers and how important such offerings are from a competitive standpoint. Respondents who offer such programs were asked to provide information about the percentage of customers who use the financing programs and through what sources such programs are offered. Where appropriate, responses in this sub-section are weighted by each respondent’s total residential HVAC equipment unit sales volume.²⁰ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

- **About half (49%) of the respondents offer their residential customers financing for the purchase of HVAC equipment.** *When weighted by respondents’ total residential HVAC equipment unit sales volume, 67% offer financing for HVAC equipment purchase.*
- **Very few residential customers use contractor-provided financing services.** According to respondents, an average of 9% of customers use contractor-provided financing services. *When weighted by respondents’ total residential HVAC equipment unit sales volume, on average 11% of customers use the contractor provided financing services.*

²⁰ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

- The “equipment manufacturer” is the most frequently offered source of financing for HVAC purchases.** As illustrated in Table 24, 42% of respondents (who offer financing) offer the “equipment manufacturer” as a customer-financing source. The second most frequently offered source of financing is a “local financing company” (32%). A complete list of financing sources mentioned by 5% or more of the respondents who offer financing is included in Table 24. *When weighted by respondents’ total residential HVAC equipment unit sales volume, percentages are very similar.*

Table 24: Sources of contractor provided customer financing for HVAC purchases¹

Sources	Percent of respondents	Percent of market activity ²
Equipment manufacturers	42%	43%
Local financing company	32%	38%
Equipment distributors	19%	24%
Nation-wide financing company	18%	22%
Contractor’s company	12%	13%
Local bank	9%	10%
Nation-wide bank	7%	7%
	(n = 106)	(n = 106)

¹ Only responses mentioned by 5% or more of the respondents are listed.

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

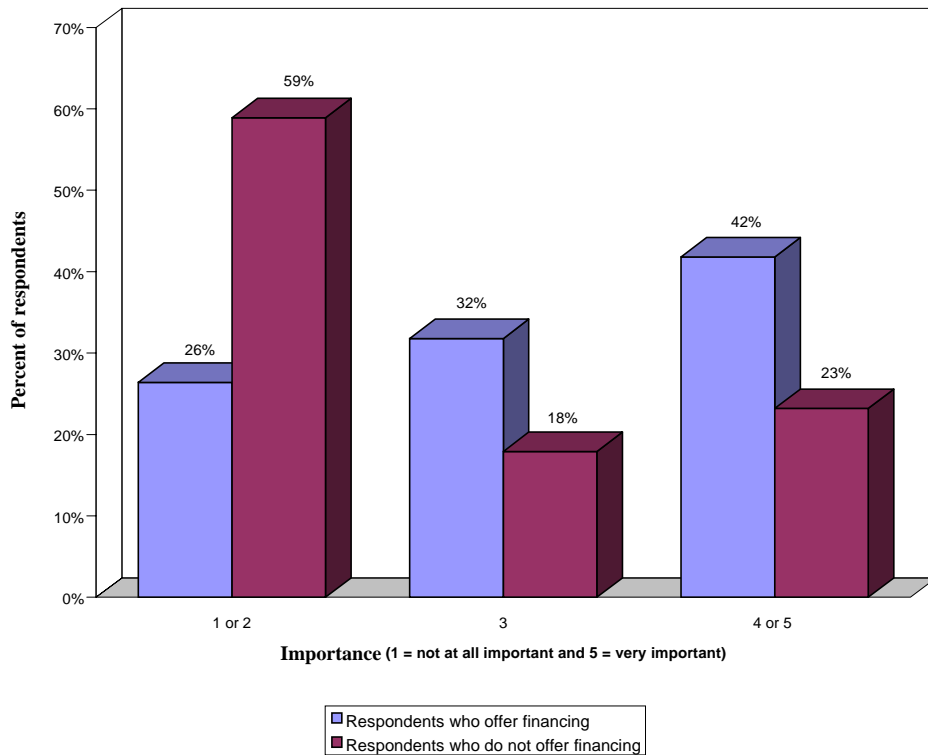
- “Trane,” “American Standard,” and “First Financial” are names of financing sources frequently mentioned by respondents.** As illustrated in Table 25, “Trane,” “American Standard,” and “First Financial” are each mentioned by 15% of the respondents. Other names mentioned by 5% or more of the respondents are shown in Table 25.

Table 25: Names mentioned most frequently as a financing source

Names	Percent of respondents
Trane	15%
American Standard	15%
First Financial	15%
Bryant	13%
Carrier	12%
Money Store	6%
Beneficial financing	5%
Norwest financial	5%
Greentree Financial	5%
	(n = 83)

- Respondents who offer customer-financing indicate that offering financing is very important from a competitive standpoint, while those who do not offer financing indicate that it is not very important.** Respondents were asked to rate the importance of financing (from a competitive standpoint) on a scale of 1 to 5 with 1 being 'not every important' and 5 being 'very important.' As illustrated in Figure 10, 42% of the respondents who offer financing indicate an importance level of 4 or 5, while only 23% of those who do not offering financing indicate an importance level of 4 or 5.

Figure 10: Importance of offering financing from a competitive standpoint



Interest in PG&E HVAC Program Offerings

This final sub-section assesses the interest and participation in PG&E HVAC programs. We asked respondents if they have participated in past PG&E air conditioning programs. We also asked about their interest in participating in a number of potential programs under consideration by PG&E. Where appropriate, responses in this sub-section are weighted by each respondent’s total residential HVAC equipment unit sales volume.²¹ (*Weighted responses are indicated when used in the findings.*) Key findings are outlined below.

²¹ This includes furnace, central air conditioner, heat pump, and evaporative cooler installations in both new and existing homes

- There is significant interest in participating in efficiency improvement programs.** Respondents were asked to rate their interest in efficiency improvement programs using a scale of 1 to 5, with 1 being ‘not at all interested’ and 5 being ‘very interested.’ Table 26 shows the percent of respondents with an interest level of 4 or 5. *As illustrated in Table 26, when the interest level is weighted by respondents’ total residential HVAC equipment unit sales volume, the estimated interest level is even higher.*
- There is more interest in a program on “central air conditioning efficiency improvement” than any of the other programs.** As illustrated in Table 26, 70% of the respondents indicate an interest in “central air conditioning efficiency improvement.” *When the interest level is weighted by respondents’ total residential HVAC equipment unit sales volume, estimated interest is at 79%.*

Table 26: Interest in energy efficiency programs¹

Efficiency Program	Percent of respondents	Percent of market activity²
Central air conditioning efficiency improvement	70%	79%
Furnace efficiency improvement	65%	70%
Air conditioner sizing and installation improvement	64%	75%
Furnace sizing and installation improvement	62%	68%
Air conditioner maintenance and service improvement	56%	63%
Duct design and installation improvement	56%	65%
	(n = 225)	(n = 225)

¹ Based upon a responses of ‘4’ or ‘5’ on a scale of ‘1’ (not at all interested) to ‘5’ (very interested).

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

- Over one-third (39%) of the respondents indicate they have participated in a PG&E air conditioning program within the past five years.** *When weighted by respondents’ total residential HVAC equipment unit sales volume, estimated participation in air conditioning programs is 57%.*

- **There was more participation in the “Home Energy Savings Loan Program” than any of the other PG&E programs mentioned.** As illustrated in Table 27, 46% of the 70 respondents who participated in an air conditioning program indicate they participated in the “Home Energy Savings Loan Program.” *The percentage is very similar when weighted by respondents’ total residential HVAC equipment unit sales volume.*

Table 27: PG&E air conditioning program with most participation¹

Program	Percent of respondents	Percent of market activity²
Home Energy Savings Loans	46%	50%
Express Efficiency(commercial AC program)	29%	33%
Energy Partners (low-income program that included AC)	17%	29%
Appliance Rebate	11%	16%
EGIA	9%	11%
Duct design	6%	2%
	(n = 70)	(n = 70)

¹ Only responses mentioned by 5% or more of the respondents (who participated in any of the air conditioning programs) are listed.

² Responses are weighted by each respondent’s total residential HVAC equipment unit sales volume.

- **Respondents suggest that PG&E should “offer customer rebates” when designing programs to improve residential energy efficiency.** When asked if there is anything else that PG&E should consider when designing programs to improve residential energy efficiency, 21% of the respondents indicate they should “offer customer rebates.” Other suggestions mentioned by 5% or more of the respondents include “educate the customers and advertise” (11%), “simplify paper work” (6%), “provide financing” (6%), and “make them available to all contractors” (5%).

Section VI: Summary and Conclusions

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.²² In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilating, and air conditioning (HVAC) market. The primary objective of this report is to help PG&E understand the equipment purchase and installation process from the perspective of residential HVAC contractors. A better understanding of the barriers to the installation of energy efficient HVAC equipment and related services among HVAC contractors will lead to future program designs that will affect a lasting market transformation. All respondents in this study provide HVAC equipment or services to the residential sector.

To address the research issues, Opinion Dynamics Corporation (ODC) surveyed 227 residential HVAC contractors located within PG&E's service territory. Specific objectives of the survey range from establishing the efficiency level of both forced air furnace and central air conditioning sales by climate zone to baselining contractor service and installation practices to exploring the role financing plays in the equipment selection process to gauging contractor interest in a number of residential HVAC program concepts. Key research findings are summarized below.

Summary

Contractor Firmographics

- **All (but 2) of the 227 contractors interviewed were independent businesses.**

²² For a general discussion of market transformation issues, see "A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

- **The “average” contracting firm has a total of four to seven employees, which typically includes two technicians, two to four installers, and one or two salespersons.**
- **For those contractors identified as doing residential work, 72% of their total business activity is residential.** This residential work breaks down as follows:
 - 24% new construction.
 - 54% in existing homes—including replacement of existing central units (39%) and installations in homes that did not have central units before (“cut-ins” 15%).
 - 22% service and repair.
- **The average firm sells and installs a modest number of units each year.** These include:
 - In existing homes—61 furnaces, 50 central air conditioners, 6 heat pumps, and 5 evaporative coolers.
 - In new construction—40 furnaces, 34 central air conditioners, 3 heat pumps, and 6 evaporative coolers.
- **Collectively, survey respondents sold and installed 21,303 forced air furnaces and 17,934 central air conditioners in 1998.** Heat pumps (2,000 units) and evaporative coolers (2,439 units) account for a relatively small percentage of the average survey respondent’s business activities.

Sales by Efficiency Level

- **Approximately 21% of 1998 forced air furnace sales across PG&E’s service territory have efficiency or A.F.U.E. ratings of 90% or higher.** This percentage is very similar across the new construction and existing home market and by climate zone. The only exception is the Desert/Mountain climate zone, where the market share of high efficiency furnaces is 46% in the new construction market and 32% in the existing home market.
- **Just over 40% of central air conditioning units sold in 1998 sales across PG&E’s service territory are high efficiency (i.e., SEER rating of 12 or higher).** This percentage is very similar across the overall new construction and existing home markets although it shows some variability by climate zone. The Coastal climate zone has the lowest share of high efficiency central air conditioning equipment, approximately 20% in both the new construction and existing home markets, while the Valley has the highest share of approximately 48%.

- **Opinions of what efficiency levels constitute “high efficiency” vary across climate zones.** Contractors in Coastal and Hill climate zones are more likely to “consider” standard efficiency forced air furnaces (80-89% A.F.U.E.) to be energy efficient. Additionally, contractors in the Coastal and Valley climate zones are more likely to “consider” standard efficiency central air conditioners (i.e., 10 SEER) to be energy efficient.

Replacement Equipment Timing

- **When equipment “breaks down,” HVAC contractors have a small window of opportunity to win the work and get the equipment installed.** Eighty-one percent of surveyed contractors said that residential customers need replacements for equipment that breaks down in four days or less.
- **Contractors have considerably more time to sell and install in “planned” equipment replacement situations.** Only 18% of surveyed contractors said that residential customers need “planned” replacements in four days or less.

The Role of HVAC in the Remodeling Market

- **Over one-half (53%) of survey respondents said that remodeling jobs improve the energy efficiency of a home ‘most of the time’ or ‘all of the time.’**
- **Just over 60% of respondents said that ‘most of the time’ or ‘all of the time’ they are given information on what energy efficiency improvements remodeling contractors are making in time to use the information in *sizing* the furnace or air conditioner.**

Role of Energy Efficiency

- **“Low operating costs/lower utility bills” are the most frequently mentioned benefits emphasized by contractors when talking to customers about high efficiency HVAC equipment.** The percentage of contractors who mention “low operating costs/lower utility bills” (83%) when talking to customers about the benefits of high efficiency is nearly 4 times higher than the next most frequently mentioned benefits: “better warranty” (23%) and “reliability” (23%).
- **Approximately two of every three surveyed contractors said they provide customers with cost comparisons between high and standard efficiency furnaces and air conditioners ‘most of the time’ or ‘always.’**

- **Contractors indicate that “equipment reliability” and “contractor reputation” are the most important factors for customers making an HVAC purchase.** Contractors rank “energy efficiency” as sixth most important factor out of seven factors.

Sizing HVAC Equipment

- **The most popular method of sizing HVAC equipment is through “a calculation based on the square footage of a home.”** This sizing method is used ‘most of the time’ or ‘always’ by 60% of survey respondents. “Experience” (21%), “ACCA Manual J calculations” (17%), and “based upon size of the old equipment” (17%) are the next most frequently used sizing methods.
- **When weighted by respondents’ new construction HVAC sales, only 10% of contractors working within the new construction market said that Title-24 HVAC calculations are ‘always’ correct.** Another 49% said the calculations are correct ‘most of the time.’ In total, 39% of respondents said that Title-24 calculations are correct ‘occasionally,’ ‘not very often,’ or ‘never.’
- **When weighted by respondents’ new construction HVAC sales, nearly two-thirds of contractors said that when Title-24 calculations seem incorrect it is usually because they think the Title-24 recommended HVAC equipment is undersized.**

Ductwork Sizing and Related Services

- **Half (50%) of survey respondents said they size and lay out ductwork in homes “based upon room or area sizes” most of the time or always.** The next most frequently mentioned techniques for sizing and laying out ductwork are “experience” (44%), “ACCA Manual D calculations” (19%), and “information about comfort and customer” (12%).
- **Most survey respondents (91%) provide duct repair or sealing service, but very few (15%) provide duct-cleaning service.** Respondents indicate the reasons for replacing ductwork are because the ductwork is deteriorating (54%), undersized (27%), or uninsulated (19%).

Incremental Cost of Energy Efficient Equipment

- **Compared to standard efficiency forced air furnaces (i.e., 80% A.F.U.E.), forced air furnaces with 90-94% A.F.U.E. ratings cost customers an average of \$601 more to install (including equipment and labor).** Compared to standard efficiency units, forced air furnaces with 95+% A.F.U.E. ratings cost customers an average of \$810 more to install. *Costs are weighted by total furnace sales.*

- **Compared to standard efficiency 3-ton central air conditioners (i.e., 10 SEER), central air conditioners with 12, 13, and 14 SEER ratings cost customers an average of \$530, \$776, and \$1,078 more to install (including equipment and labor), respectively. *Costs are weighted by total central air conditioner sales.***
- **Compared to standard efficiency 5-ton central air conditioners (i.e., 10 SEER), central air conditioners with 12, 13, and 14 SEER ratings cost customers an average of \$634, \$859, and \$1,187 more to install (including equipment and labor), respectively. *Costs are weighted by total central air conditioner sales.***
- **The highest percentage of surveyed contractors (45%) said they make the same amount of profit on the markup of the equipment they install as they do on the markup of labor.** Other contractors were approximately equally split between those who said they make more profit on the markup of equipment (27%) and those who said they make more profit on the markup of labor (28%).

Service and Maintenance

- **Seventy-six percent (76%) of respondents who provide service and maintenance services offer service agreements to residential customers.**
- **Most service agreements include “checking for sufficient airflow across the indoor coil” (92% of the time) and “checking for proper refrigerant charge” (95% of the time).**
- **The fee for “checking for sufficient airflow across the indoor coil” and for “checking proper refrigerant” are very similar—approximately \$60. *Fees are weighted by each respondent’s level of service and repair activity.***

Role of Financing

- **About half (49%) of survey respondents offer their residential customers financing for the purchase of HVAC equipment. *However, when weighted by respondents’ total residential HVAC equipment unit sales volume, this percentage increases to 67%.***
- **According to surveyed contractors, very few residential customers use contractor provided financing services.** On average, contractors said that approximately 9% of their residential customer actually take advantage of the financing programs they offer. *When weighted by respondents’ total residential HVAC equipment unit sales, this percentage increases to 11%.*

Interest in PG&E HVAC Offerings

- **There is significant interest in participating in possible PG&E efficiency improvement programs.** Contractors expressed the most interest in “central air conditioning” and “furnace” efficiency improvement programs.
- **Over one-third (39%) of respondents indicate they have participated in a PG&E air conditioning program within the past five years.** The Home Energy Savings Loan program was the most frequently mentioned program in which survey respondents have participated.

Conclusions

In these conclusions we describe the key features of the “average” contractor, contractors’ views of typical purchase events, incremental costs, the role of financing and, finally, results—the contractors’ sales of energy efficient residential HVAC equipment. We believe translating the findings of this survey into “images” of small businesspeople provides a clearer understanding of the nature of their situation, their beliefs, and the services they offer.

Contractors

The “average” contractor serving the residential sector operates a small business with few employees, and makes most of his or her sales to owners of existing homes. The average year for an average contractor involves installing about 205 central heating or cooling units. The following profile is an important reminder of who contractors are and what their business is like.

- **The vast majority of contractors who participated in the survey operate small independent businesses and focus on the residential sector.** All but two of the 227 contractors interviewed are independent businesses. The mean number of employees per firm is seven and the median is only four.
- **The residential sector accounts for 72% of the average respondent’s overall business activity.** About 39% of the average survey respondents’ residential HVAC business involves the replacement of existing equipment. Installations in homes that did not have central units before (often referred to as “cut-ins”) accounts for 15% of their residential work. New construction and service/repair account for 24% and 22% of the average contractors’ residential business activity, respectively.

- **The average firm sells and installs a modest number of units each year.** These include 61 furnaces, 50 central air conditioners, 6 heat pumps, and 5 evaporative coolers in existing homes, and 40 furnaces, 34 central air conditioners, 3 heat pumps, and 6 evaporative coolers in new construction.

From this description of the average residential HVAC contractor we can conclude that each sale of a new or replacement unit is important; and each contractor depends on this modest volume of work to support himself or herself and a few employees. This suggests that each and every sales opportunity is critical to these small firms.

The Sales Situation

Contractors provided information which, when taken together, allows us to describe their views of some key parameters of the typical sales situation.

- **Breakdown replacements are 60% and planned replacements only 40% of all equipment replacement purchases.**
- **In a breakdown replacement, the contractor's experience prepares him or her to expect 31% of all customers to want the job done that day, 67% of all customers to want it done within 2 days, and 86% to want it done within 4 days.**
- **For planned replacements, the contractor will face much less stringent time pressures: 2% of all customers will want the job done the same day, 6% of all customers will want the job done within 2 days, and only 14% will want the job done within 4 days.**

Thus, it appears that most residential contractors may feel considerable pressure to bid and—if they win the job—complete the work within a very short time period for the 60% of jobs that involve replacing broken down equipment.

HVAC in the Remodeling Market

Further consideration of some responses to three questions concerning remodeling work leads to some other interesting conclusions. We ask contractors how often they are working on a job at the same time as a remodeling contractor; how often the remodeling project involves improvements to the energy efficiency of the home; and finally, how often they receive information on these improvements in time to use that information in sizing the furnace or air conditioner.

By applying some reasonable numerical values for each response category and multiplying by the percentage reporting each response category, we can estimate the overall percentage of time each of the following steps occurs:²³

- **The HVAC contractor works on a job at the same time as a remodeling project is being done 29% of the time.**
- **The remodeling improves the energy efficiency 47% of the time.**
- **The HVAC contractor receives information about the improvements to energy efficiency in time to use that information in sizing the furnace or air conditioner 57% of the time.**
- ***The percentage of jobs where all three occur is 8% of the time (the product of the three percentages).***

While this calculation now involves some speculation, it agrees with some other information from contractors that suggests *it is rare to coordinate the installation of HVAC equipment with remodeling.*

²³ Reasonable assumptions may be: All of the time—90% of the time; Most—60%; Occasionally—30%; Not very often—15%, Never—0%.

Role of Energy Efficiency

Most contractors (83%) report they discuss “low operating costs / lower utility bills” with customers, and many contractors (61% for furnaces and 67% for air conditioners) report they “always” or “most of the time” present cost comparisons of standard-efficiency and high-efficiency units. However, contractors rank “energy efficiency” as sixth of seven factors customers consider in making an HVAC purchase, while they believe “equipment reliability” and “contractor reputation” are the first and second most important factors. Thus, although contractors provide some energy efficiency information, their overall view is that energy efficiency is not very important to customers.

Costs and Financing of Energy Efficient Equipment

Contractors report there are significant incremental costs for energy-efficient equipment but few customers utilize the financing they offer.

- **Moving up from an A.F.U.E. 80% to 90% furnace costs customers an average of \$601. A similar step up for an air conditioner (from a SEER 10 to 12) costs an average of \$530.**
- **Very few customers use the financing services contractors provide: their financing only covers about 11% of sales-weighted purchases.**

There appears to be an opportunity to provide contractors with a better financial tool to meet more customers needs.

Sales by Efficiency Level for Existing Homes

It is notable how many energy-efficient HVAC units are sold and installed in existing homes given some of the apparent limitations we have identified. These “limitations” include: the emphasis on price by most residential HVAC contracting firms, the urgency of many equipment replacement sales situations, the small percentage of customers using contractor-provided financing, the contractors’ belief that energy efficiency is of relatively low importance to most customers, and the mild climate conditions where the majority of PG&E customers live.

- **Contractors report that, overall 17% of all furnaces installed in existing homes exceed the minimum efficiencies required by Federal standards.**
- **They also report that 50% of all central air conditioners installed in existing homes are units that exceed the minimum required efficiencies.**
- **The market penetration of units that exceed minimum required efficiencies varies considerably by climate zone.** Based upon 1988 installations, the largest portion of furnaces exceeding minimums are being installed in the Desert / Mountain climate zone—32% for existing homes. Furnace installations exceeding minimums in the other climate zones range from 13 to 17 % for existing homes. The largest portion of air conditioner installations in existing homes exceeding minimums are in the Valley climate zones (56%), while the Coastal climate zone has the lowest share (33%) of high efficiency air conditioning equipment installations.

Sales by Efficiency Level for New Construction

Price is the major—some contractors say the only—factor when builders select HVAC equipment for new homes. However, again we see notable market penetration by units that exceed the minimum efficiency levels required by Federal standards.

- **Contractors report that, overall 21% of all furnaces installed in new construction exceed the minimum required efficiencies.**
- **They also report that 44% of all central air conditioners installed in new construction are units that exceed the minimum required efficiencies.**

- **The market penetration of furnace units that exceed minimum required efficiencies varies considerably by climate zone, but the market penetration of air conditioner units that exceed minimum required efficiencies is less variable.** The largest portion of furnaces exceeding minimums are being installed in the Desert / Mountain climate zone—46% for new construction. Installations in the other climate zones range from 14 to 21% for new construction. All of climate zones except the Coastal climate zone have market penetration of 45% for air conditioners exceeding minimums. The Coastal climate zone has market penetration of 31%.

Contractor Practices

We also have presented information on contractor practices—including equipment sizing, ductwork sizing and layout, duct repair and sealing, offering service and maintenance agreements, and conducting service checks of airflow and refrigerant charge.

- **Only 17% of contractors (21% of market activity) use ACCA Manual J for equipment sizing.**
- **Only 19% of contractors (24% of market activity) use ACCA Manual D for duct sizing.**

It appears that there is considerable opportunity to improve contractor practices that directly impact the energy efficiency of the total HVAC system.

ODCID

SAMP

odc sample 1
dump sample 0

CZ

climate zone
Desert/Mountain R
Valley S
Coastal T
Hill X

BNAME

business name

ADDR

CITY

STATE

California CA

ZIP

PHONE

START

Q1A Do you do any RESIDENTIAL heating and cooling installation or service work? (

Business name: <BNAME >)

Yes 1 => TXT2A

No 2

(Don't know / Not sure)..... 3

Q1B

(READ LIST, ENTER ALL THAT APPLY)

Q1B. I'm calling for PG&E to update our information on contractors who might participate in our new energy efficiency programs. I have two quick questions: First, what types of contracting work do you do?

- (none)01
- light commercial HVAC02
- large commercial / industrial HVAC03
- commercial / industrial refrigeration.....04
- plumbing05
- electrical.....06
- (other).....07 O
- (Don't know / Not sure).....98 X

Q1C

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q1C About how many total employees are there in your firm?

- \$E 1 500
- (Don't know)998 I
- (Refused).....999 I

INT21

Thank you for your time today. That's all the questions I have today.

- (No residential work)21 => END

My name is _____. I'm calling from Opinion Dynamics for Pacific Gas and Electric Company. PG and E is planning new residential energy efficiency programs. As part of that planning, we are speaking with a small number of HVAC contractors in northern and central California to collect information to help PG and E design better programs.

May I speak with the owner or manager?
 (GET THE OWNER/MANAGER NAME AND RECORD UNDER F7)
 (REPEAT INTRO WITH OWNER MANAGER OR ARRANGE CALLBACK)

The information we collect from you and other select contractors will help PG and E design better programs. This is a critical stage in PG and E's planning, and to thank you for taking time to answer our questions, we'll send you a \$50 check.

(PROBE: This should take about 20 minutes.)
 @txt2a

TXT2A

- see screens
- (continue)1 D

Q2

Q2 Should we make the check payable to you or your company?

- Individual1
- Company2
- (Refused check)3 => Q5

And, I need to verify your name and address so we can mail you the \$50 check.
(ENTER AND CONFIRM ALL INFO - CONFIRM SPELLINGS!!!)

What is your name? @q3n

What is your title? @q3t

What is your company name? @q3co

What is your address? @q3ad

What city is that? @q3cit

(CONFIRM IT'S IN CALIFORNIA) @q3st

and, what's your zip code? @q3z

Q3N

Q3 And, I need to verify your name and address so we can mail you the \$50 check.

Q3T

title

Q3CO

Q3AD

Q3CIT

Q3ST

California CA D

Q3Z

zip

Q5

(READ LIST AND RECORD ALL THAT APPLY)

Q5 Which of the following services does your company provide for the residential HVAC market?

- (none)00 X => Q5B
- Selling heating and cooling equipment01 => Q6A
- Installing heating and cooling equipment02 => Q6A
- Servicing or repairing heating and cooling equipment.....03 => Q6A
- (Don't know/Not sure).....98 X

INT22

Is there someone else who would know this? (IF YES: Get name and arrange callback, record under F7, start over with Q5) (IF NO: Thank you for your time. Those are all the questions I have today.)

(Don't know type of res HVAC work)22 => END

Q5B

Q5B What types of contracting work do you do?

(none)01 X => INT23
 light commercial HVAC02
 large commercial / industrial HVAC03
 commercial / industrial refrigeration (no HVAC)04
 plumbing (no HVAC)05
 electrical (no HVAC)06
 general contracting (no HVAC)07
 (other).....08 O
 (Don't know / Not sure).....98 X => INT23

Q5C

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q5C About how many total employees are there in your firm?

\$E 1 500
 (Don't know)998 I
 (Refused).....999 I

INT23

Thank you for your time today. You are not in the group of contractors in need to survey. We are looking for residential HVAC contractors. We will not be sending you a \$50 check.

(Not HVAC contractor)23 => END

If you divided your business into three categories: residential, light commercial, and large commercial and industrial, about what percentage of your work is...

(998=Don't know 999 = Refused)

residential? @q6a %

light commercial? @q6b %

large commercial or industrial? @q6c %

(INTERVIEWER: THIS SHOULD TOTAL 100%!!!)

(NOTE: Light commercial refers to small commercial buildings that utilize heating and cooling equipment that is similar to residential equipment)

Q6A

residential

\$E 0 100

(Don't know)998 I
 (Refused).....999 I

Q6B

light commercial

\$E 0 100

(Don't know) 998 I

(Refused)..... 999 I

Q6C

large commercial or industrial

\$E 0 100

(Don't know) 998 I

(Refused)..... 999 I

Q6CHK

=> * if IF((Q6A+Q6B+Q6C==100)1,2)

check to see if q6a+q6b+q6c = 100%

adds up, continue 1 => Q7A

doesn't add up, go back 2

Q698

=> * if IF((Q6A=998,999 OR Q6B=998,999 OR Q6C = 998,999)1,2)

skip if q6a=998,999

skip..... 1 => Q7A

coninue..... 2

Q6BAK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue)..... 1 D => Q6A

Q7A

Q7A Are you an independent business or a subsidiary of a larger company?

Independent..... 1 => Q8A

Subsidiary 2

(Don't know/Not sure)..... 3 => Q8A

Q7B

Q7B What company are you a subsidiary of?

(hit enter to open response box) 00 DO

(Don't know/Refused) 98 X

Q8A

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q8A How many total employees does your company have?

\$E 1 500

(Don't know) 998 I

(Refused)..... 999 I

Q8B

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q8B How many of those are HVAC installers?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Q8C

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q8C How many are HVAC technicians?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Q8D

(ENTER NUMBER OF EMPLOYEES - 998=DON'T KNOW 999=REFUSED)

Q8D How many are HVAC sales people?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

TXT9

During the rest of the interview, I would like to focus only on your residential HVAC business. (Note: Residential business includes single family homes, duplexes, and townhouses.)

(continue).....1 D

Q9

(RECORD ALL THAT APPLY, PROBE FOR OTHERS)

Q9 What brands or makes of HVAC equipment do you sell and install?

(Air)	01
(Amana)	02
(American Standard)	03
(Arco Air)	04
(Armstrong).....	05
(Bard).....	06
(Bryant).....	07
(Burnham).....	08
(Carrier)	09
(Coleman)	10
(Day & Night).....	11
(Fedders).....	12
(Frigidaire).....	13
(Fujitsu General America)	14
(General Electric (GE)).....	15
(Heil).....	16
(Honeywell)	17
(Janitrol).....	18
(Kenmore).....	19
(Lennox).....	20
(Luxaire)	21
(Mitsubishi).....	22
(Payne)	23
(Rheem)	24
(Ruud).....	25
(Sanyo Fisher).....	26
(Tappan).....	27
(Tempstar).....	28
(Thermal Zone - Pameco's brand)	29
(Trane)	30
(Whirlpool)	31
(York).....	32
(Other).....	33 O
(Don't know/Not sure).....	98 X

Q10

(RECORD ALL THAT APPLY, PROBE FOR OTHERS)

Q10 From which HVAC equipment distributors do you buy equipment regularly?

(Air Cold).....	01
(Air Treatment Corporation).....	02
(Allied Refrigeration).....	03
(Amana).....	04
(Bryant Heating and Air Conditioning).....	05
(CFM Equipment Distributor).....	06
(Commercial Industrial Sales Company "CISCO").....	07
(Duckworth Environmental).....	08
(E. B. Ward & Company).....	09
(Familian Pipe and Supply).....	10
(Geary Pacific).....	11
(Heating and Cooling Supply Inc.).....	12
(Heieck Supply).....	13
(Johnstone).....	14
(Lennox Industries).....	15
(Pameco Corporation).....	16
(Sam Alexander Distributing).....	17
(Slakey Brothers).....	18
(Southern California Air Conditioning Distributors).....	19
(Specialty AC Products (Pacific Coast)).....	20
(The Trane Company).....	21
(Valair).....	22
(Washback).....	23
(Westburne Supply).....	24
(Western Air Systems & Controls, Inc.).....	25
(York Heating and Air Conditioning).....	26
(Other).....	27 O
(Don't know/Not sure).....	98 X

Next, I would like you to tell me how much of your RESIDENTIAL HVAC BUSINESS is in each of four categories: new construction, replacement of existing equipment, installations in existing homes without central heating or cooling, and service and repair.

(998=Don't know 999=Refused)

What percent is new construction? @q11a %

What percent is replacement of existing equipment? @q11b %

What percent is installation in existing homes without central heating or cooling? @q11c %
(PROBE: Often referred to as "CUT INS")

What percent is service and repair? @q11d %

(INTERVIEWER: THIS SHOULD TOTAL 100%!!!)

Q11A

Q11A What percentage of your residential HVAC business is new construction?

\$E 0 100

(Don't know).....	998 I
(Refused).....	999 I

Q11B

Q11B What percentage is replacement of existing equipment?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q11C

Q11C What percentage is installation in existing homes without central heating or cooling?

(Note: These are often referred to as "cut ins.")

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q11D

Q11D What percentage is service and repair?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q11CK

=> * if IF((Q11A+Q11B+Q11C+Q11D==100)1,2)

check to see if q11a+q11b+q11c+q11d = 100%

adds up, continue1 => Q12A

doesn't add up, go back2

Q1198

=> * if IF((Q11A=998,999 OR Q11B=998,999 OR Q11C=998,999 OR Q11D=998,999)1,2)_

skip if q11=998,999

skip1 => Q12A

continue.....2

Q11BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue).....1 D => Q11A

Q12A

=> Q15A if Q11A==0

(ENTER NUMBER OF FURNACES - 998=DON'T KNOW 999=REFUSED)

Q12A. How many furnaces did you install in new homes in 1998?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Q12B

(ENTER NUMBER OF AIR CONDITIONERS - 998=DON'T KNOW 999=REFUSED)

Q12B. How many central air conditioners did you install in new homes in 1998?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Q12C

(ENTER NUMBER OF HEAT PUMPS - 998=DON'T KNOW 999=REFUSED)

Q12C How many heat pumps did you install in new homes in 1998?

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Q12D

(ENTER NUMBER OF EVAPORATIVE COOLERS - 998=DON'T KNOW 999=REFUSED)

Q12D How many evaporative coolers did you install in new homes in 1998? (Note:

Evaporative coolers are sometimes referred to as "swamp coolers.")

\$E 0 500

(Don't know)998 I

(Refused).....999 I

Now of those furnaces you installed in new homes last year...

Approximately what percent had AFUE ratings of 80%? @q13a
 (NOTE: Furnaces rated 79% to 84% are considered 84% efficient.)

Approximately what percent had AFUE ratings of 90%? @q13b

Approximately what percent had AFUE ratings of 95%? @q13c

 (INTERVIEWER: SHOULD TOTAL 100% !!!)

(998 = Don't know, 999 = Refused)

Q13A

=> Q14A if	Q12A==0
------------	---------

Q13A Now, of those furnaces you installed in new homes last year, approximately what percentage had AFUE ratings of 80%? (Note: Furnaces rated from 79% to 84% are considered 80% efficient.)

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q13B

Q13B Approximately what percentage had AFUE ratings of 90%?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q13C

Q13C Approximately what percentage had AFUE ratings of 95%?

\$E 0 100

(Don't know)998 I
 (Refused).....999 I

Q13CK

=> * if IF((Q13A+Q13B+Q13C==100)1,2)

check to see if q13a+q13b+q13c = 100%

adds up, continue1 => Q13D
 doesn't add up, go back2

Q1398

=> + if IF((Q13A=998,999 OR Q13B=998,999 OR Q13C=998,999)1,2)

skip if q13=998,999

skip.....1 => Q13D
 continue.....2

Q13BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue).....1 D => Q13A

Q13D

(DO NOT READ LIST, RECORD ONE RESPONSE)

Q13D What efficiency level do you consider to be "energy efficient"?

(80%)01
 (90%)02
 (95%)03
 (Other).....04 O
 (Don't know/Not sure).....98

Now of those central air conditioners you installed in new homes last year...

approximately what percent had SEER ratings of 10? @q14a

approximately what percent had SEER ratings of 11? @q14b

approximately what percent had SEER ratings of 12? @q14c

approximately what percent has SEER ratings of 13? @q14d

approximately what percent had SEER ratings of 14 or higher? @q14e

(INTERVIEWER: SHOULD TOTAL 100%!!!)

(998=Don't know, 999=Refused)

Q14A

=> Q15A if	Q12B==0
------------	---------

Q14A Now, of those (Q12B Answer) central air conditioners you installed in newhomes last year, approximately what percentage had SEER ratings of 10?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q14B

Q14B Approximately what percentage had SEER ratings of 11?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q14C

Q14C Approximately what percentage had SEER ratings of 12?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q14D

Q14D Approximately what percentage had SEER ratings of 13?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q14E

Q14E Approximately what percentage had SEER ratings of 14 or higher?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q14CK

=> * if IF((Q14A+Q14B+Q14C+Q14D+Q14E==100)1,2)

check to see if q14a+q14b+q14c+Q14D+Q14E = 100%
 adds up, continue 1 => Q14F
 doesn't add up, go back 2

Q1498

=> * if IF((Q14A=998,999 OR Q14B=998,999 OR Q14C=998,999 OR Q14D=998,999 OR Q14E=998,999)1,2)_

skip if q14=998,999
 skip 1 => Q14F
 continue 2

Q14BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.
 (continue) 1 D => Q14A

Q14F

(DO NOT READ LIST, RECORD ONE RESPONSE)

Q14F Which SEER level do you consider to be "energy efficient"?
 (10) 01
 (11) 02
 (12) 03
 (13) 04
 (14) 05
 (Other) 06 O
 (Don't know/Not sure) 98 X

Q15A

=> Q18A if Q11B==0 AND Q11C==0

(ENTER NUMBER OF FURNACES - 998=DON'T KNOW 999=REFUSED)

Q15A Next, I have some questions about your installations in existing homes in 1998, only. How many furnaces did you install in existing homes in 1998? (Note: This includes replacements and additions.)
 \$E 0 500
 (Don't know) 998 I
 (Refused) 999 I

Q15B

(ENTER NUMBER OF AIR CONDITIONERS - 998=DON'T KNOW 999=REFUSED)

Q15B How many central air conditioners did you install in existing homes in 1998?
 \$E 0 500
 (Don't know) 998 I
 (Refused) 999 I

Q15C

(ENTER NUMBER OF HEAT PUMPS - 998=DON'T KNOW 999=REFUSED)

Q15C How many heat pumps did you install in existing homes in 1998?

\$E 0 500

(Don't know)998 I
 (Refused).....999 I

Q15D

(ENTER NUMBER OF EVAPORATIVE COOLERS - 998=DON'T KNOW 999=REFUSED)

Q15D How many evaporative coolers did you install in existing homes in 1998? (Note: Evaporative coolers are sometimes referred to as "swamp coolers.")

\$E 0 500

(Don't know)998 I
 (Refused).....999 I

Now, of the furnaces you installed in existing homes last year...

Approximately what percent had AFUE ratings of 80%? @q16a %
 (NOTE: Furnaces rated 79% to 84% are considered 80% efficient)

Approximately what percent had AFUE ratings of 90%? @q16b %

Approximately what percent had AFUE ratings of 95%? @q16c %

 (INTERVIEWER: SHOULD TOTAL 100%!!!)

(998 = Don't know, 999 = Refused)

Q16A

=> Q17A if Q15A==0

Q16A Now, of those (Q15A Answer) furnaces you installed in existing homes last year, approximately what percentage had AFUE ratings of 80%? (Note: Furnaces rated from 79% to 84% are considered 80% efficient.)

\$E 0 100

(Don't know)998 I
 (Refused).....999 I

Q16B

Q16B Approximately what percentage had AFUE ratings of 90%?

\$E 0 100

(Don't know)998 I
 (Refused).....999 I

Q16C

Q16C Approximately what percentage had AFUE ratings of 95%?

\$E 0 100

(Don't know)998 I
 (Refused).....999 I

Q16CK

=> * if IF((Q16A+Q16B+Q16C==100)1,2)

check to see if q16a+q16b+q16c = 100%
 adds up, continue 1 => Q17A
 doesn't add up, go back 2

Q1698

=> * if IF((Q16A=998,999 OR Q16B=998,999 OR Q16C=998,999)1,2)

skip if q16=998,999
 skip 1 => Q17A
 continue 2

Q16BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue) 1 D => Q16A

Now, of those central air conditioners you installed in existing homes last year...

- approximately what percent had SEER ratings of 10? @q17a %
- approximately what percent had SEER ratings of 11? @q17b %
- approximately what percent had SEER ratings of 12? @q17c %
- approximately what percent had SEER ratings of 13? @q17d %
- approximately what percent had SEER ratings of 14 or higher? @q17e %

 (INTERVIEWER:SHOULD TOTAL 100%!!!)

(998 = Don't know 999 = refused)

Q17A

=> Q18A if Q15B==0

Q17A Now, of those (Q15B Answer) central air conditioners you installed in existing homes last year, approximately what percentage had SEER ratings of 10?

\$E 0 100
 (Don't know) 998 I
 (Refused) 999 I

Q17B

Q17B Approximately what percentage had SEER ratings of 11?

\$E 0 100
 (Don't know) 998 I
 (Refused) 999 I

Q17C

Q17C Approximately what percentage had SEER ratings of 12?

\$E 0 100

(Don't know) 998 I
 (Refused)..... 999 I

Q17D

Q17D Approximately what percentage had SEER ratings of 13?

\$E 0 100

(Don't know) 998 I
 (Refused)..... 999 I

Q17E

Q17E Approximately what percentage had SEER ratings of 14 or higher?

\$E 0 100

(Don't know) 998 I
 (Refused)..... 999 I

Q17CK

=> * if IF((Q17A+Q17B+Q17C+Q17D+Q17E==100)1,2)

check to see if q17a+q17b+q17c+q17d+q17e = 100%

adds up, continue 1 => Q18A
 doesn't add up, go back 2

Q1798

=> * if IF((Q17A=998,999 OR Q17B=998,999 OR Q17C=998,999 OR Q17D=998,999 OR Q17E=998,999)1,2)

skip if q17=998,999

skip 1 => Q18A
 continue 2

Q17BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue)..... 1 D => Q17A

Next, I'd like to ask you a few questions about HVAC equipment you REPLACED in 1998.
Of all the HVAC equipment you replaced in 1998...

what percent was because the existing equipment BROKE DOWN? @q18a %

and, what percent was PLANNED - not breakdown? @q19a %

(NOTE: PLANNED replacements include remodeling or updating, replacing HVAC equipment that is getting old, replacing with more efficient equipment, etc.)

(INTERVIEWER: SHOULD TOTAL 100%!!!)

(998 = Don't know 999 = Refused)

Q18A

=> Q20A if Q11B==0

Q18A Next, I have a few questions about HVAC equipment you replaced in 1998. Of all the HVAC equipment you replaced in 1998, what percentage was because the existing equipment broke down?

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q19A

Q19A And, what percentage of the replacement HVAC equipment you installed in 1998 was planned - not breakdown? (Note: Planned replacements include remodeling or updating, replacing HVAC equipment that is getting old, replacing with more efficient equipment, etc..)

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q18CK

=> * if IF((Q18A+Q19A==100)1,2)

check to see if q18a+q19a = 100%

adds up, continue1 => Q18B

doesn't add up, go back2

Q1898

=> * if IF((Q18A=998,999 OR Q19A=998,999)1,2)

skip if q18=998,999

skip1 => Q18B

continue.....2

Q18BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue).....1 D => Q18A

Q18B

(LISTEN, CLARIFY, RECORD ONE RESPONSE)

Q18B How quickly do most customers need you to install a replacement for the BROKEN DOWN equipment?

(Same day)	01
(Next day)	02
(2 days)	03
(3 or 4 days)	04
(a week).....	05
(two weeks).....	06
(longer than two weeks).....	07
(longer than a month).....	08
(Don't know/Not sure).....	98

Q19B

(LISTEN, CLARIFY, RECORD ONE RESPONSE)

Q19B How quickly do customers need you to install this planned replacement equipment? Is it.

(Same day)	01
(Next day)	02
(2 days)	03
(3 or 4 days)	04
(a week).....	05
(two weeks).....	06
(longer than two weeks).....	07
(longer than a month).....	08
(Don't know/Not sure).....	98

Q19C

Q19C Please compare those customers who were PLANNING to replace HVAC equipment in 1998 to the other customers who HAD to replace equipment because of BREAKDOWNS. Do you usually have more time, about the same amount of time, or less time to discuss options with customers who are planning ahead than those who had a breakdown?

More time.....	1
About the same time	2
Less time	3
(Don't know/Not sure).....	4

Q20A

(READ LIST)

Q20A How often do you work on a job at the same time a remodeling contractor is working there? Would you say . . .

Never.....	1	=> Q21
Not very often	2	
Occasionally.....	3	
Most of the time	4	
All of the time	5	
(Don't know/Not sure).....	6	=> Q21

Q20B

(READ LIST)

Q20B How often are they doing work that will improve the energy efficiency of the home they are remodeling?

Never.....	1	=> Q21
Not very often	2	
Occasionally.....	3	
Most of the time	4	
All of the time	5	
(Don't know/Not sure).....	6	=> Q21

Q20C

(READ LIST)

Q20C How often are you given information on what energy efficiency improvements they are making in time to use that information in SIZING the furnace or air conditioner you are bidding or installing?

Never.....	1
Not very often	2
Occasionally.....	3
Most of the time	4
All of the time	5
(Don't know/Not sure).....	6

Q21

(DO NOT READ LIST, RECORD ALL THAT APPLY)

Q21 What benefits do you emphasize when talking to customers about high efficiency HVAC equipment?

(Don't mention high efficiency)	00	X
(Low operating costs / Lower utility bills).....	01	
(Better comfort)	02	
(Reliability)	03	
(Better warranty).....	04	
(Low maintenance costs)	05	
(Noise reduction)	06	
(Better for the environment).....	07	
(Other).....	08	O
(Don't know / Not sure).....	98	X

Q22A

(READ LIST)

Q22A How often do you provide customers with cost comparisons between high efficiency and standard efficiency furnaces? Would you say ...

Never.....	1
Not very often	2
Occasionally.....	3
Most of the time	4
Always	5
(Don't know/Not sure).....	6

Q22B

(READ LIST)

Q22B How often do you provide customers with cost comparisons between high efficiency and standard efficiency central air conditioners? Would you say ...

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

TXT23

Q23 Based on a 1 to 5 scale were 1 means "not at all important" and 5 means " very important," how important are the following factors to residential customers when they make decisions about purchasing heating and cooling equipment?

(continue)..... 1 D

Q23A

Rotation => Q23G

On a 1 to 5 scale, how important is PRICE to residential customers?

- Not at all important 1
- 2
- 3
- 4
- Very important 5
- (Don't know/Not sure)..... 6

Q23B

On a 1 to 5 scale, how important is CONTRACTOR REPUTATION to residential customers?

- Not at all important 1
- 2
- 3
- 4
- Very important 5
- (Don't know/Not sure)..... 6

Q23C

On a 1 to 5 scale, how important is ENERGY EFFICIENCY to residential customers?

- Not at all important 1
- 2
- 3
- 4
- Very important 5
- (Don't know/Not sure)..... 6

Q23D

On a 1 to 5 scale, how important is BRAND to residential customers?

Not at all important	1
.....	2
.....	3
.....	4
Very important	5
(Don't know/Not sure).....	6

Q23E

On a 1 to 5 scale, how important is EQUIPMENT RELIABILITY to residential customers?

Not at all important	1
.....	2
.....	3
.....	4
Very important	5
(Don't know/Not sure).....	6

Q23F

On a 1 to 5 scale, how important is EQUIPMENT NOISE to residential customers?

Not at all important	1
.....	2
.....	3
.....	4
Very important	5
(Don't know/Not sure).....	6

Q23G

On a 1 to 5 scale, how important is HOW QUICKLY YOU CAN INSTALL THE EQUIPMENT to residential customers?

Not at all important	1
.....	2
.....	3
.....	4
Very important	5
(Don't know/Not sure).....	6

Q24

=> Q25A if Q11B==0 AND Q11C==0

(DO NOT READ LIST, CLARIFY, RECORD ALL THAT APPLY)

Q24 How do you determine the size of HVAC equipment being installed in EXISTING homes?

- (Experience).....01
- (Size of old equipment).....02
- (Calculation based on square footage of home)03
- (Look at efficiency improvements to the home and then size equipment).....04
- (Information from customer about comfort in home)05
- (Manufacturers tables / guides).....06
- (ACCA Manual J calculation).....07
- (Comprehensive calculation which considers efficiency improvements / many factors) 08
- (Suggest efficiency improvements as part of equipment sizing).....09
- (Other).....10 O
- (Don't know / Not sure).....98 X

Q24A

=> +1 if NOT Q24=01

(READ LIST)

Q24A How often do you use EXPERIENCE to size HVAC equipment being installed in existing homes?

- Never.....1
- Not very often2
- Occasionally.....3
- Most of the time4
- Always5
- (Don't know/Not sure).....6

Q24B

=> +1 if NOT Q24=02

(READ LIST)

Q24B How often do you use the SIZE OF THE OLD EQUIPMENT to size new HVAC equipment being installed in existing homes?

- Never.....1
- Not very often2
- Occasionally.....3
- Most of the time4
- Always5
- (Don't know/Not sure).....6

Q24C

=> +1 if NOT Q24=03

(READ LIST)

Q24C How often do you use CALCULATIONS BASED ON THE SQUARE FOOTAGE of the home to size HVAC equipment being installed in existing homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24D

=> +1 if NOT Q24=04

(READ LIST)

Q24D How often do you look at EFFICIENCY IMPROVEMENTS TO THE HOME to determine the size of new HVAC equipment being installed in existing homes? (Note: Efficiency improvements could include: new windows, more insulation, window shading, etc.)

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24E

=> +1 if NOT Q24=05

(READ LIST)

Q24E How often do you GET INFORMATION FROM THE CUSTOMER ABOUT COMFORT in the home to help determine the size of new HVAC equipment being installed in existing homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24F

=> +1 if NOT Q24=06

(READ LIST)

Q24F How often do you use MANUFACTURER'S TABLES OR GUIDES to determine the size of new HVAC equipment being installed in existing homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24G

=> +1 if NOT Q24=07

(READ LIST)

Q24G How often do you use ACCA Manual J calculations to size HVAC equipment being installed in existing homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24H

=> +1 if NOT Q24=08

(READ LIST)

Q24H How often do you calculate the size of new HVAC equipment being installed in existing homes BASED ON COMPREHENSIVE CALCULATIONS that consider efficiency improvements and other factors?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q24I

=> +1 if NOT Q24=09

(READ LIST)

Q24I How often do you SUGGEST EFFICIENCY IMPROVEMENTS as part of equipment sizing for new HVAC equipment to be installed in existing homes?

- Never..... 1 => Q25A
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6 => Q25A

Q24IA

=> +1 if	NOT(Q24I=2,3,4,5)
----------	-------------------

(DO NOT READ LIST, RECORD ALL THAT APPLY)

- Q24Ia What efficiency improvements do you suggest as part of equipment sizing for new HVAC equipment to be installed in existing homes?
- (Better windows).....01
 - (More insulation)02
 - (Resize duct work)03
 - (Seal duct work).....04
 - (Seal air leaks in exterior of house).....05
 - (Improve shading).....06
 - (Install programmable thermostat).....07
 - (Other).....08 O
 - (Don't know/Not sure).....98 X

Q25A

Q25A Do you generally receive a Title 24 calculation that gives you the equipment size for NEW construction jobs?

- Yes 1
- No 2 => Q26
- (Don't know/not sure) 3 => Q26

Q25B

Q25B How often do Title 24 calculations size HVAC equipment correctly?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q25C

Q25C When Title 24 calculations seem incorrect, is the recommended HVAC equipment usually OVERsized or UNDERsized?

- undersized 01
- oversized 02
- (Other)..... 03 O
- (Don't know/Not sure)..... 98

Q26

(DO NOT READ LIST, CLARIFY, RECORD ALL THAT APPLY, PROBE FOR OTHERS)

Q26 How does your firm size and lay out the ductwork in homes?

- (Experience).....01
- (Size of each room / area)02
- (Information from customer about comfort problems in some areas of the house)03
- (ACCA Manual D calculations).....04
- (Other).....05 O
- (Don't know / Not sure).....98 X

Q26A

=> +1 if NOT Q26=01

(READ LIST)

Q26A How often do you use EXPERIENCE to size and lay out the ductwork in homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q26B

=> +1 if NOT Q26=02

(READ LIST)

Q26B How often do you use the SIZE OF EACH ROOM to help size and lay out the ductwork in homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q26C

=> +1 if NOT Q26=03

(READ LIST)

Q26C How often do you GET INFORMATION FROM THE CUSTOMER ABOUT COMFORT PROBLEMS in some areas of the house to help size and lay out the ductwork in homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q26D

=> +1 if NOT Q26=04

(READ LIST)

Q26D How often do you use ACCA Manual D calculations to size and lay out the ductwork in homes?

- Never..... 1
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6

Q27A

Q27A Do you provide duct-cleaning services?

- Yes 1
- No 2
- (Don't know/Not sure)..... 3

Q27B

Q27B Do you provide duct repair or duct sealing services?

- Yes 1
- No 2 => Q28
- (Don't know/Not sure)..... 3 => Q28

Q27C

Q27C What do you use to seal ducts?

- Tape 1
- Mastic..... 2
- Both..... 3
- (Don't know/Not sure)..... 4 => Q28

Q27D

Q27D Do these materials meets UL 181 requirements?

- Yes 1
- No 2
- (never heard of UL 181)..... 3
- (Don't know/Not sure)..... 4

Q28

(READ LIST)

Q28 How often do you replace ductwork during installation jobs in homes?

- Never..... 1 => Q30A
- Not very often 2
- Occasionally..... 3
- Most of the time 4
- Always 5
- (Don't know/Not sure)..... 6 => Q30A

Of all the times you replace ductwork, approximately what percent of the time is it because the old ductwork was...

undersized? @q29a %

deteriorating? @q29b % (998=Don't know 999 = Refused)

uninsulated? @q29c %

(INTERVIEWER: TOTAL=100%!!!)

Q29A

Q29 Of all the time you replace ductwork, approximately what percent of the time is it because the old ductwork was . . .

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q29B

deteriorating

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q29C

uninsulated

\$E 0 100

(Don't know)998 I

(Refused).....999 I

Q29CK

=> * if	IF((Q29A+Q29B+Q29C==100)1,2)
---------	------------------------------

check to see if q29a+q29b+q29c = 100%

adds up, continue1 => Q30A

doesn't add up, go back2

Q29BK

I'm sorry, but your responses do not add up to 100%. Let's go back and check what I entered.

(continue).....1 D => Q29A

Q30A

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED, 9997=NO FURNACES)

Q30A How much more do you charge a CUSTOMER to install a 90% efficient 80,000 BTUH input furnace instead of an 80% efficient furnace? (NOTE: This include ALL costs associated with installation, including the cost of the furnace.)

\$E 0 9950

(NO FURNACES)9997 I => Q31A

(DONT KNOW).....9998 I

(REFUSED).....9999 I

Q30B

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q30B How much more do you charge a CUSTOMER to install a 95% efficient 80,000 BTUH input furnace instead of an 80% efficient furnace? (NOTE: This includes ALL costs associated with installation, including the cost of the furnace.)

\$E 0 9950
 (DONT KNOW).....9998 I
 (REFUSED).....9999 I

Q31A

Q31A Next, I'd like to ask you some questions about air conditioner installations. In 3 ton central air conditioners do you usually install packaged units or split systems?

(Do not install 3 ton units)0 => Q32A
 Packaged unit.....1
 Split system.....2
 (Both equal)3
 (Don't know/Not sure).....4

Q31B

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q31B How much more do you charge a CUSTOMER to install a 12 SEER 3 ton <Q31A > instead of a 10 SEER 3 ton central air conditioner? (NOTE: This includes ALL installation costs, including the cost of the air conditioner.)

\$E 0 9950
 (DONT KNOW).....9998 I
 (REFUSED).....9999 I

Q31C

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q31C How much more do you charge a CUSTOMER to install a 13 SEER 3 ton <Q31A > instead of a 10 SEER 3 ton central air conditioner? (NOTE: This includes ALL installation costs, including the cost of the air conditioner.)

\$E 0 9950
 (DONT KNOW).....9998 I
 (REFUSED).....9999 I

Q31D

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q31D How much more do you charge a CUSTOMER to install a 14 SEER 3 ton <Q31A > instead of a 10 SEER 3 ton central air conditioner? (NOTE: this includes ALL installation costs, including the cost of the air conditioner)

\$E 0 9950
 (DONT KNOW).....9998 I
 (REFUSED).....9999 I

Q32A

Q32A In 5 ton central air conditioners do you usually install packaged units or split systems?

- (Do not install 5 ton units)0 => Q33
- Packaged unit1
- Split system2
- (Both equal)3
- (Don't know/Not sure).....4

Q32B

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q32B How much more do you charge a CUSTOMER to install a 12 SEER 5 ton <Q32A > instead of a 10 SEER 5 ton central air conditioner? (NOTE: This includes ALL installation costs, including the cost of the air conditioner.)

- \$E 0 9950
- (DON'T KNOW).....9998 I
- (REFUSED)9999 I

Q32C

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q32C How much more do you charge a CUSTOMER to install a 13 SEER 5 ton <Q32A > instead of a 10 SEER 5 ton central air conditioner? (NOTE: This includes ALL installation costs, including the cost of the air conditioner.)

- \$E 0 9950
- (DON'T KNOW).....9998 I
- (REFUSED)9999 I

Q32D

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q32D How much more do you charge a CUSTOMER to install a 14 SEER 5 ton <Q32A > instead of a 10 SEER 5 ton central air conditioner? (NOTE: this includes ALL installation costs, including the cost of the air conditioner)

- \$E 0 9950
- (DON'T KNOW).....9998 I
- (REFUSED)9999 I

Q33

Q33 In general, do you make most of your profit on the markup of the equipment you install or on the markup on your labor hours?

- (equipment)1
- (labor)2
- (Both equal)3
- (Don't know / Not sure).....4
- (Refused).....5

Q34A

=> Q37A if Q11D==0

Q34A Does your company offer service or maintenance agreements to your residential customers?
 Yes 1
 No 2 => Q35A
 (Don't know/Not sure)..... 3 => Q35A

Q34B

(READ LIST)

Q34B How often do you sell a service or maintenance agreement with installations in NEW CONSTRUCTION?
 Never..... 1
 Not very often 2
 Occasionally..... 3
 Most of the time 4
 Always 5
 (Don't know/Not sure)..... 6

Q34C

(READ LIST)

Q34C How often do you sell a service or maintenance agreement with installations in EXISTING homes?
 Never..... 1
 Not very often 2
 Occasionally..... 3
 Most of the time 4
 Always 5
 (Don't know/Not sure)..... 6

Q34D

Q34D Do your service or maintenance agreements include checking for sufficient airflow across the indoor coil when there is an air conditioner or heat pump?
 Yes 1
 No 2
 (Don't know/Not sure)..... 3

Q34E

Q34E Do your service or maintenance agreements include checking for the proper refrigerant charge in air conditioners or heat pumps?
 Yes 1
 No 2
 (Don't know/Not sure)..... 3

Q35A

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q35A About how much would you charge a customer for checking the airflow across the indoor coil?

\$E 0 9950

(DON'T KNOW).....9998 I

(REFUSED).....9999 I

Q35B

(ENTER \$ AMOUNT, 9998 = DONT KNOW, 9999 = REFUSED)

Q35B About how much would you charge a customer for checking the refrigerant charge?

\$E 0 9950

(DON'T KNOW).....9998 I

(REFUSED).....9999 I

Q36

(DO NOT READ LIST, RECORD ALL THAT APPLY)

Q36 How do you determine that you have the correct refrigerant charge in air conditioners and heat pumps?

(Sight window/gage).....01

(Feel tubing).....02

(Weight).....03

(Super heat).....04

(They come factory charged).....05

(Check manufacturers information and measure pressures and temperatures).....06

(Other).....07 O

(Don't know/Not sure).....98 X

Q37A

Q37A Next, I'd like to ask you a few questions about your employees. Do you look for technicians who have formal training before you hire them? (Note: Formal training includes trade school, technical school, manufacturers' training, etc. It does not include "on the job training.")

Yes 1

No 2

(Don't know/Not sure) 3

Q37B

Q37B Do you feel there is a shortage of qualified, well-trained technicians?

Yes 1

No 2

(Don't know/Not sure) 3

Q37C

Q37C Do you feel there is a shortage of qualified installers?

Yes 1

No 2

(Don't know/Not sure) 3

Q37D

=> +1 if (Q37B=2,3 AND Q37C=2,3)

Q37D Does this shortage of qualified people limit the amount of work your company can do?

- Yes 1
- No 2
- (Don't know/Not sure) 3

Q38A

Q38A Do you offer your residential customers financing?

- Yes 1
- No 2 => Q39
- (Don't know/Not sure)..... 3 => Q39

Q38B

(ENTER PERCENT, 998 = DON'T KNOW, 999 = REFUSED)

Q38B What percentage of your customers use your financing?

- \$E 0 100
- (DON'T KNOW)..... 998 I
- (REFUSED) 999 I

Q38C

(READ LIST, RECORD ALL THAT APPLY)

Q38C Through what type of sources do you offer this financing?

- Your company 01
- Local bank 02
- Local financing company 03
- A nation-wide bank 04
- A nation-wide financing company 05
- Equipment Distributors 06
- Equipment Manufacturers 07
- (Other) 08 O
- (Don't know/Not sure) 98 X

Q38D

=> +1 if NOT Q38C=02

Q38D What is the name of the local bank?

- (HIT ENTER TO OPEN RESPONSE BOX) 00 DO
- (Don't know) 98 X
- (Refused)..... 99 X

Q38E

=> +1 if NOT Q38C=03

Q38E What is the name of the local financing company?

- (HIT ENTER TO OPEN RESPONSE BOX) 00 DO
- (Don't know) 98 X
- (Refused)..... 99 X

Q38F

=> +1 if NOT Q38C=04

Q38F What is the name of the nation-wide bank?
 (HIT ENTER TO OPEN RESPONSE BOX)00 DO
 (Don't know)98 X
 (Refused).....99 X

Q38G

=> +1 if NOT Q38C=05

Q38G What is the name of the nation-wide financing company?
 (HIT ENTER TO OPEN RESPONSE BOX)00 DO
 (Don't know)98 X
 (Refused).....99 X

Q38H

=> +1 if NOT Q38C=06

Q38H What is the name of the equipment distributor(s)?
 (HIT ENTER TO OPEN RESPONSE BOX)00 DO
 (Don't know)98 X
 (Refused).....99 X

Q38I

=> +1 if NOT Q38C=07

Q38I What is the name of the equipment manufacturer(s)?
 (HIT ENTER TO OPEN RESPONSE BOX)00 DO
 (Don't know)98 X
 (Refused).....99 X

Q39

Q39 Based on a scale from 1 to 5 with 1 meaning "not at all important" and 5 meaning "very important," how important is offering financing from a competitive standpoint? (PROBE: Do your competitors get more business because they offer financing?)
 Not at all important1
2
3
4
 Very important5
 (Don't know/Not sure).....6

TXT40

Q40 Based on a scale of 1 to 5 with 1 meaning "not at all interested" and 5 meaning "very interested," how interested would you be in participating in the following efficiency improvement programs?
 (continue).....1 D

Q40A

Rotation => Q40F

On a 1 to 5 scale, how interested would you be in participating in a duct design and installation improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q40B

On a 1 to 5 scale, how interested would you be in participating in a furnace efficiency improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q40C

On a 1 to 5 scale, how interested would you be in participating in a central air conditioning efficiency improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q40D

On a 1 to 5 scale, how interested would you be in participating in an air conditioner sizing and installation improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q40E

On a 1 to 5 scale, how interested would you be in participating in an air conditioner maintenance and service improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q40F

On a 1 to 5 scale, how interested would you be in participating in a furnace sizing and installation improvement program?

- Not at all interested 1
- 2
- 3
- 4
- Very interested 5
- (Don't know/Not sure)..... 6

Q41A

Q41A Over the past five years, have you participated in any of PG&E's air conditioning programs?

- Yes 1
- No 2 => Q42
- (Don't know) 3 => Q42

Q41B

(READ LIST, RECORD ALL THAT APPLY)

Q41B In which programs have you participated?

- Home Energy Savings Loans (HESL) 01
- Energy Partners (low-income program that included AC)..... 02
- Express Efficiency (commercial AC program) 03
- (Other)..... 04 O
- (Don't know/Not sure)..... 98 X

Q42

Q42 And finally, is there anything else PG&E should consider when designing programs to improve residential energy efficiency?

- (HIT ENTER TO OPEN RESPONSE BOX) 00 DO
- (Don't know) 98 X

BYE

PRESS ENTER TWICE TO COMPLETE INTERVIEW.

Those are all the questions I have. Thank you very much for your time and help with this study! This information will be very valuable as PG&E designs new energy efficiency programs. We will send you a check for \$50 within the next 10 days.

- Continue..... 1 D

INT

Enter the appropriate disposition code.

No answer	01	=> END
Answering machine.....	02	=> END
Busy	03	=> END
Disconnected phone	04	=> END
Residential Phone.....	05	=> END
Initial refusal	06	=> END
Computer tone.....	07	=> END
Language problems	08	=> END
Schedule a callback.....	09	=> CB
Completed interview	10	C => END
Mid-interview terminate	11	=> END
Enter a substitute phone number	12	=> TEL02
Duplicate phone number	13	=> END
Don't do residential	21	=> END
No one knows type of work	22	=> END
Not HVAC contractor	23	=> END

**Residential
HVAC Market Transformation
Customer Survey**

Draft Report

**Research conducted by:
Opinion Dynamics Corp.**

**Research conducted: March & April 1999
Draft Report completed: May 3, 1999**

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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly-funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. Research was conducted with HVAC equipment consumers, contractors, distributors, and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes research conducted with the customer segment. The primary objective of the research is to help PG&E understand the equipment purchase process from the perspective of consumers (purchasers in the last five years) of HVAC equipment. Specific research objectives range from establishing equipment installation rates by PG&E climate zone to baselining consumer purchasing patterns and practices to exploration of the role financing plays in the equipment selection and purchasing process. All respondents in this study own and live in a single family home, duplex, or townhouse.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs.” (Eto, et.al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, extend from research, to educational programs, to various types of up-stream and down-stream incentive programs. Today, market transformation has emerged as a central policy objective of future publicly-funded energy-efficiency programs in California. Market transformation has been defined as "a reduction in market barriers due to a market intervention, as evidenced by a set of market effects that last after the intervention has been withdrawn, reduced, or changed."² In order to adapt to this policy change, PG&E is pursuing detailed market research regarding the California residential heating, ventilating, and air-conditioning (HVAC) market. This research is designed to improve PG&E's understanding of barriers to installation of energy efficient heating and cooling equipment and related energy services in the residential sector – leading to market transformation efforts targeting the residential HVAC market.

This report, which summarizes customer behaviors and attitudes in replacing or adding HVAC equipment, is part of a comprehensive market research project designed to address the residential HVAC market.³ The purpose of this report is to summarize key findings from research conducted with residential customers who purchased HVAC equipment within the past 5 years.

² For a general discussion of market transformation issues, see "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs" (Eto, et.al., July 1996)

³ The overall research project includes interviews with 1) HVAC manufacturers, 2) HVAC equipment and component part distributors, and 3) HVAC contractors. It also includes secondary research on the residential HVAC market.

Section III: Objectives

The primary objectives of this customer research are to understand barriers to the purchase and installation of energy efficient residential HVAC equipment and “whole system” energy services, identify marketing and program strategies which may help to eliminate or reduce barriers, understand the influence of various market actors (especially residential HVAC contractors) on equipment and “whole system” services decision making, and identify customer information needs relative to HVAC-related products and system services. Specifically, the residential customer survey seeks to:

- Establish residential HVAC equipment purchase and installation rates;
- Document the reason(s) why residential customers are replacing or adding HVAC equipment;
- Explore the HVAC equipment purchasing process, including the criteria residential customers use to select HVAC contractors and related equipment;
- Explore customer perceptions of the HVAC equipment sales process including the extent to which salespeople focus on energy efficiency and other issues;
- Understand the type and range of HVAC services which are “typically” offered to residential customers; and
- Explore the role that financing plays in the equipment selection and purchasing process.

Section IV: Methodology

To address the research objectives, 803 telephone interviews were completed with residential customers who purchased HVAC equipment within the past five years.⁴ Interviews were completed with a random sample of customers across PG&E's service area, ranging from the hot desert/mountain climate zones to the cool, coastal climate zones. All survey respondents own and live in a single family home, duplex, or townhouse.

A random digit dial (RDD) sample was used for the survey process. The sample represented 1,221 ZIP codes (located in 47 California counties) served by PG&E. (A total of 128 ZIP codes were excluded because they were served electricity by other utilities.) As shown in Table 1, the 1,221 ZIP codes are distributed across four major PG&E climate zones, each of which includes one to four local climate zones. (The locations of PG&E's major climate zones are shown in Figure 1 on page 5.)

Table 1: PG&E climate zone descriptions

Major PG&E Climate Zone	Climatic condition
R—Desert/Mountain	Extremes of hot and cold
S—Valley	Hot
T—Coastal	Cool
X—Hill	Moderate

⁴ HVAC equipment was defined as a "central forced-air furnace," a "central forced-air heat pump," or a "central air conditioner."

The RDD sample, purchased from Survey Sampling, Inc. (SSI), was drawn based on the proportion of telephone numbers in each ZIP code. Table 2 compares the 1994 Residential Energy Survey (RES) Report “estimate of numbers of single family households” in each of PG&E’s major climate zones to estimates of the 1997 population in each major climate zone. (We obtained 1997 population estimates from SSI for each ZIP code and combined them into the climate zones.) As illustrated in Table 2, the percentage of survey responses closely approximates the percentage of PG&E’s single family household population per climate zone.

Table 2: Households, population, and responses by climate zone

PG&E Major Climate Zone	Estimate of Single Family & Townhouse Households ¹ 1994 RES Report		Estimate of Population 1997 (via SSI)		Responses to Customer Survey 1999	
	Number	Percent	Number	Percent	Number	Percent
R—Desert/Mountain Extremes of hot and cold	502,600	16.2%	2,024,445	15.5%	127	15.8%
S—Valley Hot	898,600	28.9%	3,615,406	27.7%	208	25.9%
T—Coastal Cool	602,600	19.4%	2,772,867	21.3%	145	18.1%
X—Hill Moderate	1,105,300	35.6%	4,638,376	35.5%	323	40.2%
Totals	3,109,100	100.0%	13,051,094	100.0%	803	100.0%

¹ Estimate does not include duplexes, as it was not possible to extrapolate that information from the RES report.

Customers who were asked to respond to the entire survey⁵ were identified by the following screening criteria. The respondent must:

1. Be a PG&E natural gas or electric customer,
2. Live in and own a single family dwelling, and
3. Have purchased a central forced air furnace, a central forced air heat pump, or a central air conditioner since January 1994.

⁵ PG&E customers who rent their dwelling space were asked an abbreviated series of six questions, then they were thanked and the interview was concluded.

We completed 803 telephone surveys from a valid sample of 1183 residential customers, which represents a response rate of 68%. The “valid sample” includes all PG&E customers who were identified during the RDD calling process who own a single family home, duplex, or townhouse, and purchased residential HVAC equipment in the past five years. As indicated by the response rate, only a portion of these targeted customers (68%) agreed to complete the entire survey. Based upon the total number of single family and townhouse households (3,109,100, as of 1994) in PG&E’s service territory, study results provide a precision of $\pm 3.5\%$ at the 95 % confidence level. The telephone interviews, which averaged 17 minutes, were completed between March 19 and April 21, 1999. A copy of the survey instrument may be found in Appendix A. A complete breakdown of the RDD sample can be found in Appendix B.

Of the 803 survey respondents, 511 replaced equipment and 383 added new equipment. (Some respondents both added and replaced equipment.) Additional respondent demographics (number of occupants in the home, household income levels, and number of bedrooms in the home) are shown in Tables 3a, 3b, and 3c.

Table 3a: Respondents’ household demographics: Number of occupants

Number of occupants in household	Percent of respondents		
	Total	Occupants less than 18 years old	Occupants over 65 years old
0	--	61%	69%
1	13%	13%	15%
2	38%	19%	14%
3	17%	4%	0%
4	20%	1%	0%
>5	10%	1%	0%
Don’t know/ refused	2%	1%	2%
Total	100% (n = 803)	100% (n = 803)	100% (n = 803)

Table 3b: Respondents' household demographics: Income

Household income	Percent of respondents
<\$25k	6%
\$25k - \$50k	20%
\$50k - \$75k	17%
\$75k - \$100k	15%
\$100k - \$150k	10%
\$150k +	8%
Don't know/ Refused	24%
Total	100% (n = 803)

**Table 3c: Respondents' household demographics:
Number of bedrooms**

Number of bedrooms in home	Percent of respondents
1	1%
2	13%
3	49%
4	28%
>5	8%
Don't know / refused	1%
Total	100% (n = 803)

Section V: Findings

This section of the report is divided into nine sub-sections. These sub-sections generally follow the order in which various issues were discussed during the interview process. The first two sub-sections provide an overview of HVAC equipment purchase rates and purchase motivations. This is followed by sub-sections that address the HVAC contractor search process, interactions with HVAC sales people, concerns that customers have during the purchase process, and HVAC contractors and equipment selection process.⁶ Further sub-sections explore financing options for and customer satisfaction with their new HVAC equipment. The section concludes with a discussion of past customer involvement in PG&E energy efficiency programs.

Installation/Purchase Rates

This sub-section outlines annual forced-air furnace, heat pump, and central air conditioning installation rates for the entire PG&E service area and by each of four climate zones. The annual installation rates are calculated based upon HVAC installations among 4,710 survey respondents contacted as part of the research who own and live in a single family home or townhouse. The estimated annual unit sales is calculated by multiplying the annual installation rate by the estimated number of single family and townhouse households in PG&E territory (as reported in PG&E's 1994 Residential Energy Survey Report). The annual equipment installation rates are further broken down into two categories: equipment replacements versus additions. Key findings are outlined below.

- **Customers indicate a forced-air furnace annual installation rate of 3.66% for PG&E's service territory. This translates into estimated unit sales of 116,677 per year.** As illustrated in Table 4, the Valley and Hill climate zones together account for just over two-thirds of all units installed in PG&E's service territory.

⁶ We have referred to HVAC salespersons as "contractors" throughout this report. The HVAC industry typically uses the term "dealers" for the residential sector.

- **Customers indicate a forced-air heat pump annual installation rate of .80% for PG&E's service territory. This translates into estimated unit sales of 27,302 per year.** As illustrated in Table 4, central forced air heat pump installation rates are highest in the Desert/Mountain and Valley climate zones. Together, these two climate zones account for just over 60 % of all units installed in PG&E's service territory.
- **Customers indicate a central air conditioning annual installation rate of 2.46% for PG&E's service territory. This translates into estimated unit sales of 84,352 per year.** As illustrated in Table 4, central air conditioning installation rates are highest in the Desert/Mountain and Valley climate zones. Together, these two climate zones account for just under 60 % of all units installed in PG&E's service territory.

Table 4: Estimated annual installation rates and units by climate zone¹

Equipment Type	Climate Zone				Total
	Desert/ Mountain	Valley	Coastal	Hill	
Central Forced-Air Furnace					
Installation rate	3.78%	4.20%	3.16%	3.70%	3.66%
Number of units	18,998	37,741	19,042	40,896	116,677
Central Forced-Air Heat Pump					
Installation rate	1.20%	1.22%	.50%	.66%	.80%
Number of units	6,031	10,963	3,013	7,295	27,302
Central Air Conditioning					
Installation rate	3.28%	3.78%	1.04%	2.50%	2.46%
Number of units	16,485	33,967	6,267	27,633	84,352

¹ Installation rates were determined through an analysis of 4,710 telephone screeners completed with PG&E single family and townhouse households. Unit counts are calculated by multiplying individual installation rates by the estimated number of single-family and townhouse households as reported in PG&E's 1994 Residential Energy Survey Report.

- **Compared with Desert/Mountain and Valley climate zones, PG&E customers in Coastal and Hill climate zones are more likely to *replace* (as opposed to add) a forced air furnace.** As illustrated in Table 5, just over 70 % of forced air furnace installations in Coastal and Hill climate zones are replacements. This compares to replacement rates of just under 60 % in the Desert/Mountain and Valley climate zones.

- **Compared with Desert/Mountain and Valley climate zones, PG&E customers in Coastal and Hill climate zones are more likely to *add* (as opposed to replace) a heat pump.** As illustrated in Table 5, just over 60 % of heat pump installations in Coastal and Hill climate zones are new or additional equipment. This compares to rates of around 40 % in the Desert/Mountain and Valley climate zones.
- **Compared with Desert/Mountain and Valley climate zones, PG&E customers in Coastal and Hill climate zones are more likely to *add* (as opposed to replace) central air conditioning equipment.** As illustrated in Table 5, nearly 80 % of installations in the Coastal climate zone are new or additional equipment. This compares to only 36 % of installations in the Desert/Mountain climate zone.

Table 5: Replacements versus additions by climate zone¹

Equipment	Climate Zone				Total
	Desert/ Mountain	Valley	Coastal	Hill	
Central Forced-Air Furnace					
Replacements	59%	57%	71%	70%	66%
Additions	41%	43%	29%	30%	34%
Central Forced-Air Heat Pump					
Replacements	60%	55%	36%	40%	49%
Additions	40%	45%	64%	60%	51%
Central Air Conditioning					
Replacements	64%	53%	22%	29%	43%
Additions	36%	47%	78%	71%	57%

¹ Replacement and addition rates were determined through an analysis of 4,710 telephone screeners completed with PG&E single family and townhouse households.

Purchase Reason and Timing

This sub-section addresses the reasons and timing for heating and cooling equipment replacements and additions. We asked respondents why they replaced or added a furnace, heat pump, or central air conditioner. For respondents who replaced a piece of equipment, we asked if the replacement is covered by a home warranty. We also asked respondents how quickly they needed the equipment they replaced or added. Key findings are outlined below.

- **The primary reason for *replacing* a furnace, heat pump, or air conditioner is because “the current unit broke down.”** Almost half (48%) of the respondents indicate the main reason for replacing a furnace, heat pump, or air conditioner is because the “unit broke down,” 21% indicate it is because the “unit is getting old,” and 17% indicate it is because the “unit needed too many repairs.” Over 60% of respondents who replaced an *air conditioner* indicate that the reason was because the “unit broke down.” Other reasons for replacing a furnace, heat pump, or air conditioner are shown in Table 6.

Table 6: Reasons for *replacing* furnace, heat pump, or air conditioner^{1, 2}

Reason	Percent of respondents indicating reason			
	All Replacements ³	Furnace and AC	Furnace Only	AC Only
Unit broke down	48%	49%	44%	62%
Unit getting old	21%	24%	21%	8%
Unit needed too many repairs	17%	13%	21%	14%
Inspector recommended	5%	2%	5%	3%
More energy efficient	4%	7%	3%	3%
Doing extensive remodel	3%	3%	4%	5%
Comfort	3%	3%	3%	5%
Wanted larger unit	2%	3%	2%	3%
Utility red-tagged it	2%	0%	3%	3%
Other/Don't Know	12%	14%	12%	11%
Total respondents	506	109	294	37

¹ Respondents could give more than one response, so total percentage may be greater than 100%.

² This table is “ordered” based upon all equipment replacement responses.

³ This category includes furnace, heat pump, and air conditioner replacements.

- **Overall, end-of-life reasons absolutely dominate the replacement of residential HVAC equipment.** Eighty-five percent (85%) of all replacements were made for “end-of-life” reasons. These include “breakdown,” “unit getting old,” “unit needing repairs,” “inspector recommendation,” “contractor convinced purchaser,” “afraid unit would breakdown,” and “utility red-tag.”
- **Very few equipment replacements are covered by a home warranty.** Less than 3% of respondents indicate that replacement of their furnace, heat pump, or air conditioner is covered by home warranty.

- Respondents indicate the primary reason for *adding* either a furnace or an air conditioner to their home is because they “did not currently have one.”** As illustrated in Table 7, 39% of the 92 respondents who *added a furnace only* and 42% of the 128 respondents who *added an air conditioner only* indicate they added the equipment because they did not currently have it. Over one-third (35%) of respondents who *added an air conditioner only* also indicated that they did so for “comfort.” Fifty-four or 14% of the 383 respondents who replaced a furnace, air conditioner, or heat pump did so because it was a “new home.” (Note: We have included the 54 “new home” respondents in Table 7, however this group of respondents is not included in further analyses.)⁷

Table 7: Reasons for *adding* a furnace, heat pump, or air conditioner¹

Reason	Percent of respondents indicating reason for add			
	All Additions	Furnace and AC	Furnace Only	AC Only
Did not have AC	24%	20%	6%	42%
Comfort	20%	12%	7%	35%
Newly constructed home ²	14%	29%	14%	2%
Did not have furnace	14%	13%	39%	0%
Added AC while replacing furnace	8%	8%	4%	13%
Remodeling	7%	5%	11%	4%
Added more space	6%	4%	8%	6%
Did not have heat pump	3%	0%	0%	0%
More energy efficient	2%	3%	2%	1%
Other	20%	26%	25%	9%
Total respondents	383	93	92	128

¹ Respondents may have given more than one response.

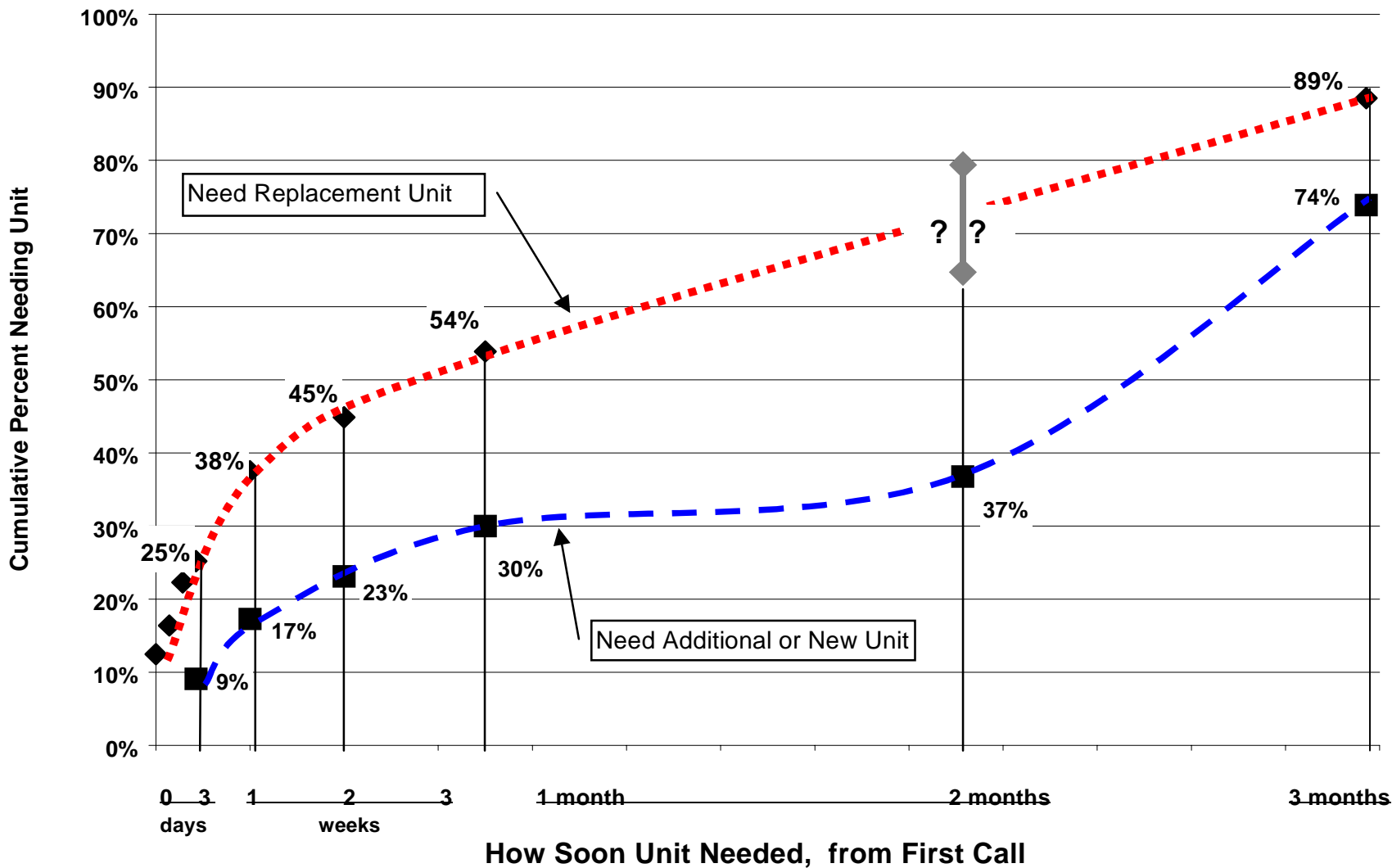
² This group of respondents is not included in further analyses.

- In the vast majority of the cases, HVAC equipment is being added to homes as a “stand alone project” and not as part of a home remodeling project or addition.** As shown in Table 7, only 7% of respondents who added equipment to their home did so as part of “remodeling” and 6% did it to “add more space.”

⁷ Characterization of the new home market is the focus of another, separate research effort.

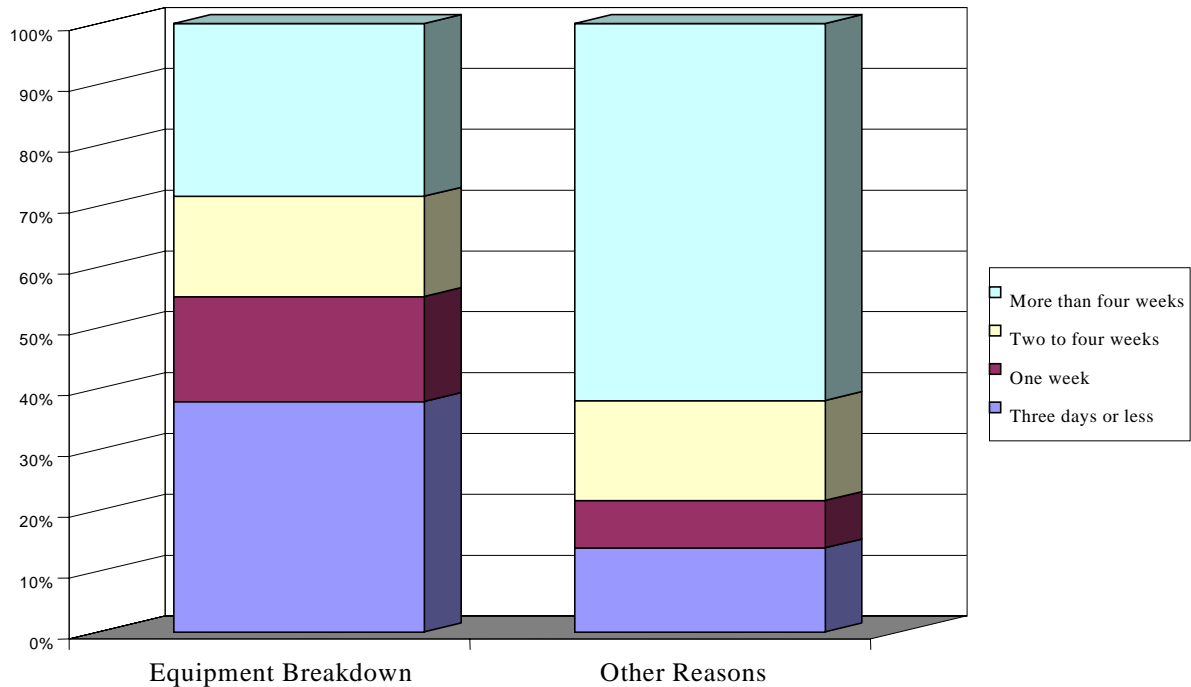
- **In general, respondents who *replaced* equipment needed the equipment more quickly than did respondents who *added* equipment.** Figure 2 plots the cumulative percentage of respondents who needed their equipment replaced or added within a certain timeframe. The figure illustrates that people who *replace* HVAC equipment have a more urgent need for their equipment than do respondents who *add* HVAC equipment. For example:
 - ⇒ One-fourth (25%) of respondents who *replace* equipment need the equipment within three days, while only 9% of respondents who *add* equipment need the equipment within three days.
 - ⇒ Almost 38% of respondents who *replace* equipment need the equipment within in one week, while only 17% of respondents who *add* equipment need the equipment within one week.
 - ⇒ Over 45% of respondents who *replace* equipment need the equipment within in two weeks, while only 23% of respondents who *add* equipment need the equipment within two weeks.

Figure 1: Comparison of timeframe for replacing and adding equipment



- Replacements made because of a “breakdown” of existing equipment are more urgent than replacements made for other reasons.** As illustrated in Figure 3, 38% of respondents need equipment replacement for a “breakdown” within three days, while only 14% need equipment replacement for some other reason in that timeframe. Additionally, 55% need equipment replacement within a one-week time period for a “breakdown” while only 22% need replacement in that timeframe for other reasons.

Figure 3: Urgency of equipment replacement



- Air conditioner replacements are more urgent than furnace replacements.** Respondents who replaced only their air conditioner are more likely to need that replacement within one week than are respondents who replaced only their furnace (45% compared with 36%). *Note: There were more respondents who replaced air conditioners in the Desert / Mountain and Valley climate zones than in the Coastal and Hills climate zones. It appears that respondents in these climate zones who are exposed to the extreme hot summer temperatures are more impatient for air conditioner replacements than respondents in the less extreme climate zones.*

Contractor Search

This sub-section addresses the process respondents go through when searching for an HVAC contractor. First, we asked respondents where they look for an HVAC provider that could help them. We also asked them how many bids they request and how long it takes them to accept a bid after they began their search. Key findings are outlined below.

- **When considering replacing or adding HVAC equipment, respondents most frequently “call a contractor.” Others mention learning about a contractor though the “yellow pages” or by “word of mouth.”** When asked where they looked for a heating or cooling provider, 46% of respondents indicate they “call a contractor.” About 20% of the respondents indicate they “look in the yellow pages or phone book,” and 15% of the respondents indicate they select a contractor by “word of mouth.” Other methods respondents use to look for an HVAC provider pale in comparison to these three methods (see Table 8 below).

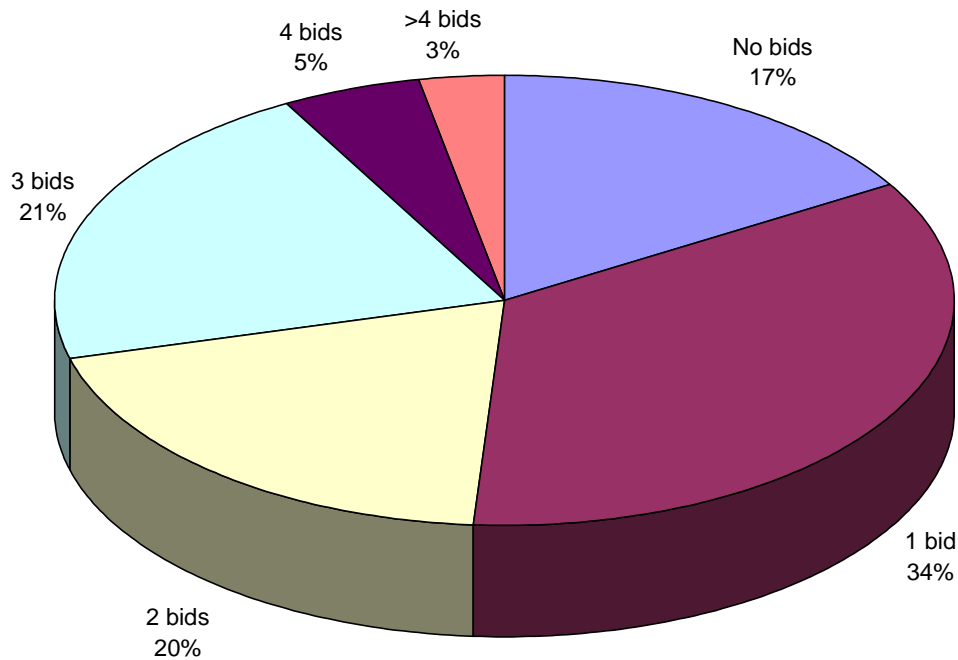
Table 8: Sources of information regarding HVAC provider^{1, 2}

Information sources	Percent of respondents
Called a contractor	46%
Looked in Yellow Pages/Phone Book	20%
Word of mouth	15%
Called a large retailer that services equipment	7%
Called PG&E Smarter Energy Line	4%
	(n = 748)

¹ Only responses mentioned by 4% or more of respondents are listed.

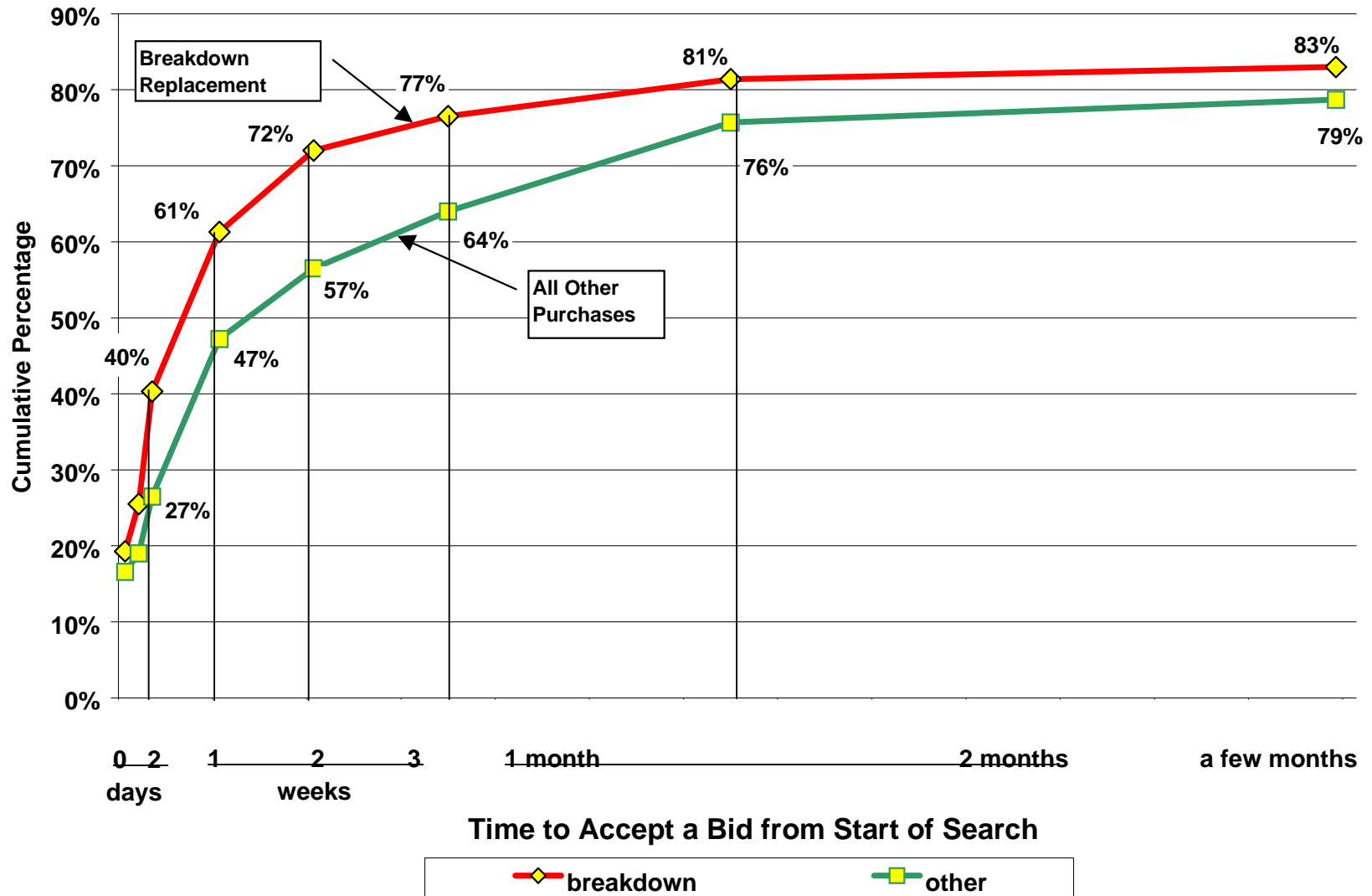
² Respondents may have given more than one response.

- **About half (51%) of respondents get either one or no bids when replacing or adding equipment.** The most frequently mentioned number of bids obtained for replacing a furnace, heat pump, or air-conditioning replacement is one, and the average number of bids obtained is 1.8. Figure 4 shows the percentage of respondents who obtained none, one, two, three, four, or greater than 4 bids when purchasing equipment.

Figure 4 Number of bids obtained when replacing or adding equipment

- **About half (52%) of the respondents accept a bid and sign a contract within one week of calling contractors about replacing or adding equipment.** Over two-thirds (70%) of the respondents who get one bid and 57% of the respondents who get two bids accept a bid and sign a contract within one week. It takes over a month for 48% of the respondents who get five or more bids to accept a bid and sign a contract.
- **After two days, 40% of the respondents replacing broken down equipment have accepted a bid, while only 27% of all other purchasers have accepted.** As shown in Figure 5, this gap widens further until, at 2 weeks, 72% of customers replacing broken down units have accepted bids while only 57% of all other purchasers have.

Figure 2: Time to accept a bid for breakdown replacement and all other purchases



HVAC Salesperson and Service Offerings

This sub-section addresses issues the salesperson raised when talking with respondents about their new furnace, heat pump, or air conditioner. We asked respondents what the salesperson emphasized. We asked if the salesperson mentioned specific features such as checking and repairing ductwork, sizing equipment, and installing a new clock or setback thermostat. We asked respondents who purchased a furnace if the salesperson mentioned replacing or adding an air conditioner as well. We asked respondents who purchased an air-conditioner or a heat pump if the salesperson mentioned checking and maybe replacing indoor coil while replacing outdoor unit. We asked respondents who replaced or added central air conditioning if the salesperson mentioned replacing their furnace at the same time. Finally we asked respondents if the salesperson offered them a service agreement and if the respondent purchased the service agreement. Key findings are outlined below.

- **“Energy efficiency benefits” is the most frequently mentioned attribute raised by a salesperson when talking with a respondent about replacing or adding an air conditioner, furnace, or heat pump.** As illustrated in Table 9, 27% of the respondents indicate that the salesperson raised the issue of energy efficiency when discussing their equipment purchase. The next most frequently mentioned issues are “reliability” (15%), “reputation of contractor and brand” (13%), and “total cost of installation” (11%).

Table 9: Salesperson emphasis in equipment replacements and additions¹

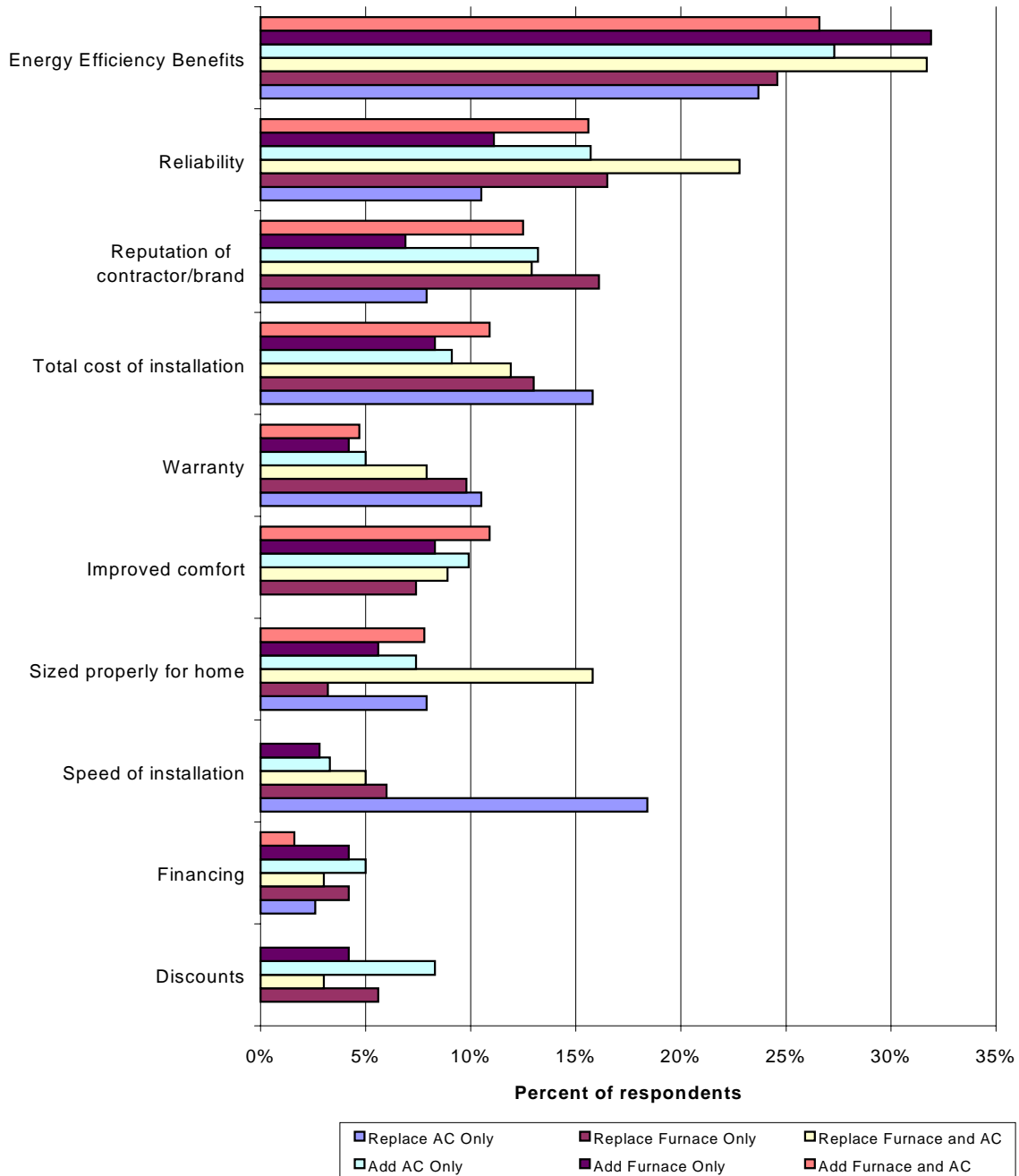
Topics emphasized	Percent of respondents		
	Replacements and additions	Replacements	Additions
Energy efficiency	27%	26%	29%
Reliability	15%	16%	16%
Reputation of contractor/brand	13%	15%	12%
Total cost of installation	11%	12%	9%
Warranty	8%	9%	7%
Improved comfort	8%	7%	9%
Sized properly for home	6%	6%	7%
Speed of installation	5%	7%	2%
Financing	4%	4%	4%
Discounts	4%	5%	5%
Other	11%	11%	11%
Don't know/Don't recall	29%	28%	29%
	(n = 709)	(n = 488)	(n = 310)

¹ Respondents may have given more than one response.

- Salesperson emphasis on attributes varies depending upon the type of equipment purchased and whether the purchase is a replacement or addition.** Figure 6 illustrates the emphasis on attributes for the following equipment purchases: (1) adding a furnace and air conditioner; (2) adding a furnace only; (3) adding air conditioner only; (4) replacing furnace and air conditioner; (5) replacing furnace only; and (6) replacing air conditioner only.
- The salesperson emphasized “speed of installation” and “cost of equipment” more when talking with respondents about replacing rather than adding an air conditioner.** As illustrated in Figure 6, salespersons emphasized “energy efficiency” (24%), “speed of installation” (18%), and “cost” (16%) with respondents who *replaced* an air conditioner, and “energy efficiency” (27%) and “reliability” (16%) with respondents who *added* an air conditioner. While some respondents indicate salespersons mentioned “improved comfort” (10%) and “discounts” (8%) when discussing *adding* an air conditioner, none of the respondents indicate sales persons discussed these topics when *replacing* an air conditioner.

- There is more salesperson emphasis on “energy efficiency,” “properly sizing equipment,” and “reliability of equipment” when both an air conditioner and a furnace are replaced than for any other combination of equipment replacements or additions (See Figure 6).

Figure 6 Salesperson emphasis when replacing or adding equipment



- **When asked specifically if a salesperson recommended certain features, almost three fourths (73%) of respondents indicate that they mentioned “properly sizing equipment” for their home.** As illustrated in Table 10, about half of the respondents indicate the salesperson mentioned “*replacing* a furnace at the same time as *replacing* the air conditioner,” “checking or repairing ductwork,” “*replacing* or *adding* an air conditioner at the same time as *replacing* their furnace,” and “installing a new clock or set back thermostat.”
- **Only 25% of the respondents mentioned checking or replacing the indoor coil while replacing the outdoor air conditioning or heat pump units (see Table 10).**

Table 10: Did salesperson recommend or mention the following?

Item mentioned or recommended	Percent of respondents	Total respondents
Properly sizing equipment for home	73%	742
Replacing furnace at the same time as <i>replacing</i> air conditioner	62%	188
Checking/repairing ductwork	53%	747
Replacing/adding an air conditioner at the same time as replacing furnace	52%	446
Installing a new clock or set-back thermostat	49%	748
Replacing furnace at the same time as <i>adding</i> air conditioner	43%	225
Checking/replacing indoor coil while replacing outdoor unit (AC and HP replacers only)	25%	217

- **Fifty-one percent (51%) of the respondents were offered a service agreement, and 36% of those who were offered an agreement purchased one.** In all, 18% (36% of 51%) of customers purchased a service agreement when they replaced or added a piece of HVAC equipment.

Customer Concerns During Purchase Decision Process

The emphasis in this sub-section moves from salesperson issues to *customer concerns* during the purchase decision process. We asked both those respondents who replaced equipment and those who added equipment a series of *unaided* questions (eliciting unique individual responses) about their main concerns. In addition to their main concerns, we asked *unaided*⁸ questions about “what else they were looking for” when making their purchase. We asked both those respondents who replaced equipment and those who added equipment two *aided* questions (prompting individuals for responses to specific issues or concerns). We asked respondent if they asked the salesperson about “fixing uneven heating or cooling” and “energy efficient units” during the decision making process. Key findings are outlined below, first of all for those respondents who replaced equipment, and secondly for those respondents who added equipment.

Equipment Replacements

- **“Energy efficiency” (or a desire to reduce energy costs) is the most frequently mentioned concern respondents have when replacing heating and cooling equipment.** When asked an *unaided* question about their main concern when replacing their HVAC equipment, 35% of survey respondents said that “energy efficiency” was their main concern. Table 11 contains a listing of all concerns mentioned by 5% or more of the respondents and illustrates that respondents who are just replacing their central air conditioning are less concerned than other heating and cooling equipment replacers about energy efficiency.
- **“Reliability/durability” and “comfort” are other major concerns that many respondents have when replacing heating and cooling equipment.** As illustrated in Table 11, 18% of heating and cooling replacers say their major concern is “reliability/durability” and 16 % mention “comfort.” Respondents who are just replacing their central air conditioning are more concerned with “comfort.” Also, “reliability/durability” tends to be more of a concern among respondents who are replacing both a forced air furnace and central air conditioner.

⁸ Unless otherwise noted, responses recorded in this report are to *unaided* questions. Responses elicited from *aided* questions will be specifically noted.

Table 11: Main concerns when replacing heating or cooling equipment¹

Main Concerns	Percent of respondents with concern			
	All Replacements ²	Furnace and AC	Furnace Only	AC Only
Energy efficiency/lower energy costs	35%	44%	36%	15%
Reliability/durability	18%	28%	17%	8%
Comfort	16%	13%	16%	30%
Need quickly/timing	8%	7%	8%	10%
Proper size for home	8%	9%	8%	10%
Safety	7%	6%	8%	0%
Cost of unit	7%	9%	4%	13%
Total respondents	511	109	294	40

¹ Respondents may have given more than one *unaided* response. Only response categories given by 5 % or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air) and combinations of replacements, not just those categories listed in the final three columns on the right.

- **When asked about “what else they look for” when replacing their heating or cooling equipment, the most frequently mentioned responses are 1) save energy/energy efficiency, 2) reliability, 3) purchase or installation cost, 4) comfort, and 5) reputation of the contractor.** As illustrated in Table 12, other concerns mentioned by 5 % or more of respondents include “speed of installation” and “to improve health/safety.”

Table 12: “What else respondents look for” when replacing heating or cooling equipment¹

Other Concerns	Percent of respondents with concern			
	All Replacements ²	Furnace and AC	Furnace Only	AC Only
Save energy/energy efficiency/reduce operating costs	34%	43%	31%	26%
Reliability	25%	27%	28%	18%
Purchase cost/installation cost	25%	23%	26%	23%
Comfort	15%	16%	15%	13%
Reputation of contractor	14%	11%	15%	8%
Speed of installation	9%	5%	11%	8%
Improve health/safety	5%	3%	5%	5%
Total respondents	498	106	287	39

¹ Respondents may have given more than one response. Only response categories given by 5 % or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air) and combinations of replacements, not just those categories listed in the final three columns on the right.

Equipment Replacements due to Breakdown

- **Respondents replacing heating and cooling equipment due to breakdown are more concerned with getting a replacement unit installed quickly and at an affordable price (it is an unexpected expenditure).** Although “energy efficiency / reduce operating costs” is still the most frequently mentioned main concern, Table 13 shows that “breakdown” purchasers are generally less concerned about energy efficiency and lowering their energy costs as compared to respondents replacing for other reasons (refer to Table 11). When analyzing “what else respondents are concerned about” at the time of replacement, respondents who replaced due to breakdown also showed somewhat less concern about “comfort” and somewhat more concern about “reliability.”

Table 13: Concerns when *replacing* heating and cooling equipment – breakdowns versus other replacements

Main Concerns	Percent of respondents with concern	
	Breakdown	Other
Save energy/energy efficiency/reduce operating costs	28%	41%
Need quickly/timing	13%	4%
Cost of unit	10%	4%
Total respondents	243	268

¹ Respondents may have given more than one response. Only those response categories where substantial differences exist are listed.

Adding Equipment

- **“Comfort” and “energy efficiency” (or a desire to reduce energy costs) are the most frequently mentioned concerns respondents have when *adding* heating and cooling equipment.** As illustrated in Table 14, 31% of survey respondents said that “comfort” was their main concern when *adding* their heating and cooling equipment. Twenty-three percent (23%) site “energy efficiency” or a desire to “lower energy costs” as their main concern.
- **Respondents who are *adding* central air conditioning only are keenly aware of and concerned about “comfort.”** As illustrated in Table 14, 46% of respondents who *added* central air conditioning only said their main concern was “comfort.” This compares to only 19% of respondents who purchase a forced air furnace only.

Table 14: Main concerns when adding heating or cooling equipment¹

Main Concerns	Percent of respondents with concern			
	All Additions ²	Furnace and AC	Furnace Only	AC Only
Comfort	31%	29%	19%	46%
Energy efficiency/lower energy costs	23%	24%	24%	23%
Proper size for home	12%	20%	17%	10%
Reliability/durability	11%	11%	8%	13%
Cost of unit	11%	11%	6%	18%
Total respondents	329	66	79	125

¹ Some respondents gave more than one response. Only response categories mentioned by 5 % or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air) and combinations of additions, not just those categories listed in the final three columns on the right.

- **When asked about “what else they look for” when *adding* heating or cooling equipment, the most frequently mentioned responses are 1) save energy/energy efficiency, 2) comfort, 3) reliability, and 4) purchase or installation cost.** Those respondents adding air conditioning only are most concerned about comfort (see Tables 14 and 15). As illustrated in Table 15, other concerns mentioned by 5% of more or respondents include “reputation of contractor” and “to improve health/safety.”

Table 15: “What else respondents look for” when adding heating or cooling equipment¹

Other Concerns	Percent of respondents with concern			
	All Additions ²	Furnace and AC	Furnace Only	AC Only
Save energy/energy efficiency/reduce operating costs	25%	27%	23%	26%
Comfort	25%	25%	17%	33%
Reliability	21%	20%	22%	22%
Purchase or installation cost	17%	11%	23%	18%
Reputation of contractor	8%	13%	9%	6%
Improve health/safety	8%	8%	8%	8%
Total respondents	316	64	77	121

¹ Some respondents gave more than one response. Only response categories given by 5 % or more of respondents are listed.

² Includes three categories of equipment (furnace, heat pump, central air) and combinations of additions, not just those categories listed in the final 3 columns on the right.

Aided Questions

- **When specifically asked if they questioned their contractor about fixing uneven heating or cooling problems within their home, 34% of survey respondents said they did.** Respondents replacing equipment due to breakdown are slightly less likely to ask about uneven heating and cooling than are respondents who replaced or added equipment for other reasons (28% versus 37%).
- **When specifically asked if they questioned their contractor about energy efficient units, 73% of survey respondents said they did.** While 73% of the respondents indicate they asked their contractor about energy efficient units, Table 11 on page 19 shows that only 35% indicate that energy efficiency was a main concern during the purchase decision process. Consumer response to this question did not vary based on whether or not the equipment was a replacement due to breakdown or some other reason for replacing or adding equipment.

Unaided Questions

- **When respondents were asked what other HVAC problems or concerns they asked their contractor about, the most frequently mentioned concern was “heating and cooling ducts.”** As shown in Table 16, 13% of respondents mentioned that they asked their contractor about “heating or cooling ducts.” Other concerns mentioned by 5% or more of the respondents include “cost of heating” (8%), “proper size for the home” (7%), “home insulation” (5%), “leaky windows” (5%), and “cost of cooling” (5%).

**Table 16: Respondents questions of contractors
(unaided responses)¹**

Concern or problem	Percent of respondents
Heating or cooling ducts	13%
Cost of heating	8%
Proper size of home	7%
Home insulation	5%
Leaky windows	5%
Cost of cooling	5%
	(n = 683)

¹ Only responses mentioned by 5% or more of the respondents are listed.

Contractor and Equipment Selection Process

This sub-section addresses factors that influence the purchasing decision when selecting an air conditioner, furnace or heat pump. We asked respondents which of the following had the most important influence on their purchase decision: the contractor, equipment make or brand, features of specific model, or price and terms. We asked respondents about their reasons for selecting a specific contractor and recorded the first response. We then asked the respondents for additional reasons for selecting the specific contractor. In a similar manner, we asked respondents why they chose a specific make or brand of equipment and why they chose the unit or model that they purchased (i.e. in each case we recorded the first response and then probed for additional responses). Key findings are outlined below.

Aided Question

- **In an *aided* question, the “contractor” was the most important element of the decision making process when purchasing a new air conditioner, furnace, or heat pump.** Of the 749 respondents, 32% said the “contractor” was the most important aspect of the decision making process, 24% said it was the “price and terms,” 18% said it was the ‘make or brand,’ and 16% said that it was the “features of the specific model.” The remaining 10% didn’t know or are not sure what was the most important element of the decision making process.

Unaided Questions

- **The primary reason for selecting a contractor is because of his or her “reputation.”** As illustrated in Table 17, 48% of the respondents choose a contractor based upon his or her “reputation.” About one-fourth (24%) choose contractors because they are “trusted contractors” and 15% choose a contractor because he or she offers the “best price.”

Table 17: Respondent reasons for selecting a specific contractor¹

Reason	Percent of respondents		
	Gave as first reason	Gave as additional reasons	Total
Reputation	41%	26%	48%
Trusted contractor	14%	42%	24%
Best price	12%	10%	15%
Friend or relative recommended	6%	3%	7%
Balance of price and other features	3%	7%	5%
Helped me/went out of way	2%	14%	5%
	(n = 748)	(n = 182)	(n = 748)

¹ Only those responses mentioned by 5% or more of the respondents are listed.

- **The primary reason for selecting a specific product brand or make is because of the “reputation of the manufacturer.”** As illustrated in Table 18, 30% of the respondents indicate the primary reason for selecting a specific equipment brand or make is due to “manufacturer’s reputation.” One-third (33%) indicate that “manufacturer’s reputation” is *one* of the reasons.

Table 18: Respondent reasons for selecting a specific product brand or make

Reason	Percent of respondents		
	Gave as first reason	Gave as additional reasons	Total
Reputation of manufacturer	30%	29%	33%
Best Price	9%	12%	10%
Did not care about make/brand	9%	0%	9%
Higher energy efficiency	6%	29%	9%
Felt it would provide best comfort	6%	16%	7%
Balance of price and other features	4%	11%	5%
	(n = 748)	(n = 76)	(n = 748)

¹ Only those responses mentioned by 5% or more of the respondents are listed.

- **The primary reason for selecting a specific unit or model of equipment is because it has the “best features.”** Seventeen percent (17%) of the respondents indicate that the primary reason for selecting a specific unit or model of furnace, air conditioner or heat pump is because the model or unit has the “best features.” Other reasons for selecting a specific unit or model are listed in Table 19.

Table 19: Respondent reasons for selecting a specific unit or model

Reason	Percent of respondents		
	Gave as first reason	Gave as additional reasons	Total
Best features	17%	25%	21%
Contractor recommended it	15%	4%	15%
Best reliability	13%	29%	17%
Best price	11%	17%	14%
Higher energy efficiency	10%	19%	13%
Did not care about unit or model	7%	0%	7%
Balance of price and other features	4%	12%	6%
Offered best comfort	4%	14%	6%
	(n = 748)	(n = 117)	(n = 748)

¹ Note: Only those responses mentioned by 5% or more of the respondents are listed.

Payment Methods and Important Financing Features

This sub-section presents the results of four questions respondents were asked relative to methods of financing heating and cooling equipment. First, we asked respondents how they paid for their new equipment. We asked those respondents who financed their equipment purchase where they got their loan. Finally, we asked both those who financed and those who did not finance their purchase equipment how important low interest rates and contractor handling of the application are in a financing program. Key findings are outlined below.

- **Nearly 80% of survey respondents said they paid for the heating and cooling equipment they replaced or added with their own money.** As illustrated in Table 20, 33% of survey respondents paid for their equipment through their next paycheck, 27% paid out of their savings, and 17% paid in cash or by check.

Table 20: Payment method

	Percent of respondents
Next paycheck	33%
Savings	27%
Cash/check	17%
Loan/financing	11%
Agreement with contractor	6%
Credit card	5%
	(n = 749)

- **One-third of the respondents who got a loan or financing got their loan through a bank.** As illustrated in Table 21, 33% of borrowers received their financing from the “bank,” 13% through the “contractor,” 10% through “PG&E,” and 10% through a “mortgage company.” Other methods of financing are shown in Table 21.

Table 21: Source of loan

	Percent of respondents
Bank	33%
Contractor	13%
PG&E	10%
Mortgage Company	10%
Credit Union	8%
Finance Company	8%
Other Utilities	5%
Savings and Loan	4%
Some other source	6%
	(n = 83)

Aided Questions

- **When asked if a “low interest rate” is an important component of a financing program for HVAC equipment, 85% of survey respondents who financed the purchase of their equipment said that it is important.** As illustrated in Table 22, 65% of all other purchasers said that a “low interest rate” is important in the decision to finance heating and cooling equipment.
- **When asked if “having contractors take the application” is an important component of a financing program for HVAC equipment, 61% of survey respondents who financed the purchase of their equipment said that is important.** As illustrated in Table 22, 44% of all other purchasers said that “contractors who take the application” is important in the decision to finance heating and cooling equipment.

Table 22: Important financing features

Feature	Percent of respondents	
	Borrowers	All Others
Low interest rate is important	85%	65%
Application through contractor is important	61%	44%
	(n = 85)	(n = 663)

Satisfaction with HVAC project

This sub-section addresses customer satisfaction with new furnaces, air conditioners, and heat pumps. We asked respondents if they are satisfied with the comfort, quality of installation, reliability, and energy costs of their new heating or cooling equipment. Key findings are outlined below.

- **Most respondents are satisfied with the *comfort* of their new furnace, air conditioner or heat pump.** As illustrated in Table 23 below, 89% of survey respondents indicate they are either “satisfied” or “somewhat satisfied” with the comfort of their new equipment. In addition, Table 23 illustrates satisfaction with comfort both among respondents who *added* a new piece of equipment and also among respondents who *replaced* an existing piece of equipment.

Table 23: Respondent satisfaction with equipment *comfort*

Level of Satisfaction	Percent of respondents		
	Replacements	Additions	Total
Satisfied	74%	71%	74%
Somewhat satisfied	18%	20%	15%
Neither satisfied nor dissatisfied	3%	4%	4%
Somewhat dissatisfied	2%	2%	3%
Not at all satisfied	2%	1%	2%
Don't Know	1%	2%	2%
	(n = 510)	(n = 329)	(n = 748)

- **Most respondents are satisfied with the *quality of installation* of their new furnace, air conditioner or heat pump.** As illustrated in Table 24 below, 89% of the respondents indicate they are either “satisfied” or “somewhat satisfied” with the quality of installation. In addition, Table 24 illustrates satisfaction with installation both among respondents who *added* a new piece of equipment and also among respondents who *replaced* an existing piece of equipment.

Table 24: Respondent satisfaction equipment *installation*

Level of Satisfaction	Percent of respondents		
	Replacements	Additions	Total
Satisfied	76%	72%	74%
Somewhat satisfied	13%	17%	15%
Neither satisfied nor dissatisfied	4%	3%	4%
Somewhat dissatisfied	3%	4%	3%
Not at all satisfied	2%	1%	2%
Don't Know	2%	3%	2%
	(n = 510)	(n = 329)	(n = 748)

- **Most respondents are satisfied with the *reliability* of their new furnace, air conditioner, or heat pump.** As illustrated in Table 25 below, 90% of the respondents indicate they are either “satisfied” or “somewhat satisfied” with the reliability. In addition, Table 25 illustrates satisfaction with reliability both among respondents who *added* a new piece of equipment and also among respondents who *replaced* an existing piece of equipment.

Table 25: Respondent satisfaction with equipment *reliability*

Level of Satisfaction	Percent of respondents		
	Replacements	Additions	Total
Satisfied	81%	80%	80%
Somewhat satisfied	10%	11%	10%
Neither satisfied nor dissatisfied	2%	2%	2%
Somewhat dissatisfied	2%	2%	2%
Not at all satisfied	2%	1%	2%
Don't Know	3%	4%	4%
	(n = 510)	(n = 329)	(n = 748)

- Among survey respondents, the level of satisfaction with *energy costs* for operating a new furnace, air conditioner, or heat pump is significantly lower than the level of satisfaction with comfort, quality of installation, and reliability.** As illustrated in Table 26 below, 72% of the respondents indicate they are either “satisfied” or “somewhat satisfied” with the energy costs. In addition, Table 26 illustrates satisfaction with energy costs both among respondents who *added* a new piece of equipment and also among respondents who *replaced* an existing piece of equipment.

Table 26: Respondent satisfaction equipment *energy costs*

Level of Satisfaction	Percent of respondents		
	Replacements	Additions	Total
Satisfied	48%	44%	46%
Somewhat satisfied	25%	28%	26%
Neither satisfied nor dissatisfied	12%	14%	13%
Somewhat dissatisfied	5%	5%	5%
No at all satisfied	4%	2%	4%
Don't Know	6%	7%	6%
	(n = 510)	(n = 329)	(n = 748)

Participation in Past PG&E Programs

This sub-section addresses customer participation in PG&E programs or services. We asked respondents if they have participated in PG&E energy efficiency programs such as one that provides either information on how to save energy, a rebate for purchasing energy efficient equipment, or a zero (or low interest) loan for purchasing energy efficient equipment. We also asked them if they have ever called the PG&E Smarter Energy Line.

- Over one-third (38%) of the respondents report participation in a PG&E energy efficiency program.** Over half (64.4%) of the respondents who indicated participation in a PG&E energy efficiency program did not know or could not recall the name of the program. Table 27 illustrates participation in energy efficiency programs.

Table 27: Respondent participation in PG&E energy efficiency programs¹

Program	Number of respondents	Percent of respondents
Insulation Program	21	7.4%
Audit/Home Energy Survey	14	4.9%
ZIP Loan	12	4.2%
Refrigerator Rebate	9	3.2%
Washer/Dryer Rebate	7	2.5%
Appliance Rebate	5	1.8%
Solar Program	4	1.4%
Budget Plan	3	1.1%
Comfort Home	2	.7%
Furnace Rebate	2	.7%
Dual Pane Windows	2	.7%
Weatherization/Showerheads/CFL	1	.4%
Energy Star	1	.4%
Seasonal billing	1	.4%
Balance Plus	1	.4%
Water Heater	1	.4%
Other	18	6.3%
Don't Know/Don't Recall	183	64.4%
	(n= 284)	

¹ Some respondents gave more than one response.

- **About one-fifth (19%) of the respondents have called the PG&E Smarter Energy Line.** When asked specifically if they had ever called the PG&E Smarter Energy Line, 19% responded that they had done so. *Note: In response to an earlier unaided question asking where respondents get information about a contractor, 4% indicated they called the PG&E Smarter Energy Line. (See Table 8.)*

Section VI: Summary and Conclusions

Market transformation has emerged as a central policy objective of future publicly-funded energy efficiency programs in California.⁹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. The primary objective of this report is to help PG&E understand the equipment purchase process from the perspective of recent purchasers (last five years) of HVAC equipment. A better understanding of the barriers to the installation of energy efficient HVAC equipment and related services among residential customers will lead to future program designs that will affect a lasting market transformation. All respondents in this study own and live in a single family home, duplex, or townhouse. (These residences will be referred to collectively as “single-family households” throughout this summary.)

To address the research issues, Opinion Dynamics Corporation (ODC) surveyed 803 recent purchasers of HVAC equipment.¹⁰ Based upon the total number of single family households in PG&E’s service territory (3,109,100 as of 1994), study results provide a precision of $\pm 3.5\%$ at the 95% confidence level. Specific objectives of the survey range from establishing equipment installation rates by PG&E climate zone to baselining consumer purchasing patterns and practices to exploration of the role financing plays in the equipment selection and purchasing process. Key research findings are summarized below.

⁹ For a general discussion of market transformation issues, see “A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs.” (Eto, et.al., July 1996)

¹⁰ HVAC equipment was defined as a “central forced-air furnace,” a “central forced-air heat pump,” or a “central air conditioner.”

Summary

Units Sales in PG&E's Service Territory

- **An estimated 116,677 forced air furnaces are installed in owner-occupied single-family homes in PG&E's service territory per year.** The majority of these units are installed in the Hill (40,896) and Valley (37,741) climate zones.
- **An estimated 27,302 forced air heat pumps are installed in owner-occupied single-family homes within PG&E's service territory per year.** The majority of these units are being installed in the Valley (10,963) and Hill (7,295) climate zones.
- **An estimated 84,352 central air conditioners are installed in owner-occupied single-family homes within PG&E's service territory per year.** The majority of these units are being installed in the Valley (33,967) and Hill (27,633) climate zones.
- **Significantly more replacements (as opposed to additions) of forced air furnaces are taking place in the Coastal and Hill climate zones.** Over 70% of forced air furnace installations in these climate zones are replacements.
- **Significantly more additions (as opposed to replacements) of central air conditioning equipment are taking place in the Coastal and Hill climate zones.** Nearly 80% of central air conditioning installations in the Coastal climate zone are additional or new equipment.

Reasons for and Timing of Equipment Replacements

- **Few consumers replace HVAC equipment prior to the end of its useful life.** Eighty-five percent (85%) of all replacements were made for "end-of-life" reasons. These include "breakdown," "unit getting old," "unit needing repairs," "inspector recommendation," "contractor convinced purchaser," "afraid unit would breakdown," and "utility red-tag."
- **When HVAC equipment breaks down, the timeframe for replacement is considerably shorter than it is for other replacement situations.** Fifty-five percent of breakdowns are replaced within a one-week period as compared to only 22% of units replaced for other reasons.

Reasons for and Timing of Equipment Additions

- **In the vast majority of cases, HVAC equipment is being added to single-family owner-occupied homes and townhouses as a “stand alone project” and not as part of a home remodeling project or addition.** Consumers are simply deciding to add equipment they did not have before (mainly for increased comfort) and these decisions are being made independent of other home improvement initiatives.
- **The timeframe for adding HVAC equipment is considerably longer than it is for equipment replacements.** Only 17% of survey respondents who added HVAC equipment needed to get the work done within one week. Twice as many respondents who are replacing existing HVAC equipment (38%) need the work done within one week.

Contractor Search and Selection Process

- **When selecting an HVAC contractor, consumers most frequently (61% of the time) rely on their own past experience or word-of-mouth referrals from friends, relatives, or neighbors.** Twenty percent of those replacing or adding equipment look to the yellow pages or phone book to help them identify contractors.
- **The average HVAC purchaser obtains 1.8 bids as part of the contractor and equipment selection process.** Over one-half of consumers simply call a single contractor and have them do the work, requesting no bids or only one bid.

Salespeople and HVAC Service Offerings

- **According to purchasers, “energy efficiency benefits” is the attribute mentioned most frequently by the salesperson during the sales process.** “Reliability,” and “reputation” (both contractor and brand), and “cost” are the next most frequently mentioned topics.
- **Salespeople discuss many issues that impact overall energy efficiency and occupant comfort during the sales process.** For example, 73% of consumers said their contractor specifically discussed the need to properly size the equipment; 53% recommended checking and repairing ductwork, and 49% recommended installing a new clock or set-back thermostat.

- **When selling replacement central air conditioning or heat pump equipment, salespeople do not routinely suggest checking or replacing the indoor coil when replacing the outdoor condenser unit.** Only 25% of respondents indicate that salesperson recommended checking or replacing the indoor coil when replacing their central air conditioning or heat pump.
- **Salespeople frequently suggest that consumers add or replace other HVAC equipment (e.g., central air, heat pump, forced air furnace) even though the consumer's initial interest was only with respect to one type of equipment.** For example, 62% of consumers who were initially interested in central air conditioner replacement said their contractor suggested replacing their forced air furnace at the same time. Another 52% said that their contractor suggested replacing or adding a central air conditioner at the same time they inquired about replacing their forced air furnace.

Consumer Concerns During the HVAC Purchase Process

- **Energy efficiency (sometimes expressed as a desire to reduce energy costs) is the most frequently mentioned concern consumers have when *replacing* heating or cooling equipment.** Reliability/durability and comfort are other frequently mentioned concerns consumers have during the purchasing process.
- **Consumers *replacing* heating and cooling equipment due to breakdown are concerned with reliability, quick installment, and an affordable price.** Compared to other HVAC equipment purchasers, this group of purchasers is less concerned about energy efficiency and comfort.
- **Consumers *adding* HVAC equipment (central air conditioning equipment in particular) are primarily concerned about comfort.** Energy efficiency or a desire for low energy costs is the next most frequently mentioned concern among consumer adding HVAC equipment.
- **When specifically asked if they questioned their contractor about energy efficiency, 75% of consumers purchasing HVAC equipment said "yes," suggesting that energy efficiency is a "hot topic" among consumers and contractors.** When specifically asked if they asked their contractor about uneven heating or cooling, 34% of those adding or replacing HVAC equipment said "yes."

Contractor and Equipment Selection Process

- **According to consumers, their choice of a contractor is the most important element of the decision making process when adding or replacing HVAC equipment.** Thirty-two percent of consumers said the contractor is the most important aspect of the decision making process, 24% said it is price and terms, 18% said it is make or brand, and 16% said it is specific model features.
- **Consumers most frequently choose an HVAC contractor based upon reputation, which is established through past work or word-of-mouth.** Almost one-half (48%) of purchasers choose a contractor based on his or her reputation and 25% choose a contractor because they “trusted” him or her.
- **A manufacturer’s reputation is the most frequently mentioned reason for selecting a specific brand or make of HVAC equipment.** This was mentioned three times as often as any other reason.

Importance of Financing and Financing Features

- **Only 11% of HVAC equipment purchasers indicate they financed their equipment purchase, and over one-third of them get a loan from the bank.**
- **The vast majority of consumers who finance their HVAC purchases think that a “low interest rate” and “contractors taking the application” are important components to a financing program.**

Satisfaction with HVAC Equipment

- **Consumers who have replaced or added HVAC equipment are highly satisfied with the comfort provided, the quality of the installation, and the reliability of the equipment installed.**
- **Consumers are most dissatisfied with the energy costs of running their new or replacement equipment.** However, it is difficult to tell if this dissatisfaction is primarily driven by what some might see as relatively high electricity rates or by dissatisfaction with the level of savings they expected.

Past Participation in PG&E Energy Efficiency Programs

- **Over one-third (38%) of survey respondents have participated in at least one PG&E energy efficiency program.**

Conclusions

Customer Decision Making—most customers are *making decisions as quickly as possible*.

One-half of respondents obtained no bids or just one bid. Customers who replaced broken down equipment consider information, make their decision and accept bids very quickly: 19% the same day, 40% by the second day, and 60% by the third day. Further, in each of the two major choices, large groups of customers *rely on brand and reputation*. They select a contractor based on “reputation” and a brand based on the “manufacturer’s reputation.”

Replacement Market and Addition Market—there are clear differences in types of equipment being replaced or added, purchase reasons, main concerns, and purchase timing.

Characteristic	Replacement Market	Addition Market
Type of Equipment	Two-thirds of furnaces are being sold to replace existing units.	Three out of every five air conditioners are additions.
<u>Purchase Reason</u>	<p>Replacements are made at the end of the equipment’s useful life.</p> <p>The following “end-of-life” reasons were given for replacement purchases:</p> <ul style="list-style-type: none"> • breakdown (48%) • getting old (21%) • needing too many repairs (17%) • home inspector recommended (5%) 	<p>Additions are made to provide heating or cooling where central equipment was not present, to increase comfort, or to condition new space:</p> <ul style="list-style-type: none"> • did <i>not</i> have <ul style="list-style-type: none"> ➢ AC (24%) ➢ furnace (14%) ➢ heat pump (3%) • comfort (20%) • remodeling (7%) • adding more space (6%)
<u>Main Customer Concerns</u>	<ol style="list-style-type: none"> 1. Energy efficiency / lower energy costs 2. Reliability / durability 3. Comfort 4. Need quickly / timing 	<ol style="list-style-type: none"> 1. Comfort 2. Energy Efficiency / lower energy costs 3. Proper size for home 4. Reliability / durability
Purchase Timing	<p>Many customers need replacements very quickly:</p> <ul style="list-style-type: none"> • 25% of respondents replacing equipment need it in 3 days, • 38% in one week, and • 45% within 3 to 4 weeks. 	<p>Far fewer customers need additional units quickly:</p> <ul style="list-style-type: none"> • only 9% need additional equipment within 3 days, • 17% within one week, and • 23% within 3 to 4 weeks

PHONE

FIPS

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ODCID

CLMAT

climate
 desert/mountain R
 valley S
 coastal T
 hill X

SAMP

ODC sample 1
 RDI sample 0

START

Hello, my name is _____. I'm doing research on home comfort and energy efficiency. I am not selling anything. I'm calling from Opinion Dynamics, for Pacific Gas & Electric Company. PG&E is collecting information to help customers- like you - save money and energy. This is not a sales call. I'd like to ask a few questions that should take less than 5 minutes.
 continue..... 1 D

Q1

Do you use natural gas in your home? (CLARIFY: not propane or "LP" that's stored in a tank outside your home)
 Yes 1
 NO..... 2 => Q3
 (Don't know/Not sure)..... 3 => Q3

Q2

Does PG&E provide natural gas to your home?
 Yes 1
 No 2
 (Don't know/Not sure)..... 3

Q3

Does PG&E provide electricity to your home?
 Yes 1 => Q4
 NO..... 2
 (Don't know/Not sure)..... 3

=> +1 if	Q1=1 AND Q2=1
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Thank you for your time. Today we are speaking with people who receive natural gas or electric service from PG&E.
 (Not PG&E customer)..... 31 => END

Q4

What type of dwelling do you live in?

(PROBE. Is it a single family house?)

- Single Family home.....01
- Duplex.....02
- Townhouse.....03
- Mobile Home.....04
- 2-4 unit apartment.....05
- 4+ unit apartment.....06
- (Other).....07 O
- (Don't know).....98

Q5

Do you own or rent this dwelling?

- Own.....1 => INT32
- Rent.....2
- (Don't know).....3 => INT32

Would you please tell me the name and phone number of your landlord or property manager?

NAME: @q5n
 CITY: @q5c
 PHONE #: @q5p

(If refused, type the word REFUSED in the name space.)

Q5N

Would you please tell me who the landlord or property management firm is? (Obtain

NAME, TELEPHONE NUMBER, and LOCATION CITY.)

(If refused, type the word refused in NAME space.)

Q5C

landlord city

Q5P

landlord phone

Q6

How important is the size of your energy utility bill when you choose a place to rent?

- Very important.....1
- Somewhat important.....2
- Neither important nor unimportant.....3
- Somewhat unimportant.....4
- Not important at all.....5
- (Don't know/Not sure).....6

Q7

How important is having a heating and cooling system that keeps you comfortable when you choose a place to rent?

- Very important 1
- Somewhat important 2
- Neither important nor unimportant..... 3
- Somewhat unimportant..... 4
- Not important at all 5
- (Don't know/Not sure)..... 6

Q8

(ENTER NUMBER OF YEARS 98=Don't know 99=Refused 00=Less than 1 year)

How many years have you lived at this location?

- Less than 1 Year..... 00 I
- (Don't know) 98 I
- (Refused)..... 99 I

Q9A

Has the furnace been replaced while you have lived here?

- Yes 1
- No 2
- (No, was told it was new when I moved in) 3
- (Don't have a furnace) 4
- (Don't know/Not sure)..... 5

Q10

Has the air conditioner been replaced while you have lived here?

- Yes 1
- No 2
- (No, was told it was new when I moved in) 3
- (Don't have a air conditioner)..... 4
- (Don't know/Not sure)..... 5

=> +1 if Q4=#1,#2,#3 AND Q5=#1

Thank you for your time. That's all the questions I have.

- (Renter/Multi-family)..... 32 => END

Q11

Have you installed a central forced-air furnace in your home since January 1994?

(PROBE:A central furnace that delivers hot air throughout your entire home)

- Yes 1
- NO..... 2 => Q14
- (Do not have a central furnace) 3 => Q14
- (Don't know/Not sure)..... 4 => Q14

Q12

Was this central furnace a replacement for an existing furnace or an additional or new furnace?

- Replacement..... 1
- Additional/New..... 2
- (Don't know/Not sure)..... 3

Q13

In what year did you install this central furnace?

- 1999 1
- 1998 2
- 1997 3
- 1996 4
- 1995 5
- 1994 6
- (Don't know/Not sure)..... 7

Q14

Have you installed a central forced-air heat pump in your home since January 1994? (PROBE:A central heat pump that delivers hot air for heating and cool air for cooling throughout your entire home)

- Yes 1
- NO..... 2 => Q17
- (Do not have a heat pump)..... 3 => Q17
- (Don't know/Not sure)..... 4 => Q17

Q15

Was this heat pump a replacement for an existing heat pump or an additional or new heat pump?

- Replacement..... 1
- Additional/New..... 2
- (Don't know/Not sure)..... 3

Q16

In what year did you install this heat pump?

- 1999 1
- 1998 2
- 1997 3
- 1996 4
- 1995 5
- 1994 6
- (Don't know/Not sure)..... 7

Q17

Have you installed a central air conditioner in your home since January 1994? (PROBE: This does not include room or window air conditioners or evaporative ("swamp") coolers.)

- Yes 1
- NO.....2 => INT33
- (Do not have a central air conditioner).....3 => INT33
- (Don't know/Not sure).....4 => INT33

Q18

Was this central air conditioner a replacement for an existing air conditioner or an additional or new air conditioner?

- Replacement..... 1
- Additional/New.....2
- (Don't know/Not sure).....3

Q19

In what year did you install this central air conditioner?

- 1999 1
- 1998 2
- 1997 3
- 1996 4
- 1995 5
- 1994 6
- (Don't know/Not sure)..... 7

=> +1 if Q11=1 OR Q14=1 OR Q17=1

Thank you, that's all the questions I have. If you have any questions for PG&E, please call the PG&E Smarter Energy Line at 1 (800) 933-9555. They will be happy to answer your questions.

- (Did not install any equipment).....33 => END

Thank you for your time. We'd like to ask you some additional questions about your experiences when you bought your <REPF > <addf > <REPP > <addp > <mult4> <repa > <ADDA >. Are you the person in your household who played the main role in purchasing this equipment? Again, I'd like to emphasize that this is not a sales call.(PROBE: Who talked to the contractor and made the decision what to get?)

(PROBE: THIS SHOULD ONLY TAKE 10-12 MINUTES)

- YES-CONTINUE 1
- NO-ASK TO SPEAK WITH CORRECT PERSON OR SET UP A CALLBACK OR TERMINATE IF NOT AVAILABLE.....2

Q24

=> Q28 if NOT(Q12=1 OR Q14=1 OR Q17=1)

(ENTER ALL THAT APPLY)

- Why did you buy the <repf > <repp > <repm4> <repa >? (Listen, then confirm reason)
- (The old unit broke down).....01
 - (The old unit required too many repairs).....02
 - (We were selling home)03
 - (Buyer's inspection said we had to replace the old unit)04
 - (Had utility inspect old unit and they `red-tagged' it).....05
 - (Had home inspected and Inspector recommended replacing old unit).....06
 - (Contractor convinced me old unit needed to be replaced).....07
 - (Unit was getting old).....08
 - (Did not want old unit to break down at a bad time)09
 - (We were doing extensive remodeling and needed to replace EQUIP)10
 - (Other).....11 O
 - (Don't know/Don't recall).....98 X

Q25

Was the replacement covered by a Home Warranty? (Probe: you might have had a home warranty if you had bought an older home and the seller included a warranty.)

- Yes 1
- NO.....2
- (Don't know/Not sure).....3

Q27

How quickly did you need this equipment? (Listen, then confirm timing)

- (Same day) 1
- (Next day)2
- (Two days)3
- (Three days)4
- (One week).....5
- (Two weeks).....6
- (Three to four weeks).....7
- (Before next heating / cooling season)8
- (Don't know/Don't recall).....9

Q28

=> Q30 if NOT (Q12=2,3 OR Q15=2,3 OR Q18=2,3)

(ENTER ALL THAT APPLY)

- Why did you add the <addf > <addp > <addm4> <adda >? (Listen, then confirm reason)
- (Added more space onto home and needed another unit for new space01
 - (Remodeled and needed to add furnace / heat pump /airconditioner02
 - (Did not have an air conditioner03
 - (Did not have a heat pump)04
 - (Did not have a furnace).....05
 - (Added AC while replacing furnace)06
 - (Other).....07 O
 - (Don't know/Don't recall).....98 X

Q29

How quickly did you need the equipment? (Listen, then confirm timing)

- (In two or three days) 1
- (One week)..... 2
- (Two weeks)..... 3
- (Three or four weeks)..... 4
- (Two months)..... 5
- (Before next heating / cooling season) 6
- (Don't know/Don't recall) 7

Q30

(LISTEN, THEN CONFIRM ANSWERS. PROBE FOR OTHERS)

Where did you look for a heating or cooling provider that could help you?

- (Called a contractor) 01
- (Called the Home Warranty Company)..... 02
- (Looked in Yellow Pages/Phone book)..... 03
- (Looked in Newspaper ads) 04
- (Called large retailer (such as Sears or Montgomery Wards) that services equipment) 05
- (Called PG&E Smarter Energy Line - PG&E's 1-800 number) 06
- (Called "Value Star" listings)..... 07
- (Searched the Internet) 08
- (Other)..... 09 O
- (Don't know) 98 X

Q35

(ENTER NUMBER OF CONTRACTORS, DEALERS INSTALLERS - 98=Don't know)

About how many bids did you get? (get their best estimate)

- \$E 0 50
- don't know 98 I

Q39

How long after you started to call contractors did you accept a bid and sign a contract?

(Listen and clarify, DO NOT READ. Record best match)

- (Same day) 1
- (Next day) 2
- (Two days) 3
- (One week)..... 4
- (Two weeks)..... 5
- (Three to four weeks)..... 6
- (A month or two)..... 7
- (A few months)..... 8
- (Don't recall/Not sure)..... 9

Q40

=> Q42 if	NOT(Q12=1 OR Q15=1 OR Q18=1)
-----------	------------------------------

When you replaced the <refp > <repp > <repm4> <repa >, what was your main concern?
 (record verbatim)
 (OPEN RESPONSE BOX)00 DO
 (Don't know/Don't recall)98 X

Q41

When you replaced the <refp > <repp > <repm4><repa >, what else were you looking for?
 (listen & record, then probe other concerns - DO NOT READ CATEGORIES)

- (Speed of installation)01
- (Purchase cost of unit).....02
- (Installation cost of unit)03
- (Operating cost of unit)04
- (Reputation of contractor or brand of equipment).....05
- (Reliability)06
- (Comfort)07
- (Improving health and safety in home).....08
- (Save energy/Energy efficiency concerns)09
- (Better for environment)10
- (Other).....11 O
- (Don't know)98 X

Q42

=> Q44 if	NOT(Q12=2,3 OR Q15=2,3 OR Q18=2,3)
-----------	------------------------------------

When you added the <addf > <addp > <addm4> <adda >, what was your main concern?
 (record verbatim)
 (OPEN RESPONSE BOX)00 DO
 (Don't know/Don't recall)98 X

Q43

When you added the <addf > <addp > <addm4> <adda >, what else were you looking for?
 (listen & record, then probe other concerns - DO NOT READ CATEGORIES)

- (Speed of installation)01
- (Purchase cost of unit).....02
- (Installation cost of unit)03
- (Operating cost of unit)04
- (Reputation of contractor or brand of equipment).....05
- (Reliability)06
- (Comfort)07
- (Improving health and safety in home).....08
- (Save energy/Energy efficiency concerns)09
- (Better for environment)10
- (Other).....11 O
- (Don't know)98 X

Q44

Next, I'd like to explore some specific questions or concerns you might have asked contractors. Did you ask about fixing uneven heating or cooling? (PROBE: some rooms not getting enough heating or cooling)

- Yes 1
- NO..... 2
- (Don't know/Not sure)..... 3

Q47

(LISTEN AND CONFIRM ANSWERS, PROBE FOR ADDITIONAL INFORMATION)

- What other heating or cooling problems or concerns did you ask about?
- (Concerns about heating/cooling ducts) 01
 - (Leaky windows)..... 02
 - (Home insulation)..... 03
 - (Concern about cost of heating) 04
 - (Concern about cost of cooling) 05
 - (Concern about window shading)..... 06
 - (Concern about air filtration/allergies) 07
 - (Other)..... 08 O
 - (Don't know/Not sure)..... 09

Q49

Did you ask about energy-efficient units?

- Yes 1
- NO..... 2
- (Don't know/Don't recall) 3

Q50

(ENTER ALL THAT APPLY - DO NOT READ LIST)

What did the salesperson emphasize when you talked about your <repf > <addf > <repp > <adp > <mult4> <repa > <adda >? (LISTEN, CLARIFY, AND PROBE FOR ADDITIONAL TOPICS)

- (Speed of installation) 01
- (Total cost of installation) 02
- (Discounts)..... 03
- (Financing)..... 04
- (Reputation of contractor or brand of equipment)..... 05
- (Reliability) 06
- (Improved comfort)..... 07
- (Warranty)..... 08
- (Save energy/Energy efficiency benefits)..... 09
- (Better for environment) 10
- (Other)..... 11 O
- (Don't know/Don't recall) 98 X

Did the sales person mention any of the following special features or options?
 continue..... 1 D

Q51A

Rotation => Q56G

- Did the sales person recommend checking and repairing ductwork if needed?
- Yes 1
 - No 2
 - (Don't know/Don't recall) 3

Q51B

Did the sales person mention properly sizing the <repf > <adda > <repp > <addp > <mult4> <repa > <adda > for your home?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q51E

Did the sales person mention installing a new clock or set-back thermostat?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q51G

=> +1 if NOT Q12=1

Did the sales person mention Replacing or adding an air conditioner at the same time as replacing your furnace?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q53G

=> +1 if NOT (Q15=1 OR Q18=1)

Did the sales person mention checking and maybe replacing indoor coil while replacing the outdoor unit?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q55G

=> +1 if NOT Q18=1

Did the sales person mention replacing your furnace at the same time as replacing your air conditioner?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q56G

=> +1 if NOT Q18=2,3

Did the sales person mention replacing your furnace at the same time as adding your air conditioner?

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q57

Did the salesperson offer you a service agreement - sometimes called an extended warranty or maintenance contract?

- Yes 1
- No 2 => Q58
- (Don't Know/Don't Recall) 3 => Q58

Q57A

Did you buy a service agreement?

- Yes 1
- No 2
- (Don't Know/Don't Recall) 3

Q58

Thinking back to when you decided to buy the equipment, which of the following was MOST important to you? Was it . . . (READ LIST)

- The contractor 1
- The make or brand of the equipment 2
- Features of specific model 3
- Price and terms 4
- (Don't know/Not sure) 5

Q59

(DO NOT READ LIST)

What were your reasons for selecting a specific contractor? (BE SURE TO RECORD FIRST THING MENTIONED FIRST!!!)

- (Did not care about a specific contractor)01 X
- (Best price).....02
- (Best balance of price and other features).....03
- (Discount was available through that contractor / dealer).....04
- (Financing was available through that contractor / dealer).....05
- (Reputation of contractor).....06
- (Trusted contractor)07
- (Contractor helped me / went out of their way to meet my needs)08
- (Best quality staff).....09
- (Trained / Certified technicians)10
- (Felt that contractor / dealer would deliver best work)11
- (Felt that contractor / dealer would deliver best comfort)12
- (Contractor / dealer offered higher (energy) efficiency)13
- (Able to get and install unit when I needed it)14
- (Other).....15 O
- (Don't know/Not sure).....98 X

Q60

(DO NOT READ LIST)

What were your reasons for selecting a specific make or brand? (MAKE SURE TO ENTER THE FIRST THING MENTIONED FIRST!!!)

- (Did not care about make / brand).....01 X
- (Best price).....02
- (Balance of price and other features)03
- (Discount was available for that make / brand).....04
- (Financing was available for that make / brand)05
- (Reputation of manufacturer of that make / brand)06
- (Felt that make / brand would provide best comfort)07
- (Able to get unit when I needed it).....08
- (Higher (energy) efficiency for that make / brand).....09
- (Other).....10 O
- (Don't know/Not sure).....98 X

Q61

(DO NOT READ LIST)

What were your reasons for choosing the unit or model you bought? (MAKE SURE TO LIST THE FIRST THING MENTIONED FIRST!!!)

- (Did not care about the unit or model)01 X
- (Best price).....02
- (Balance of price and other features)03
- (Discount was available on that model)04
- (Financing was available on that model).....05
- (Best features)06
- (Best reliability)07
- (Able to get unit when I needed it).....08
- (That model offered best comfort)09
- (That model offered higher (energy) efficiency) 10
- (Other)..... 11 O
- (Don't know/Not sure).....98 X

Q62

How did you pay for the equipment?

- Savings01 => TXT66
- Next paycheck (cash flow)02 => TXT66
- Agreement with contractor / dealer to pay over a couple of months03 => TXT66
- Credit card.....04 => TXT66
- Loan / financing05
- Other06 O => TXT66
- (Don't know)98 => TXT66
- (Refused).....99 => TXT66

Q63

Where did you get the loan?

- Through the contractor (retail installment).....01
- Bank02
- Savings and loan03
- Mortgage company.....04
- Credit union05
- Finance company06
- Other07 O
- (Don't know)98 X

Which of the following features would be important to you in a financing program for furnaces, heat pumps or air conditioners?

- continue..... 1 D

Q66A

Would a lower interest rate for high efficiency equipment be important?

- Yes 1
- No2
- (Don't know/Not sure).....3

Q66F

Would having the application handled by the contractor be important?

- Yes 1
- No 2
- (Don't know/Not sure)..... 3

We are almost done. I have just two more short sets of questions. For the next five questions about your equipment, please tell me how satisfied or dissatisfied you are. I'd like you to use a five-point scale where "5" means "Satisfied", "4" means "Somewhat Satisfied", "3" means "Neither Dissatisfied nor Satisfied", "2" means "Somewhat Dissatisfied", and "1" means "Not at All Satisfied".

continue..... 1 D

Q67

Rotation => Q70

How satisfied or dissatisfied are you with the comfort your <repf > <addf > <repp ><addp > <mult4> <repa > <adda > provides?

- Not at all satisfied 1
- Somewhat dissatisfied 2
- Neither dissatisfied nor satisfied 3
- Somewhat satisfied..... 4
- Satisfied..... 5
- (Don't know) 6

Q68

How satisfied or dissatisfied are you with the quality of the installation work done by the contractor who installed your <repf > <addf > <repp > <addp > <mult4> <repa > <adda >?

- Not at all satisfied 1
- Somewhat dissatisfied 2
- Neither dissatisfied nor satisfied 3
- Somewhat satisfied..... 4
- Satisfied..... 5
- (Don't know) 6

Q69

How satisfied or dissatisfied are you with the reliability of your <repf > <addf > <repp > <addp > <mult4> <repa > <adda >?

- Not at all satisfied 1
- Somewhat dissatisfied 2
- Neither dissatisfied nor satisfied 3
- Somewhat satisfied..... 4
- Satisfied..... 5
- (Don't know) 6

Q70

How satisfied or dissatisfied are you with the energy costs for running your <ref> <addf> <repp> <addp> <mult4> <repa> <adda>?

- Not at all satisfied 1
- Somewhat dissatisfied 2
- Neither dissatisfied nor satisfied 3
- Somewhat satisfied 4
- Satisfied 5
- (Don't know) 6

Q71

Now, to finish up, I just have a few final questions on your use of PG&E's services and your family's characteristics. Have you ever participated in a PG&E energy efficiency program? That could be a program that provided information on how to save energy; a program that offered a rebate for purchasing an energy efficient appliance; or a program that provided a zero or low interest loan for purchasing energy efficient equipment.

- Yes 1
- No 2 => Q73
- (Don't know/Don't recall) 3 => Q73

Q72

What was the name of the PG&E program?

- (OPEN RESPONSE BOX) 00 DO
- (Don't know/Don't recall) 98 X

Q73

Have you ever called the PG&E Smarter Energy Line? That is their "1-800 number" information line.

- Yes 1
- No 2
- (Don't know/Don't recall) 3

Q74

ENTER NUMBER OF BEDROOMS (98 = DON'T KNOW 99 = REFUSED)

Just to get an idea of how big your home is, how many separate bedrooms does your residence have?

- \$E 1 20
- DON'T KNOW 98 I
- REFUSED 99 I

Q76

ENTER NUMBER OF PEOPLE - 98 = DON'T KNOW 99 = REFUSED

Including yourself, how many people live in this residence at least six months of the year?

- \$E 1 20
- DON'T KNOW 98 I
- REFUSED 99 I

Q77

(ENTER NUMBER OF PEOPLE - 98 = DON'T KNOW 99 = REFUSED)

How many of these people are under age 18?

\$E 0 20

DON'T KNOW98 I

REFUSED99 I

Q78

(ENTER NUMBER OF PEOPLE - 98 = DON'T KNOW 99 = REFUSED)

How many of these people are over 65?

\$E 0 20

DON'T KNOW98 I

REFUSED99 I

Q79

Would you please tell me which of the following groups best represents your total annual household income, before taxes?

- Less than \$25,000 1
- \$25,000 to under \$50,000 2
- \$50,000 to under \$75,000 3
- \$75,000 to under \$100,000 4
- \$100,000 to \$150,000 5
- \$150,000 or more 6
- (Don't know/Not sure) 7
- (Refused) 8

ZIP

(ENTER ZIP CODE - 99999 = DON'T KNOW/REFUSED)

To verify this survey, may I please have your zip code? (VERY IMPORTANT!!!!)

99999

DON'T KNOW/REFUSED..... 99999 I

Q80

(RECORD GENDER - DO NOT ASK)

Female 1

Male 2

BYE

Thank you very much for your time. If you have any questions for PG&E, please call the PG&E Smarter Energy Line at 1 (800) 933-9555. They will be happy to answer your questions.

continue..... 1 D

INT

Enter the appropriate disposition code.

No answer	01	=> END
Answering machine	02	=> END
Busy	03	=> END
Disconnected phone	04	=> END
Business/Government phone	05	=> END
Initial refusal	06	=> END
Computer tone.....	07	=> END
NON-SPANISH Language problems.....	08	=> END
Schedule a callback	09	=> CB
Completed interview	10	C => END
Mid-interview terminate.....	11	=> END
Enter a substitute phone number	12	N => TEL02
Duplicate phone number	13	=> END
SPANISH Language problem	14	=> END
Not a PG&E Customer.....	31	=> END
Rent or Multi-family	32	=> END
Did not purchase equipment.....	33	=> END
No Answer - Dialer	P1	N
Busy - Dialer	P2	N
Operator - Dialer	P3	N
Drop - Dialer.....	P4	N
Answering Machine - Dialer	P5	N
Fax/Modem - Dialer.....	P6	N
No Ring - Dialer.....	P7	N

Customer Survey – Response Rate

	Random Digit Dial Sample Points	Percent of Identified Purchasers
Starting Sample	62,500	
Less:		
Non-working/Invalid Phone Number	14,020	
Language Problems	1,541	
Not PG&E Customer	630	
Renter/Multi-family	4,218	
Refusals	11,180	
Incomplete (callback, no answer, etc.)	24,919	
Mid-Interview terminate	489	
Other	793	
Identified Single-Family Owner- Occupied Dwellings	4,710	
Less:		
Non-Purchasers	3,527	
Identified Single-Family Owner- Occupied Dwelling <i>Purchasers</i>	1,183	
Completes (Purchased in last 5 years)	380	32%
Survey Completions	803	68%

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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly-funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. Research will be conducted with HVAC equipment consumers, contractors, distributors and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes research conducted with HVAC contractors. The primary objective of the research is to help PG&E to understand the equipment sales process from the perspective of the dealers and contractors who sell, install, service, and sometimes finance HVAC equipment.

This is the first, exploratory phase of the contractor research. It consists of qualitative, in-depth telephone interviews with 20 contractors who work in the residential sector. A wide variety of topics were covered in these interviews, averaging more than one hour in duration. The responses from these interviews were used to design the questionnaire for the second phase—a quantitative survey (using a shorter, 30 minute, survey instrument that resulted in completed interviews with 227 contractors).

Please note that the results of this qualitative research are not projectable to the entire population of residential HVAC contractors.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs.” (Eto, et. al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs.

Today, market transformation has emerged as a central policy objective of future publicly-funded energy-efficiency programs in California. Market transformation has been defined as “a reduction in market barriers due to a market intervention, as evidenced by a set of market effects, that last after the intervention has been withdrawn, reduced, or changed.”²

In order to adapt to this new policy framework, PG&E is pursuing detailed market research regarding the residential heating and cooling market across 44 California counties in which they provide electricity or natural gas. This research is designed to improve PG&E's understanding of the barriers to the installation of energy-efficient heating and cooling equipment and related services in the residential sector—leading to future market transformation efforts targeting the residential HVAC market.

This report is part of a comprehensive market research effort designed to address the residential heating and cooling market.³ In it we summarize the key findings from the qualitative research conducted with heating and cooling (or “HVAC”) contractors performing at least some residential work.⁴ Two project managers completed detailed telephone interviews with 20 contractors during the period from March 17 to May 5, 1999.

² For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

³ The overall research project includes interviews with 1) heating and cooling manufacturers, 2) heating and cooling equipment and component part distributors, 3) heating and cooling contractors, and 4) single family homeowners who purchased heating and cooling equipment in the past 5 years. It also includes secondary research on the residential heating and cooling market.

⁴ These contractors are often referred to as Heating, Ventilating and Air Conditioning or “HVAC” contractors, although in residences they primarily install, service and replace heating and air-conditioning units and systems.

Section III: Objectives

The primary objectives of this contractor research include:

- 1) Exploring the barriers to the sale and installation of energy-efficient residential HVAC equipment and whole house energy services;
- 2) Identifying marketing and program strategies which may help to eliminate or reduce the barriers; and
- 3) Understanding the influence that residential HVAC contractors have on information flows and purchase decisions relative to residential HVAC-related products and system services.

The contractor in-depth interviews are a very important component of the overall research effort. A key hypothesis was that, in many cases, contractors are the primary—or only—source of information customers consult during the purchase decision making process.

Thus, the primary purposes of the in-depth interviews are to:

- 1) provide the research team with a better understanding of the range of issues, concerns, opinions, attitudes, and practices that exist within the Northern and Central California HVAC contracting community; and
- 2) to provide insight into issues of most importance for developing the quantitative HVAC contractor telephone survey.

Discussions with the PG&E Residential HVAC project team produced an ambitious and comprehensive listing of research issues associated with residential HVAC contractors:

- Profile the size of firms (e.g., number of installations completed, number of technicians, number of installers, etc.);
- Identify the market segment focus of firms (e.g., residential / light commercial / commercial and industrial, and retrofit – replacement / new construction);

- Obtain information on residential HVAC equipment sales by efficiency level and market segment (e.g., number of central air conditioners installed in 1998 by efficiency level for residential retrofit – replacement versus new construction);
 - Establish residential HVAC equipment installation and replacement rates by energy efficiency level;
- Explore the HVAC equipment sales process including:
 - the criteria residential customers use to select HVAC contractors and related equipment; and
 - the extent to which salespeople focus on energy efficiency compared other issues;
- Determine contractors’ perceptions regarding
 - the typical customer purchase decision making process (e.g., influence of contractor on purchase decision, role of financing, importance of energy efficiency);
 - the customers’ use of financing, the role financing plays in the equipment selection and purchase process, and the competitive importance of financing to contractors;
 - the reason(s) why residential customers are replacing or adding HVAC equipment;
- Determine attitudes toward, perceptions of, and practices relative to energy-efficient equipment (including how they define “what is energy-efficient”);
- Understand the type and range of HVAC services and energy efficiency services provided (e.g., refrigerant charge measurement, airflow measurement, use of service and maintenance agreements, duct cleaning, duct sealing, other new or innovative services, etc.);
- Identify processes used to ensure quality installations (e.g., proper equipment sizing, proper airflow, proper refrigerant charge, extent to which they consider the “whole system” versus system components);
- Explore competitive issues facing contractors and the industry (e.g., consolidation of contractors, role of large retailers in service territory, etc.); and
- Explore the degree to which they look for specific training qualifications when hiring technicians, their views of the shortage of trained workers, impacts of the shortage on their business.

It was clear that a primary objective was to focus the subsequent quantitative research much more sharply on selected issues for which contractors could provide quality responses based upon their first-hand experience.

Section IV: Methodology

We addressed the research objectives by designing an in-depth interview guide and completing 20 in-depth telephone interviews with residential HVAC contractors. Interviews were completed with a quota sample of contractors from 16 communities across PG&E's service area. Communities were dispersed across climate zones, geographic areas and by size. For the communities outside the San Francisco Bay Area, we initially drew samples of 5 records to complete one interview per community. For the Bay Area communities, we initially drew samples of 10 records to complete two interviews.

An initial sample of 100 records for contractors with "C-20" licenses was drawn from the State of California Contractors State License Board files.⁵ Subsequently, an additional sample of 25 records was drawn for two cities where the initial samples were inadequate.⁶ The climate zone, geographic location, population, sample sizes, and number of completed interviews for each city are indicated in Table 1:

Table 1: Contractor In-Depth Interview Samples and Completions

City	Climate Zone ⁷	Geographic Location	Population ⁸	Sample	Completed Interviews
Bakersfield	R	Southeast	230,800	5 + 5	2
Redding	R	North Central	78,700	5	1
Stockton	S	Central	243,700	5	1
Modesto	S	Central	184,600	5	1
Chico	S	North Central	54,100	5	1
Rocklin⁶	S	<i>Foothills</i>	<i>31,700</i>	<i>1</i>	<i>1</i>
San Francisco	T	Bay Area	790,500	10 + 20	2
Oakland	T	Bay Area	399,900	10	0
San Luis Obispo	T	South Coast	42,850	5	2
Monterey	T	Central Coast	33,100	5	1
Eureka	T	North Coast	27,750	5	1
San Jose	X	S. Bay Area	909,100	10	2
Santa Rosa	X	N. Bay Area	138,700	5	1
Walnut Creek	X	E. Bay Area	63,900	10	1
San Rafael	X	Marin	54,400	10	2
Ukiah	X	North Hills	15,000	5	1

⁵ The "C-20" license allows contractors to work on "warm-air heating, ventilating and air-conditioning."

⁶ In addition, one contractor (in Rocklin) was specifically suggested for the initial interview.

⁷ Climate zones include: R—Desert/Mountain; S—Valley; T—Coastal; and X—Hill. See map in Customer Survey Report.

⁸ California Department of Finance, estimates for January 1, 1999.

Because the in-depth interviews were our first opportunity to use the Contractor State License Board listings, we tracked the disposition of each sample point carefully to provide an initial estimate of the population of active HVAC contractors serving residential customers. The following dispositions resulted:

Table 2: Disposition of CSLB sample

Description of Disposition	Number	Percent
<i>Starting Sample</i>	125	100%
Duplicate records	1	1%
<u>Unused sample (not checked for listings)</u>	19	15%
<i>Sample checked for listings</i>	105	100%
<u>No listing</u>	23	22%
<i>Sample with telephone numbers</i>	82	100%
<u>Unused sample (with phone listings)</u>	18	22%
<i>Sample used</i>	64	100%
Answering Machine / Voice Mail	6	9%
<u>Computer / Fax tone</u>	1	2%
<i>Contacted</i>	58	100%
Initial refusal	6	10%
Unqualified (no residential HVAC work)	27	46%
Callback scheduled (not needed)	5	9%
Completed interview	20	35%

The major losses from the sample were CSLB records for which we could find no telephone listing (22% of listings requested) and those who reported doing no residential HVAC work (46% of contacted). Many contractors appear to be small and very busy. We believe this contributed to the three other major losses: 1) continually getting their answering machines at different times of day; 2) initial refusals to take time to answer our questions; and 3) a sizeable number who missed scheduled call backs. We do not believe this caused significant bias in what was learned from this qualitative research.

We completed 20 in-depth interviews with residential HVAC contractors. The completed interviews took between 25 and 120 minutes with a mean of 64 minutes. Participating contractors each received an incentive of \$100.

Use of Qualitative Research Findings

The reader should keep in mind that in-depth interviews are a qualitative research method. They are designed to play an exploratory role in research, and were primarily used in this research to clarify issues and identify specific topics to be quantified in the subsequent contractor survey.

The information presented in this report should be considered within this context and understood to have the following limitations, fundamental to all qualitative research:

- **Qualitative research results may not be representative of what would be found in the population (of contractors doing HVAC work) and thus are not projectable;**
- **This report is a synthesis of comments from a small sample of individuals. Collectively, respondents discussed many issues. Individually, respondents expressed deeply held views and opinions, while covering a more limited range of issues; and**
- **Because of small sample sizes, we may not have identified all important views.**

Section V: Findings

This section of the report is divided into twelve sub-sections. These sub-sections generally follow the order in which various issues were discussed during the interview process. We begin with a brief description of the contractors we interviewed. This is followed by their reported sales by energy efficiency level, their views on replacement timing, the remodeling market, selling HVAC equipment, HVAC-related products and services, incremental costs of energy-efficient units, financing HVAC equipment, technical training, competitive issues and their recommendations to PG&E.

Firmographics

We asked contractors a few specific questions about their business operations. A brief summary of this information is presented to provide a better understanding of the types of contractors interviewed.

Services Provided

- **All contractors interviewed deal / sell and install HVAC equipment to residential customers.** All, but one of these contractors, also service residential equipment. Some of these contractors noted that they only service equipment they have installed.
- **About two-fifths of these contractors offer financing for residential equipment.**
- **None of these contractors distributed any products or supplies to other contractors.**
- **Almost all of the contractors we interviewed also deal / sell and install HVAC equipment to light commercial customers.** Several do not service equipment for these customers.
- **Only one-fourth deal / sell, install and service HVAC equipment for larger commercial / industrial (C / I) customers.**
- **Only one-fifth of all contractors interviewed offer financing to light commercial customers and none offer financing to larger C / I customers.**

Ownership, Employees, Brands Offered and Distributors Used

- **All the contractors we interviewed are independently owned.** And, they do the vast majority of their work with their own employees. One-third subcontract small amounts of work—estimated at 5 to 10% of their work.
- **These contractors employed from just themselves to 55 installers and technicians.** In addition, they employed from none to 14 salespeople.
- **Their “other employees” numbered from none to 240.** These others included secretary, office manager, support, inventory control, fabrication, shop and construction workers. Many contractors do a variety of other work from architectural sheet metal and plumbing (several firms) to complete home remodeling (one firm).
- **These contractors sold and installed an average of 3 to 4 brands (ranging from 1 to 12).**
- **They bought equipment from an average of 3 distributors (ranging from 1 to 8).** They purchased supplies and materials from an average of 2 distributors (ranging from 1 to 7 for supplies and from 1 to 4 for materials).

Customer Sectors Served

- **Their residential work averaged 70% of their gross sales revenue (ranging from 5% to 100%).**
- **Their small commercial work averaged 20% of their total.** Their large Commercial and Industrial work averaged about 9%.
- **The largest revenues for residential work are derived from replacement of existing equipment, with three other types of work contributing about the same percentage of revenue.** Specifically, their residential replacement averaged about 40% of total revenues, new construction averaged just under 20%, adding central heating or cooling to dwellings that had not had a central system averaged just less than 20%, and service and repair work averaged 20%.

Sales by Efficiency Level

Contractors were willing and able to provide specific information on the number of units they sold for new construction, and for replacements and additions in existing homes. They also provided estimates dividing these sales figures by energy efficiency levels. Of course, these qualitative results are relatively unimportant, but they demonstrated contractors could and would provide this information. This was important to designing and implementing the subsequent quantitative telephone survey.

Forced Air Furnaces

- **Just over half of the contractors we interviewed consider A.F.U.E. 90 units to be “energy efficient,” while just under one-half consider A.F.U.E. 80 or 82 units to be “energy efficient.”**
- **These contractors installed an average of 33 furnaces in 1998 in new homes.**
- **Of these furnaces for new construction, 80% were A.F.U.E. 80 units and 20% were A.F.U.E. 90 or higher.**
- **These contractors installed an average of 89 furnaces in 1998 for replacements and additional units in existing dwellings.**
- **The contractors reported installing a similar mix of efficiency levels in existing dwellings as they installed in new homes.**

Central Air Conditioners

- **Most contractors said SEER 12 or 12-13 units were “energy-efficient.” However, almost as many said SEER 10 were “sufficient.”**
- **For new construction, these contractors installed an average of 26 central air conditioners in 1998.**
- **Of the central air conditioners installed in new homes, 60% were SEER 10 units and almost 30% were SEER 12 units. SEER 13 and 14+ units totaled only 9% of all units.**
- **For replacements and additional units installed in existing dwellings, these contractors installed an average of 42 central air conditioners in 1998.**

- **They reported a higher percentage of sales of higher efficiency central air conditioners in replacements than in sales to new homes: one-half were SEER 10 or 11 units, more than one-third were SEER 12 units and more than one-tenth were SEER 13 and 14+ units.**

Replacement Timing

- **An average of 55% of these contractors' work is breakdown replacement. Contractors report that customers need this work done within 3 days.**
- **The balance of their replacement work—45%—is planned. Contractors report that customers need planned work done within an average of 2 weeks.**

The contractors' comments tend to reinforce the "factual" information that they are asked to provide quick turnaround for most breakdown replacements. They feel that they do not have as much opportunity to discuss energy efficiency and other options with customers when equipment breaks down during the middle of the cooling or heating season.

Remodeling Market

- **Our respondents have varying experiences working with remodeling contractors—those who never do, one-half who sometimes do, and some who work with them regularly.**
- **Those who work with remodelers say that the projects often include reducing heat losses and gains.** Common energy-related measures are upgrading windows, reinsulating attics and floors and sealing "holes" in walls. One pointed out that most of this work affects only portions of the home—almost never is the whole house upgraded.
- **Some contractors found out about the improvements to thermal integrity in time to use the information in sizing the HVAC equipment they were to install.** *We investigated this situation further in the contractor telephone survey.*

Also of interest were interviews with a remodeling contractor who also does HVAC work and with a remodeling contractor who is about to start offering HVAC work. Both commented that after trying *rather unsuccessfully* to coordinate remodeling with HVAC work done by other contractors, they now were establishing internal “divisions” to do their own HVAC work. The general view of these and other contractors appears to be that completing a coordinated “whole house” project is rare.

Selling HVAC Equipment

We explored the extent to which contractors mention—or actively sell—energy-efficient equipment. We asked who sells and how knowledgeable they are about energy-efficient products; their reasons for selling energy-efficient equipment; the benefits they receive from doing so; the options they discuss when selling furnaces and those they discuss when selling air conditioners; and the benefits they stress to customers. Their responses guided our development of the section covering these topics in the telephone survey.

Who Sells and How Knowledgeable They Are

- **Most of our respondents do all the selling themselves, while a few have salespeople on their staff.** Only one used the services of independent home improvement salespeople.
- **Most rated their—or their sales staff’s—knowledge of energy-efficient products and services as a 4 or 5 out of a maximum of 5.**

These answers were judged relatively uninformative and these questions were dropped when we had to limit the length of the telephone survey.

Options Discussed with Customers

- **Contractors identified many options they discussed with residential customers interested in buying a furnace. These include:**
 - **Efficiency levels—most contractors mentioning A.F.U.E. levels in this question feel 80 is adequate for most customers due to the “mild” heating season climate (in much of PG&E’s service territory).**
 - **Cost / Price —many noted “very price driven,” “it’s all price driven,” “customers not interested in anything else.”**
 - **Affordability / financing.**
 - **Customer’s needs—how long customer expects to live in house.**
 - **Comfort.**
 - **Filtration—allergies create most interest in electrostatic filters and electronic air cleaners.**
 - **Brands / Models.**
 - **Warranty and reliability.**
 - **Energy consumption and maintenance differences (based on experience installing and servicing many brands).**
 - **Components and quality differences.**
 - **Clock / programmable thermostats.**
 - **Two stage / variable speed.**
 - **Review house—heat loss / gain, ductwork condition, size, insulation.**
 - **Fuel.**
 - **Changing evaporator coil when replacing furnace.**

- **Contractors also identified many options they discuss with residential customers interested in buying an air conditioner. These include:**
 - **Efficiency levels (most mentioning SEER levels *in this question* feel 12 is adequate). Also, some explain that savings are not large.**
 - **Cost / Price.**
 - **Affordability / financing.**
 - **Lower operating costs—some only talk savings in percentage terms, never dollars.**
 - **Customer’s needs—how long customer expects to live in house.**
 - **Warranty and reliability.**

- **Safety.**
- **Replacing refrigerant lines with outside unit (lines are likely to be full of metal filings from failed compressor).**
- **Noise levels.**
- **Brands / models / color (of outside unit) / other features.**
- **Review house—heat loss / gain, especially ductwork condition, size, insulation and register sizes. In many cases they must redesign ductwork.**
- **Test airflow.**
- **Replace asbestos ducts.**
- **Energy consumption and maintenance differences (based on experience installing and servicing many brands).**
- **Components and quality differences, condenser unit construction.**
- **Two stage / variable speed.**
- **Filtration.**

Benefits Contractors Stress to Customers

Contractors listed many benefits they stress when selling energy-efficient furnaces and air conditioners to customers. Two-thirds of the contractors listed more than one benefit for furnaces and half the contractors listed more than one for air conditioners.

- **Low operating costs / lower utility bills were listed by two-thirds of the contractors for both furnaces and air conditioners.**
- **Better warranties were listed by one-quarter of contractors for furnaces and by one-third of contractors for air conditioners.**
- **One-third of contractors listed noise reduction for air conditioners.**
- **One quarter of contractors also listed improving comfort and reducing noise for furnaces.**
- **Comfort and low maintenance costs were also mentioned several times for air conditioners.**
- **A few contractors mentioned that energy-efficient furnaces are “better for the environment.”**

- **Contractors also stress ease of installation and better quality for furnaces and smaller sized equipment, better equipment, better dehumidification, and equipment that lasts longer and increases the value of the home for air conditioners.**

The responses contractors gave when asked what “options” they discuss for furnaces and air conditioners and what “benefits” they stress when selling energy-efficient units were employed in creating response categories for a question in the contractor quantitative telephone survey concerning the benefits they emphasize to customers.

Important Factors in Customers’ Purchase Decisions

Contractors were asked to list factors important in a typical residential customer’s heating and cooling purchase decision. Then they were asked to identify which factors are most important to customers. There are a small number of factors that most contractors agree are important and many other interesting factors mentioned by only one or two contractors.

- **Price (or cost) was said to be an important factor in customers’ decisions by the largest number of contractors.**
- **Contractor’s reputation was said to be an important factor by the second largest number of contractors.**
- **The equipment brand (or the “brand’s reputation”) and reliability was the third most often mentioned factor. There is little differentiation in the use of these terms and concepts.⁹**
- **Energy efficiency was the fourth most often mentioned (and the last mentioned by at least one-fourth of the contractors).**
- **Most contractors believe price and their reputation are the most important factors in customers’ purchase decisions**

- **Others identified an interesting set of other factors:**
 - **Comfort**
 - **Satisfaction**
 - **Response to problems**
 - **Lower utility bills**
 - **Quality**
 - **Reliability**
 - **Trust and confidence [in contractor]**
 - **Equipment performance**
 - **Referrals**
 - **Noise [reduction]**

In addition to these factors, contractors also listed professionalism, thoroughness, truthfulness, craftsmanship, timeliness, equipment benefits and features, concern for the whole house, and information / performance on warranty service.

Customers' Level of Knowledge

We asked contractors how knowledgeable customers are about HVAC equipment and probed to find out if contractors believe they understand efficiency ratings and if the customers rely on contractors to recommend or select equipment.

- **Almost one-third of contractors said most customers have “no clue.”** Some provided illustrations, including one who said he had a customer inquire how to light the pilot on an A.F.U.E. 80 furnace.
- **One-fourth said many customers know of efficiency ratings and some may ask about the SEER of a unit.** Others added that customers are “relatively uneducated” and “marginally knowledgeable.”
- **One-fifth said customers rely on the contractor.**
- **Two contractors noted that customers are becoming more knowledgeable because they get information on the Internet.**

⁹ Some manufacturers promote reliability as their brand identity, for example Trane says, “It takes a lot to stop a Trane.”

Providing Cost Estimates for High-Efficiency Units

Contractors were asked how often they provide customers with cost estimates for high-efficiency as well as standard-efficiency furnaces and air conditioners. Table 3 shows the responses for furnaces and air conditioners.

Table 3: Number of contractors providing cost estimates for energy-efficient units

Provide cost information in . . .	Furnaces	Air Conditioners
1 - All sales situations	3	5
2 - Most sales situations	7	6
3 - Some sales situations	2	3
4 - Very few sales situations	3	4
5 - Never	5	2

An average “score” for furnaces is 3.0 (meaning that contractors provide cost estimates for energy efficient units in “Some sales situations.” The average “score” for air conditioners is a little “higher,” at 2.6 (meaning they provide information in between “Some” and “Most” sales situations).

Providing Utility Bill Savings Estimates

We also asked how often they provide customers with estimates of utility bill savings for high-efficiency compared to standard efficiency units. And, we followed up by asking how they estimated those utility bill savings for furnaces and then for air conditioners.

- **The average score for how often contractors provide estimates of bill savings was 3.7, or they provide estimates in close to “Very few sales situations” (4.0).** (One-third of respondents said “Never.”)
- **The largest number (one-quarter of respondents) use manufacturer’s charts or tables to estimate bill savings.**
- **Some others use manufacturer’s slide rules, calculators or computer programs.**

- **Still others give general percentage savings, or just explain differences between units or the efficiency ratings.**

Our impression is that contractors are reluctant to provide utility bill savings estimates because they do not want to create ‘false’ expectations. Few of the contractors had tools that they trusted to accurately account for local climatic conditions. Also, contractors “live by referrals from satisfied customers” and “never want to disappoint customers” in any way.

Benefits Contractors Receive

- **Contractors identified many benefits they receive from selling energy-efficient furnaces and air conditioners:**
 - **More money.**
 - **Better customer satisfaction that leads to better word-of-mouth / referrals.**
 - **Higher margins.**
 - **Better quality—fewer callbacks.**
 - **Better warranty.**
 - **Distributor recognition.**
 - **Ecological benefits for all (use less electricity).**
- **However, several contractors also said they receive “no benefits” and some said that problems and callbacks with energy-efficient furnaces (especially) cost them more than they made.**

Contractors noted that the anticipated benefit of more money and higher margins were accompanied by many concerns. The most important concerns to many of the contractors related to anything that might get in the way of their ability to keep “their” customers happy over the long run.

Early Experiences with Energy-Efficient Units

Contractors were also asked the reasons they first began selling and installing energy-efficient furnaces and air conditioners and what problems—if any—they had encountered during those early days. The reasons they began were mostly customer focused:

- **Most of the contractors who sell energy-efficient units said they began selling them because of customer demand / interest.**
- **The next most often mentioned reasons relate to customer benefits: saving customers money, units are more efficient, have better warranties, are better products, provide better comfort, and are less noisy.**
- **Some contractors began selling efficient air conditioners because of PG&E, SMUD and factory rebates.**
- **Contractors also mentioned making more money / higher markups and needing to stay competitive and to offer more competitive product lines.**

Most contractors had no problems when first selling energy-efficient units. Most who did sell early energy-efficient units reported typical problems one could expect—learning to sell new concepts and service new technologies. Several still do not sell “energy-efficient” equipment (defined here as any equipment more efficient than the federal minimum standards).

- **Most said energy-efficient units were harder to sell, they needed to train all their staff, and they had reliability problems with the early energy-efficient furnaces.**
- **Among “other” problems they reported lack of service schools, “bugs,” problems with building inspectors regarding furnace venting, noise (with the Lennox Pulse furnace), and that the “equipment was different.”**

Sizing HVAC Equipment

Due to the importance of proper furnace and air conditioner sizing for operating efficiency / costs and occupant comfort, we asked separate questions on how the responding contractors sized furnace and air conditioners. Their answers were identical in most cases and are reported together.

Existing Homes

- **The largest number of contractors base sizing replacement units for existing homes on their experience plus some consideration of the floorspace of the home (square footage), the size of the old heating or cooling unit and, possibly, any efficiency improvements.** The following list captures the major methods used.
 - **Experience or ‘Intuition’** (some have learned Manual J and D and now have gone back to just using experience).
 - **Square Feet** (per Ton or per 20,000 BTUH heating).
 - **Manual J calculations**—using Wright-J or Elite software or Lennox computer (Sharp).
 - **Heat gain / loss calculation** taking into account insulation levels, window area / type and other factors.
 - **Consider duct capacity as limit on size** of air conditioner that can be installed (without rebuilding ducts).
 - **Consider types of rooms**—high ceilings and other factors.
 - **Consider date of construction** (as a proxy for insulation levels and quality of windows).

- **One contractor stressed his belief that, under California law, he has to put in the same size unit he took out, unless the old unit was grossly oversized.**

We also asked contractors what efficiency improvements they examined before they determined the size of the HVAC equipment that will be needed. We recorded their initial answers and then probed for several specific items.

- **Less than one-half of all contractors said they visually inspect ductwork for damage.** Some also check plenums and one checks the size, layout and quality.

- **Only about one-third of all contractors said they check for or suggest improvements to insulation and windows.**
- **Only a few test ductwork for air leakage (with a duct blaster or blowerdoor) or check airflow through the duct system.**
- **Several comments indicate a lack of interest among contractors in going beyond looking at the old unit to be replaced and having a brief discussion with the customer:**
 - **“Customers don’t like you poking around their homes.”**
 - **“No, I don’t check unless there’s a dramatic need or they are going to do something themselves.”**
 - **“I look at the whole picture but don’t change the size from the old equipment.”**

New Construction

- **Title 24 calculations provide the required energy efficiency and unit capacity (size).** In some cases an engineer working for the contractor will perform the Title 24 calculations. Contractors made several interesting comments on the accuracy and usability of the Title 24 recommendations.
 - **Title 24 is occasionally inaccurate or way off.**
 - **Several do their own calculations to check the Title 24—One contractor who uses an in-house computer program, believes that Title 24 is “usually wrong.”**
 - **Others make “corrections” to the Title 24-recommended sizing—One contractor typically installs ½ ton more than the builder’s Title 24 specification.**

Contractors’ Role in Selecting Size and Efficiency

- **When asked how often they recommend or select the specific unit size and efficiency rating to be installed in existing homes, almost all contractors indicated that they do this all or almost all of the time.**
- **For new construction, one-third indicated they recommend or select the size and efficiency rating in less than 35% of their new construction jobs, almost one-third said they do no new construction, and some indicated they do this in a major proportion of their new construction jobs.**

A new series of questions exploring the sizing methods used for HVAC equipment was developed for the telephone survey. In addition, we added a question sequence on contractors' opinions of the Title 24 sizing recommendations they receive from the general contractor for new construction jobs.

HVAC-Related Products and Services

In addition to proper selection and sizing a furnace or air conditioner, several associated products and services are critical for achieving and maintaining total HVAC system efficiency. These product and services include: 1) duct sizing and layout; 2) duct testing, repair, and sealing; 3) installing programmable thermostats; 4) applying zoned systems where appropriate; 5) measuring airflow across heat exchangers; 6) checking refrigerant charge; and 7) selling service and maintenance agreements. Another service—related to occupant safety—is testing for carbon monoxide.

Duct cleaning, repair and sealing

- **Almost three-fourths of the respondents do not clean ducts.** In fact, several of these who do not offer duct cleaning made negative comments on the service:
 - **“Fifty percent of the ducts that get cleaned don’t need it. It’s a sales gimmick.”**
 - **“It’s a bad idea—tears things apart. Spend a little more for new ductwork. Most providing duct cleaning now are not qualified.”**
 - **“Some environments may call for it, but most of the time it’s a rip-off.”**
- **Some of those who do not offer duct cleaning refer customers to others who do.**
- **Three-fourths of the contractors perform some duct repairs, most often when installing replacement units.** One-fourth does not offer duct repairs or sealing and do not believe you can make money on it.
- **Even several of those offering duct repair and sealing do not believe they can make money on these services.**
- **One-fourth believes their products meet UL 181 requirements.** They use tape and mastic (with two providing the name “Versagrip”).

Duct sizing and layout

Duct design is critical to proper functioning of central heating and cooling systems. Yet there is considerable concern that few contractors use systematic methods to size and lay out duct systems. We included four questions on this topic.

- **Only one contractor acknowledged using the ACCA Manual D procedure for sizing ductwork.**
- **Six other contractors described other calculations and procedures.** These included: Wright-J and cubic feet per minute (cfm) to each room; Ductulator (duct calculator); SMACNA; load calculation; static method, equal friction throughout the ductwork; and slide rule and experience.
- **All others listed intuitive, experience-based methods.** These considered room sizes, downsizing when converting from gravity furnace, routinely upsizing ducts and registers and other rules of thumb.

Measuring airflow

- **Two-thirds of contractors said they measure airflow.** However, almost one-half of those contractors said they rarely did this for residential jobs. One has just acquired a blower door and is planning to offer a complete service soon.
- **One-half of all contractors reported having flow hoods and / or anemometers.**

Checking refrigerant charge

Another critical service action is checking that the proper amount of refrigerant is in a system. We asked a specific question on this, accepted answers and probed for clarification. Nineteen contractors provided a total of 28 responses.

- **Almost one-half of the contractors mentioned using temperature and pressure or pressure gauges.**
- **One-fifth mentioned manufacturers chart, superheat, temperatures and pressures.**
- **One-fourth mentioned superheat.**
- **One-fifth mentioned digital scales.**

- **One-seventh mentioned subcooling.**
- **And a few mentioned sight glass and prefilled at the factory.**

Several of these responses are “indicative” that a contractor is probably using proper methods of ensuring a cooling unit has the correct refrigerant charge. Mention of using instruments to measure temperatures and pressures, manufacturer’s charts, superheat and subcooling are all positive signs that the contractor may be employing industry-approved service practices. We used our understanding of how well our questions and contractors’ responses ‘worked’ to design questions for the quantitative telephone survey.¹⁰

Service and maintenance agreements

- **More than one-half offer service or maintenance agreements or schedule regular service calls with their customers.** Some commented that not many people wanted agreements, while others commented that they are doing more and more each year.
- **Six contractors sold agreements to new construction.** Their average success in selling agreements was 35%.
- **Ten contractors sold agreements to replacement customers.** Their average success in selling agreements was 55%. Some indicated that the agreement comes with the installation and that agreements sell best when they install a filtration system.

Other products and services

- **All but one contractor sell clock / setback (or programmable) thermostats regularly with installations.** Twelve reinforced their affirmative response with “always” or “every job.”
- **Three-fourths of the contractors have installed zoned systems.** One-half of them qualified their positive response with “a few,” “very few,” or “rarely.”

¹⁰ There is some ambiguity inherent in trying to establish how closely a firm’s technicians are following proper procedures through a telephone interview. A much better method is to have a technically knowledgeable observer ‘ride-along’ and employ a formal evaluation tool to note the methods a sample of technicians are using.

- **More than 4 out of 5 contractors have installed electronic air filters.** One-half of them qualified their positive response with “rare,” “some,” “not common,” or “occasionally.” And, several mentioned the better media filters (Space Guard) and electrostatics. Many cautioned about the need for frequent cleaning.
- **More than 4 out of 5 contractors have not installed any heat pumps.** They cited high cost, lack of market in mild climate (no A/C), and lack of experience as reasons they do not try or, when they have tried, they have not had success.
- **“Whole house” and “total system” concepts were mentioned by a small number of contractors.**
- **Contractors also reported that their customers have asked about air balancing rather than a full test for duct leaks, duct cleaning and energy efficient equipment, and electronic air filters.**

Safety check

- **More than one-half of all contractors test for carbon monoxide with an instrument.** Some test every home, others only if they are asked or the customer suspects a problem. One-third of the contractors performs visual checks of the furnace, the flame, and / or the venting.
- **Most of those who believe there may be a liability problem with performing carbon monoxide checks always have their customers also call the local gas company.**

Adopting new technologies

We asked contractors about how quickly they would adopt new technologies and what types of support would be most important when they did adopt a new technology.

- **Contractors descriptions of their speed in starting to offer “new and innovative products or services” allowed us to categorize them as “early adopters” or “late adopters.”** The others were labeled “majority adopters.” Table 4 shows the distribution of contractors across these categories and their respective interest in various types of support for new products or services.

Table 4: New product support desired by contractors

New Product Support	Early Adopters (n = 7)	Majority (n = 8)	Late Adopters (n = 5)
Product Training	7	3	5
Technical Support	6	3	5
Marketing Materials	5	3	4
Sales Support	2	2	0
Track Record	0	0	2
Product Information	1	1	2

Contractors clearly need new products to be well supported with training, technical support and marketing materials. And, as they begin doing more upselling, they may discover the usefulness of sales support.

Incremental Costs of Energy-Efficient Units

When asked for the incremental costs to their customers of going from standard to energy-efficient units, contractors were willing and able to provide figures *where they had experience*.¹¹ Thus, all contractors gave estimates for going from A.F.U.E. 80 to A.F.U.E. 90 furnaces, but only 8 gave estimates for going from 80 to 95. For air conditioners, 16 contractors gave estimates for going from SEER 10 to SEER 12, 12 contractors gave estimates for going from 10 to 13 or 14, and only 7 contractors gave estimates for going from 10 to 14+. Table 5 shows the mean, standard deviation, minimum and maximum estimates for the incremental costs.

¹¹ Those not having experience installing some types of units responded “don’t know.”

Table 5: Contractors' estimates of incremental costs

Equipment	Usable Estimates	Mean	Standard Deviation	Minimum Estimate	Maximum Estimate
Furnace, A.F.U.E. 80 to 90	19	\$511	\$211	\$130	\$1,000
Furnace, A.F.U.E. 80 to 95	8	\$925	\$271	\$700	\$1,500
Air Conditioner, SEER 10 to 12	16	\$412	\$188	\$70	\$750
Air Conditioner, SEER 10 to 13,14	11	\$823	\$339	\$350	\$1,300
Air Conditioner, SEER 10 to 14+	7	\$1,121	\$398	\$700	\$1,600

Financing HVAC Purchases

We began our exploration of financing HVAC purchases with questions on how contractors are paid for installations in newly constructed homes and in replacement situations. We then asked if they offer financing for equipment purchases, how important they believe financing to be from a competitive standpoint, and if they finance equipment installations or major repair or service work.

New Construction

- **For installing HVAC systems in new homes, most contractors receive progress payments.** These may be 1/3, 1/3, 1/3 or two draws, one draw when the rough-in work is completed and a second when the finish work is done.
- **In some cases, the builder pays them within 10 days of completion.**

Replacement

- **While there is more variety in contractors' payment arrangements for replacement jobs, most contractors require a lump sum payment upon completion.**
- **Many contractors noted that they extend "informal financing" by allowing some customers (especially those on fixed incomes) to pay over 30, 60 or 90 days.**
- **Many contractors require a down payment of \$100 or 10% of the bid price with the balance due upon completion.**
- **Many accept cash or credit cards.**
- **There were few who reported the percentage of jobs where the buyer financed their HVAC purchase.** One said 40% and another about 30% of their customers financed the purchase.

The next question specifically asked if the contractor offers financing and the following question asked about the competitive importance of financing.

- **Two-thirds do not offer financing or arrange financing for their customers.** One put it bluntly, "I'm not a bank—work it out and call me back."
- **The others do offer financing through a variety of sources.** The sources they mentioned include:
 - **Supply houses (distributors).**
 - **Manufacturers.**
 - **Local finance companies.**
 - **Local banks.**
 - **Independent, national finance companies.**
- **The largest number giving one response were the one-fifth who said there is not much demand for financing.**
- **Only one-eighth said financing was very important or was important because competitors offer it.**
- **Another one-eighth said "probably," "customers ask," "most contractors offer, few customers use."**

- **Other answers included “customers don’t want it, they want me” and “I never asked my customers.”**

Finally, we asked if customers finance just equipment installations or also major repairs.

- **One-third of respondents said that financing is only for equipment installations.** Only one contractor said it was offered for both.

Qualifications and Training

In this sub-section we present all of the information we obtained from contractors regarding qualifications and training of technicians and installers. This includes both qualitative and quantitative findings, from the In-depth Interviews and the Contractor Survey, respectively.

Qualitative findings

We asked each contractor what training they looked for when hiring technicians (for service and repair work) and installers. We also asked if they felt there was a shortage of qualified, well-trained technicians and installers. Finally, we asked if a shortage of qualified technicians and installers limit the amount of work they can do.

- **Technical school course completion or degree was the most sought after qualification for technicians.**
- **Good work experience was the second most desired qualification (one-quarter of the contractors).** Some contractors wanted 5 years experience.
- **Freon recovery certification ranked next (one fifth of the contractors).** Some contractors specified certification by the Federal EPA or the City of Fresno.
- **A few contractors want technicians who have completed a union apprenticeship, while others look at the amount of training.**
- **Finally, other contractors mentioned references, manufacturer’s certification, work style, good attitude, customer relations, and sales ability.**

When asked where technicians get the desired training, contractors listed the following sources:

- **Trade and technical schools;**
- **Manufacturers' and distributors' training sessions;**
- **On-the-job training (OJT) with other companies; and**
- **Refrigeration Service Engineers Society (RSES).**

Contractors look for simpler qualifications for installers, because these are generally entry level, minimum wage positions:

- **Most look for a good work ethic, fast and thorough, some mechanical aptitude, possibly a positive attitude that will make them good at customer service.**
- **Beyond these characteristics, most contractors want to provide OJT and teach new hires their way of doing things.**

Contractors do see shortages of qualified, well-trained technicians and, to a lesser degree, of qualified installers. However, among this small group of respondents (from the In-depth Interviews), the shortage is seldom a limiting factor on the amount of work they can complete.

Quantitative results

However, these and other reports of shortage of qualified, trained technicians and installers justified further attention. We asked questions in the quantitative survey to measure the dimensions of the problem. We present those results here for continuity.

- **Most contractors (79%) look for technicians with formal training.** More contractors in both the Coastal and Desert / Mountain climate zones want formal training (91% for both areas).
- **Eighty-six percent of contractors believe there is a shortage of qualified, well-trained technicians.** Somewhat more contractors (91%) in the Hill climate zone feel there is a shortage.

- **Slightly fewer contractors (75%) believe there is a shortage of qualified installers.** More contractors in the Coastal (85%) and Hill (83%) feel the shortage of installers.
- **Even fewer (63%) contractors feel that the shortage of qualified technicians and installers limits the work they can do.** Only 48% of contractors in the Desert / Mountain zone feel limited by the shortage, while 77% of the contractors in the Coastal zone feel the effects of the shortage.

Competitive Issues

Near the end of each In-depth Interview, we asked contractors what were the most challenging competitive issues they faced. The following responses illustrate their major concerns.

Consolidators,

- **“Consolidators are hard to compete with. They have the ability to do more advertising and offer more benefits to the customer.”**
- **“Maintaining my reputation. Consolidation will affect larger businesses, but smaller contractors will survive because of low overhead.”**
- **“Consolidation has had no impact yet, but large retailers selling HVAC equipment could have an impact.”**
- **“Consolidation is not affecting me, as an independent I can charge less. SCE is putting service on their bill, that’s a concern.”**

Utilities

- **“Utilities getting into the HVAC business.”**
- **“I face competition from utilities—they have unlimited funds and resources.”**

Other large competitors

- **“Pricing against large firms, not consolidation, not Sears.”**

- **“Larger companies are buying up small companies which will eventually cost the consumer more.”**
- **“Other companies advertise and do lots of service and repair [giving them more exposure]. I get almost all my business from referrals [for replacements in existing homes].**
- **“The market share of larger companies that advertise and the shortage of trained technicians limits my ability to grow.”**

Pricing and unions

- **Flat rate pricing [versus his time and materials prices].”**
- **“Non-union contractors”**
- **“Low ball pricing companies”**

Standards and poor work

- **“Set higher standards. Improve the current workmanship including some kind of monitoring. Saving people money on energy bills.”**
- **“Bidding unlike installations. Poor workmanship.”**
- **“Contractors are not installing to manufacturers’ standards, especially AC. Ductwork is also not being installed correctly by a lot of contractors.”**
- **“The one man contractor who is in and out of business. They are not very competent.”**

Shortage of well-trained technicians

- **“Shortage of well-trained technicians. It restricts the growth of our service department. This is a concern for a lot of contractors.”**

PG&E Should . . .

The final question gave contractors the opportunity to tell PG&E what else they should consider in designing programs to improve the energy efficiency of residential heating and cooling equipment, systems and installation practices.

Educate consumers and advertise

- **“Stress savings of energy-efficient units.** Although the price for high efficiency equipment is too much compared to the weather around here.”
- **“Educate the consumer! Promotion of energy efficiency.”**
- **“Educate customer, concentrate on distribution [duct] systems.** *Do not do something only with equipment.*”
- **“Advertising efforts about lowering utility bills.** Build awareness of saving money.”

Program measures and incentives

- **“Sponsor programs to rework old ductwork. Insulation programs. Windows.”**
- **“Emphasize duct sizing. Many Comfort Homes have poorly sized ducts with 12 SEER units.”**
- **“Why no duct sealing program yet?** If I had known what I learned at [PG&E’s] Stockton [Training Center], I would have done [that] years ago.”
- **“Offer rebates to motivate people to update their equipment.** Rebate duct sealing / insulation. Offer low interest financing. Demand Manual J load calculation in order to participate in rebate program.”
- **“I could see rebates to customers for installation and duct sealing.** Lots of homes get done so fast you can’t get to areas were ducts are leaking.”

Program procedures

- **“Ensure jobs are done to a high standard and verify it was done correctly.** They didn’t verify jobs were done correctly in the past. Incentives to the customer.”

- **“Implement stricter and higher guidelines which are difficult to do in such a competitive market.** Promote consumer awareness of quality versus poor installation practices.”
- **“Parameters have not been good for past programs.** They did not maintain good control over who was actually completing the work as intended by the programs. The work was not inspected, and some contractors cut corners. Require building permits with future programs and ensure the work is done correctly.”
- **“Bring back EGIA on improving home efficiency.** Design programs to the climate zone.”

Training

- **“Offer current technicians additional courses, certify and qualify.”**

Other recommendations

- **“Safety is important.** Manufacturers don’t realize that customers will try to quiet a noisy furnace by plugging combustion air inlets.”
- **“Clarify issues on the 90+ furnaces with the San Francisco Building Department.** It’s OK elsewhere [in the Bay Area].”

Section VI: Summary and Conclusions

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹² In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. The primary objective of this report is to help PG&E understand the equipment sales and installation process from the perspective of residential HVAC contractors. A better understanding of the barriers to the installation of energy efficient HVAC equipment and related services among HVAC contractors will lead to future market transformation efforts targeting the residential HVAC market. All respondents in this study provide HVAC equipment or services to the residential sector.

To address the research issues, Opinion Dynamics Corporation (ODC) conducted 20 in-depth, telephone interviews with residential HVAC contractors located within PG&E's service territory. Specific objectives of these interviews begin by profiling each contracting firm and confirming contractors' willingness and ability to provide data on their sales / installations of both forced air furnace and central air conditioning sales by efficiency level. We then explore important factors in the customer purchase decision process, especially the role financing plays. Of major importance is exploring the hypothesis that contractors are the primary source of information customers consult during their purchase decision process. We also explore contractor service and installation practices. Key research findings are summarized below and the summary of each topic is followed immediately by related conclusions (*designated by text in italics*).

¹² For a general discussion of market transformation issues, see "A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

Typical firms

Most of the HVAC contracting firms that participated in the in-depth interviews are small, independent, local firms providing services to residential and light commercial customers. They sell a limited number of brands and deal with a few suppliers.

Thus, most HVAC contractors have limited internal resources and limited access to external support. And, although smaller firms have greater needs for technical, sales and management training, they will be the least likely to be able to make time for such development activities.

Geographic diversity

Each contractor's energy efficiency beliefs and results appear to be related to the climate zone in which he or she works. The efficiency level they consider "energy-efficient" and their sales of more efficient units appear to vary with their location. Those in the Valley and Desert / Mountain zones are more likely to be concerned with energy-efficiency and sell higher proportions of efficient units.

Both the baseline situations and the potential for energy efficiency vary by climate zone. Program efforts and expectations will also need to be tailored by climate zone.

The contractor's time budget

The contractors we interviewed were difficult to contact. It was even more difficult to schedule an hour on the phone with them and then find them there at the scheduled time.

Because most small contractors rely on one (or two) key individual(s), their time for anything new is virtually priceless. The implication for the Residential HVAC program is that all means of communicating messages and providing training must be as time-efficient as possible.

Replacement timing

Contractors report that more than half of customers with broken down equipment want it replaced within 3 days. And, customers want an immediate response to their call, a quick proposal and next day service.

Thus, contractors feel that they do not have as much opportunity to discuss options when equipment breaks down during the middle of the cooling or heating season. A clearer

definition of the breakdown purchase situation is needed to determine what the customers' interests are and what their willingness to consider a better alternative is.

Selling HVAC equipment

The topics contractors mentioned as “options they discuss” and “benefits they stress” produced lengthy lists without many “most often mentioned” items.¹³ This suggests that HVAC contractors encounter a wide variety of situations. It may also mean there is little “industry-wide” agreement on a few ways to provide the greatest improvement in energy efficiency for most customers.

Proposed market transformation efforts for the Residential HVAC market will need to be flexible to support appropriate efficiency efforts across a range of situations. The program may also need to support efforts to engage people throughout the California HVAC industry to identify the most effective options (by climate zone).

Customers need information that contractors have

Contractors' described important factors in customer decisions, customers' level of knowledge, and how often they provide cost estimates of high-efficiency units and estimates of utility bill savings. Comparing five key findings points out some conflicts:

- **Price / cost is most important in customer purchase decisions.**
- **Energy efficiency is fourth most important.**
- **Customers know of efficiency ratings, but that is about all.**
- **Contractors provide cost estimates for standard and efficient units in only “some” situations.**
- **Contractors provide estimated utility bill savings in “very few” situations.**

It appears contractors are not providing needed information to help customers balance the benefits of energy-efficient units with the incremental costs. Contractors are rightly viewed as the experts and have access to key information. Proposed efforts to influence the Residential HVAC market may need to help prepare contractors for a new role as “consultants.”

¹³ Of course, the most frequently mentioned option discussed was “cost/price.”

Benefits contractors receive from selling energy-efficient equipment

Contractors mention the additional money and higher margins from selling and installing energy-efficient equipment almost as a secondary benefit. It appears the most important benefit to them is customer satisfaction. Listening closely to their list of benefits it becomes apparent they are committed to serving customers needs with quality equipment and sound craftsmanship.

Some contractors—especially the smaller ones—stated their goal is to get better and more referrals. The downside of “trying to please people” may be that many contractors then undersell both the equipment and the value of their labor and expertise.

Sizing equipment and ductwork

Overall, it appears that there is *significant* room to improve the equipment sizing practices of HVAC contractors. Most contractors’ responses showed that they ‘know’ that proper sizing affects the operating efficiency of furnaces and air conditioners. However, it appears they are not doing what may be required to properly size every installation. Their investigation of existing conditions and their calculation procedures are too informal. And, in new construction some do not trust the Title 24 sizing recommendations and “adjust” them.

It appears that in addition to teaching proper sizing procedures, it may be necessary to stress the importance and proven benefits of proper sizing. Here again contractors need to learn to “sell” customers on the value of spending more time discussing their situation and their needs.

Other products and services

We explored seven of contractors’ other HVAC-related product and service offerings.¹⁴ Their responses suggest that few of them are applying these products and services in all appropriate situations or applying them correctly when they do use them. It appears that few contractors believe the benefits these products and services could bring to their customers or their business are worth the extra effort to sell and install them properly.

¹⁴ These included 1) duct sizing and layout; 2) duct testing, repair, and sealing; 3) installing programmable thermostats; 4) applying zoned systems where appropriate; 5) measuring airflow across heat exchangers; 6) checking for proper refrigerant charge; and 7) selling service and maintenance agreements.

It appears that additional training, possibly certification and some incentives to use proper methods will be required to make these products and services approach their potential.

New products—experiences and needs

Contractors' recollections of their experiences with the first energy-efficient furnaces and air conditioners demonstrate difficulties with unfamiliar and sometimes unreliable equipment. They note the lack of service schools, their difficulties selling, and problems with building inspectors. Contractors also said they want new products to be fully supported by manufacturers and distributors.

Because so many HVAC contracting firms are very small and have few links to distributors, introducing new products will require a strong and sustained outreach effort to reach the contractors.

Technical training

It is clear that the shortage of qualified, well-trained technicians and installers is a significant problem. Given the variety of existing training sources and the demands for improvements, PG&E's role in addressing this problem is less clear. Options may include supporting others' efforts (such as the Consortium for Energy Efficiency efforts to develop standards for training and certification), providing more training through PG&E's Stockton Training Center, or providing incentives for contractors and their staff to participate in existing training opportunities.

It appears that PG&E should first consult with distributors who supply contractors in PG&E's service territory with HVAC equipment and training. These discussions should clarify what training is most needed and who can best supply which training. The distributors and contractors should also be able to provide useful recommendations on other steps to improve technical skills required to help make energy-efficient equipment perform at its potential efficiency in most installations.

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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly-funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. Research will be conducted with HVAC equipment consumers, contractors, distributors and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes research conducted with HVAC contractors. The primary objective of the research is to help PG&E to understand the equipment sales process from the perspective of the dealers and contractors who sell, install, service, and sometimes finance HVAC equipment.

This is the first, exploratory phase of the contractor research. It consists of qualitative, in-depth telephone interviews with 20 contractors who work in the residential sector. A wide variety of topics were covered in these interviews, averaging more than one hour in duration. The responses from these interviews were used to design the questionnaire for the second phase—a quantitative survey (using a shorter, 30 minute, survey instrument that resulted in completed interviews with 227 contractors).

Please note that the results of this qualitative research are not projectable to the entire population of residential HVAC contractors.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs.” (Eto, et. al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs.

Today, market transformation has emerged as a central policy objective of future publicly-funded energy-efficiency programs in California. Market transformation has been defined as “a reduction in market barriers due to a market intervention, as evidenced by a set of market effects, that last after the intervention has been withdrawn, reduced, or changed.”²

In order to adapt to this new policy framework, PG&E is pursuing detailed market research regarding the residential heating and cooling market across 44 California counties in which they provide electricity or natural gas. This research is designed to improve PG&E's understanding of the barriers to the installation of energy-efficient heating and cooling equipment and related services in the residential sector—leading to future market transformation efforts targeting the residential HVAC market.

This report is part of a comprehensive market research effort designed to address the residential heating and cooling market.³ In it we summarize the key findings from the qualitative research conducted with heating and cooling (or “HVAC”) contractors performing at least some residential work.⁴ Two project managers completed detailed telephone interviews with 20 contractors during the period from March 17 to May 5, 1999.

² For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

³ The overall research project includes interviews with 1) heating and cooling manufacturers, 2) heating and cooling equipment and component part distributors, 3) heating and cooling contractors, and 4) single family homeowners who purchased heating and cooling equipment in the past 5 years. It also includes secondary research on the residential heating and cooling market.

⁴ These contractors are often referred to as Heating, Ventilating and Air Conditioning or “HVAC” contractors, although in residences they primarily install, service and replace heating and air-conditioning units and systems.

Section III: Objectives

The primary objectives of this contractor research include:

- 1) Exploring the barriers to the sale and installation of energy-efficient residential HVAC equipment and whole house energy services;
- 2) Identifying marketing and program strategies which may help to eliminate or reduce the barriers; and
- 3) Understanding the influence that residential HVAC contractors have on information flows and purchase decisions relative to residential HVAC-related products and system services.

The contractor in-depth interviews are a very important component of the overall research effort. A key hypothesis was that, in many cases, contractors are the primary—or only—source of information customers consult during the purchase decision making process.

Thus, the primary purposes of the in-depth interviews are to:

- 1) provide the research team with a better understanding of the range of issues, concerns, opinions, attitudes, and practices that exist within the Northern and Central California HVAC contracting community; and
- 2) to provide insight into issues of most importance for developing the quantitative HVAC contractor telephone survey.

Discussions with the PG&E Residential HVAC project team produced an ambitious and comprehensive listing of research issues associated with residential HVAC contractors:

- Profile the size of firms (e.g., number of installations completed, number of technicians, number of installers, etc.);
- Identify the market segment focus of firms (e.g., residential / light commercial / commercial and industrial, and retrofit – replacement / new construction);

- Obtain information on residential HVAC equipment sales by efficiency level and market segment (e.g., number of central air conditioners installed in 1998 by efficiency level for residential retrofit – replacement versus new construction);
 - Establish residential HVAC equipment installation and replacement rates by energy efficiency level;
- Explore the HVAC equipment sales process including:
 - the criteria residential customers use to select HVAC contractors and related equipment; and
 - the extent to which salespeople focus on energy efficiency compared other issues;
- Determine contractors’ perceptions regarding
 - the typical customer purchase decision making process (e.g., influence of contractor on purchase decision, role of financing, importance of energy efficiency);
 - the customers’ use of financing, the role financing plays in the equipment selection and purchase process, and the competitive importance of financing to contractors;
 - the reason(s) why residential customers are replacing or adding HVAC equipment;
- Determine attitudes toward, perceptions of, and practices relative to energy-efficient equipment (including how they define “what is energy-efficient”);
- Understand the type and range of HVAC services and energy efficiency services provided (e.g., refrigerant charge measurement, airflow measurement, use of service and maintenance agreements, duct cleaning, duct sealing, other new or innovative services, etc.);
- Identify processes used to ensure quality installations (e.g., proper equipment sizing, proper airflow, proper refrigerant charge, extent to which they consider the “whole system” versus system components);
- Explore competitive issues facing contractors and the industry (e.g., consolidation of contractors, role of large retailers in service territory, etc.); and
- Explore the degree to which they look for specific training qualifications when hiring technicians, their views of the shortage of trained workers, impacts of the shortage on their business.

It was clear that a primary objective was to focus the subsequent quantitative research much more sharply on selected issues for which contractors could provide quality responses based upon their first-hand experience.

Section IV: Methodology

We addressed the research objectives by designing an in-depth interview guide and completing 20 in-depth telephone interviews with residential HVAC contractors. Interviews were completed with a quota sample of contractors from 16 communities across PG&E's service area. Communities were dispersed across climate zones, geographic areas and by size. For the communities outside the San Francisco Bay Area, we initially drew samples of 5 records to complete one interview per community. For the Bay Area communities, we initially drew samples of 10 records to complete two interviews.

An initial sample of 100 records for contractors with "C-20" licenses was drawn from the State of California Contractors State License Board files.⁵ Subsequently, an additional sample of 25 records was drawn for two cities where the initial samples were inadequate.⁶ The climate zone, geographic location, population, sample sizes, and number of completed interviews for each city are indicated in Table 1:

Table 1: Contractor In-Depth Interview Samples and Completions

City	Climate Zone ⁷	Geographic Location	Population ⁸	Sample	Completed Interviews
Bakersfield	R	Southeast	230,800	5 + 5	2
Redding	R	North Central	78,700	5	1
Stockton	S	Central	243,700	5	1
Modesto	S	Central	184,600	5	1
Chico	S	North Central	54,100	5	1
Rocklin⁶	S	<i>Foothills</i>	<i>31,700</i>	<i>1</i>	<i>1</i>
San Francisco	T	Bay Area	790,500	10 + 20	2
Oakland	T	Bay Area	399,900	10	0
San Luis Obispo	T	South Coast	42,850	5	2
Monterey	T	Central Coast	33,100	5	1
Eureka	T	North Coast	27,750	5	1
San Jose	X	S. Bay Area	909,100	10	2
Santa Rosa	X	N. Bay Area	138,700	5	1
Walnut Creek	X	E. Bay Area	63,900	10	1
San Rafael	X	Marin	54,400	10	2
Ukiah	X	North Hills	15,000	5	1

⁵ The "C-20" license allows contractors to work on "warm-air heating, ventilating and air-conditioning."

⁶ In addition, one contractor (in Rocklin) was specifically suggested for the initial interview.

⁷ Climate zones include: R—Desert/Mountain; S—Valley; T—Coastal; and X—Hill. See map in Customer Survey Report.

⁸ California Department of Finance, estimates for January 1, 1999.

Because the in-depth interviews were our first opportunity to use the Contractor State License Board listings, we tracked the disposition of each sample point carefully to provide an initial estimate of the population of active HVAC contractors serving residential customers. The following dispositions resulted:

Table 2: Disposition of CSLB sample

Description of Disposition	Number	Percent
<i>Starting Sample</i>	125	100%
Duplicate records	1	1%
<u>Unused sample (not checked for listings)</u>	19	15%
<i>Sample checked for listings</i>	105	100%
<u>No listing</u>	23	22%
<i>Sample with telephone numbers</i>	82	100%
<u>Unused sample (with phone listings)</u>	18	22%
<i>Sample used</i>	64	100%
Answering Machine / Voice Mail	6	9%
<u>Computer / Fax tone</u>	1	2%
<i>Contacted</i>	58	100%
Initial refusal	6	10%
Unqualified (no residential HVAC work)	27	46%
Callback scheduled (not needed)	5	9%
Completed interview	20	35%

The major losses from the sample were CSLB records for which we could find no telephone listing (22% of listings requested) and those who reported doing no residential HVAC work (46% of contacted). Many contractors appear to be small and very busy. We believe this contributed to the three other major losses: 1) continually getting their answering machines at different times of day; 2) initial refusals to take time to answer our questions; and 3) a sizeable number who missed scheduled call backs. We do not believe this caused significant bias in what was learned from this qualitative research.

We completed 20 in-depth interviews with residential HVAC contractors. The completed interviews took between 25 and 120 minutes with a mean of 64 minutes. Participating contractors each received an incentive of \$100.

Use of Qualitative Research Findings

The reader should keep in mind that in-depth interviews are a qualitative research method. They are designed to play an exploratory role in research, and were primarily used in this research to clarify issues and identify specific topics to be quantified in the subsequent contractor survey.

The information presented in this report should be considered within this context and understood to have the following limitations, fundamental to all qualitative research:

- **Qualitative research results may not be representative of what would be found in the population (of contractors doing HVAC work) and thus are not projectable;**
- **This report is a synthesis of comments from a small sample of individuals. Collectively, respondents discussed many issues. Individually, respondents expressed deeply held views and opinions, while covering a more limited range of issues; and**
- **Because of small sample sizes, we may not have identified all important views.**

Section V: Findings

This section of the report is divided into twelve sub-sections. These sub-sections generally follow the order in which various issues were discussed during the interview process. We begin with a brief description of the contractors we interviewed. This is followed by their reported sales by energy efficiency level, their views on replacement timing, the remodeling market, selling HVAC equipment, HVAC-related products and services, incremental costs of energy-efficient units, financing HVAC equipment, technical training, competitive issues and their recommendations to PG&E.

Firmographics

We asked contractors a few specific questions about their business operations. A brief summary of this information is presented to provide a better understanding of the types of contractors interviewed.

Services Provided

- **All contractors interviewed deal / sell and install HVAC equipment to residential customers.** All, but one of these contractors, also service residential equipment. Some of these contractors noted that they only service equipment they have installed.
- **About two-fifths of these contractors offer financing for residential equipment.**
- **None of these contractors distributed any products or supplies to other contractors.**
- **Almost all of the contractors we interviewed also deal / sell and install HVAC equipment to light commercial customers.** Several do not service equipment for these customers.
- **Only one-fourth deal / sell, install and service HVAC equipment for larger commercial / industrial (C / I) customers.**
- **Only one-fifth of all contractors interviewed offer financing to light commercial customers and none offer financing to larger C / I customers.**

Ownership, Employees, Brands Offered and Distributors Used

- **All the contractors we interviewed are independently owned.** And, they do the vast majority of their work with their own employees. One-third subcontract small amounts of work—estimated at 5 to 10% of their work.
- **These contractors employed from just themselves to 55 installers and technicians.** In addition, they employed from none to 14 salespeople.
- **Their “other employees” numbered from none to 240.** These others included secretary, office manager, support, inventory control, fabrication, shop and construction workers. Many contractors do a variety of other work from architectural sheet metal and plumbing (several firms) to complete home remodeling (one firm).
- **These contractors sold and installed an average of 3 to 4 brands (ranging from 1 to 12).**
- **They bought equipment from an average of 3 distributors (ranging from 1 to 8).** They purchased supplies and materials from an average of 2 distributors (ranging from 1 to 7 for supplies and from 1 to 4 for materials).

Customer Sectors Served

- **Their residential work averaged 70% of their gross sales revenue (ranging from 5% to 100%).**
- **Their small commercial work averaged 20% of their total.** Their large Commercial and Industrial work averaged about 9%.
- **The largest revenues for residential work are derived from replacement of existing equipment, with three other types of work contributing about the same percentage of revenue.** Specifically, their residential replacement averaged about 40% of total revenues, new construction averaged just under 20%, adding central heating or cooling to dwellings that had not had a central system averaged just less than 20%, and service and repair work averaged 20%.

Sales by Efficiency Level

Contractors were willing and able to provide specific information on the number of units they sold for new construction, and for replacements and additions in existing homes. They also provided estimates dividing these sales figures by energy efficiency levels. Of course, these qualitative results are relatively unimportant, but they demonstrated contractors could and would provide this information. This was important to designing and implementing the subsequent quantitative telephone survey.

Forced Air Furnaces

- **Just over half of the contractors we interviewed consider A.F.U.E. 90 units to be “energy efficient,” while just under one-half consider A.F.U.E. 80 or 82 units to be “energy efficient.”**
- **These contractors installed an average of 33 furnaces in 1998 in new homes.**
- **Of these furnaces for new construction, 80% were A.F.U.E. 80 units and 20% were A.F.U.E. 90 or higher.**
- **These contractors installed an average of 89 furnaces in 1998 for replacements and additional units in existing dwellings.**
- **The contractors reported installing a similar mix of efficiency levels in existing dwellings as they installed in new homes.**

Central Air Conditioners

- **Most contractors said SEER 12 or 12-13 units were “energy-efficient.” However, almost as many said SEER 10 were “sufficient.”**
- **For new construction, these contractors installed an average of 26 central air conditioners in 1998.**
- **Of the central air conditioners installed in new homes, 60% were SEER 10 units and almost 30% were SEER 12 units. SEER 13 and 14+ units totaled only 9% of all units.**
- **For replacements and additional units installed in existing dwellings, these contractors installed an average of 42 central air conditioners in 1998.**

- **They reported a higher percentage of sales of higher efficiency central air conditioners in replacements than in sales to new homes: one-half were SEER 10 or 11 units, more than one-third were SEER 12 units and more than one-tenth were SEER 13 and 14+ units.**

Replacement Timing

- **An average of 55% of these contractors' work is breakdown replacement. Contractors report that customers need this work done within 3 days.**
- **The balance of their replacement work—45%—is planned. Contractors report that customers need planned work done within an average of 2 weeks.**

The contractors' comments tend to reinforce the "factual" information that they are asked to provide quick turnaround for most breakdown replacements. They feel that they do not have as much opportunity to discuss energy efficiency and other options with customers when equipment breaks down during the middle of the cooling or heating season.

Remodeling Market

- **Our respondents have varying experiences working with remodeling contractors—those who never do, one-half who sometimes do, and some who work with them regularly.**
- **Those who work with remodelers say that the projects often include reducing heat losses and gains.** Common energy-related measures are upgrading windows, reinsulating attics and floors and sealing "holes" in walls. One pointed out that most of this work affects only portions of the home—almost never is the whole house upgraded.
- **Some contractors found out about the improvements to thermal integrity in time to use the information in sizing the HVAC equipment they were to install.** *We investigated this situation further in the contractor telephone survey.*

Also of interest were interviews with a remodeling contractor who also does HVAC work and with a remodeling contractor who is about to start offering HVAC work. Both commented that after trying *rather unsuccessfully* to coordinate remodeling with HVAC work done by other contractors, they now were establishing internal “divisions” to do their own HVAC work. The general view of these and other contractors appears to be that completing a coordinated “whole house” project is rare.

Selling HVAC Equipment

We explored the extent to which contractors mention—or actively sell—energy-efficient equipment. We asked who sells and how knowledgeable they are about energy-efficient products; their reasons for selling energy-efficient equipment; the benefits they receive from doing so; the options they discuss when selling furnaces and those they discuss when selling air conditioners; and the benefits they stress to customers. Their responses guided our development of the section covering these topics in the telephone survey.

Who Sells and How Knowledgeable They Are

- **Most of our respondents do all the selling themselves, while a few have salespeople on their staff.** Only one used the services of independent home improvement salespeople.
- **Most rated their—or their sales staff’s—knowledge of energy-efficient products and services as a 4 or 5 out of a maximum of 5.**

These answers were judged relatively uninformative and these questions were dropped when we had to limit the length of the telephone survey.

Options Discussed with Customers

- **Contractors identified many options they discussed with residential customers interested in buying a furnace. These include:**
 - **Efficiency levels—most contractors mentioning A.F.U.E. levels in this question feel 80 is adequate for most customers due to the “mild” heating season climate (in much of PG&E’s service territory).**
 - **Cost / Price —many noted “very price driven,” “it’s all price driven,” “customers not interested in anything else.”**
 - **Affordability / financing.**
 - **Customer’s needs—how long customer expects to live in house.**
 - **Comfort.**
 - **Filtration—allergies create most interest in electrostatic filters and electronic air cleaners.**
 - **Brands / Models.**
 - **Warranty and reliability.**
 - **Energy consumption and maintenance differences (based on experience installing and servicing many brands).**
 - **Components and quality differences.**
 - **Clock / programmable thermostats.**
 - **Two stage / variable speed.**
 - **Review house—heat loss / gain, ductwork condition, size, insulation.**
 - **Fuel.**
 - **Changing evaporator coil when replacing furnace.**

- **Contractors also identified many options they discuss with residential customers interested in buying an air conditioner. These include:**
 - **Efficiency levels (most mentioning SEER levels *in this question* feel 12 is adequate). Also, some explain that savings are not large.**
 - **Cost / Price.**
 - **Affordability / financing.**
 - **Lower operating costs—some only talk savings in percentage terms, never dollars.**
 - **Customer’s needs—how long customer expects to live in house.**
 - **Warranty and reliability.**

- **Safety.**
- **Replacing refrigerant lines with outside unit (lines are likely to be full of metal filings from failed compressor).**
- **Noise levels.**
- **Brands / models / color (of outside unit) / other features.**
- **Review house—heat loss / gain, especially ductwork condition, size, insulation and register sizes. In many cases they must redesign ductwork.**
- **Test airflow.**
- **Replace asbestos ducts.**
- **Energy consumption and maintenance differences (based on experience installing and servicing many brands).**
- **Components and quality differences, condenser unit construction.**
- **Two stage / variable speed.**
- **Filtration.**

Benefits Contractors Stress to Customers

Contractors listed many benefits they stress when selling energy-efficient furnaces and air conditioners to customers. Two-thirds of the contractors listed more than one benefit for furnaces and half the contractors listed more than one for air conditioners.

- **Low operating costs / lower utility bills were listed by two-thirds of the contractors for both furnaces and air conditioners.**
- **Better warranties were listed by one-quarter of contractors for furnaces and by one-third of contractors for air conditioners.**
- **One-third of contractors listed noise reduction for air conditioners.**
- **One quarter of contractors also listed improving comfort and reducing noise for furnaces.**
- **Comfort and low maintenance costs were also mentioned several times for air conditioners.**
- **A few contractors mentioned that energy-efficient furnaces are “better for the environment.”**

- **Contractors also stress ease of installation and better quality for furnaces and smaller sized equipment, better equipment, better dehumidification, and equipment that lasts longer and increases the value of the home for air conditioners.**

The responses contractors gave when asked what “options” they discuss for furnaces and air conditioners and what “benefits” they stress when selling energy-efficient units were employed in creating response categories for a question in the contractor quantitative telephone survey concerning the benefits they emphasize to customers.

Important Factors in Customers’ Purchase Decisions

Contractors were asked to list factors important in a typical residential customer’s heating and cooling purchase decision. Then they were asked to identify which factors are most important to customers. There are a small number of factors that most contractors agree are important and many other interesting factors mentioned by only one or two contractors.

- **Price (or cost) was said to be an important factor in customers’ decisions by the largest number of contractors.**
- **Contractor’s reputation was said to be an important factor by the second largest number of contractors.**
- **The equipment brand (or the “brand’s reputation”) and reliability was the third most often mentioned factor. There is little differentiation in the use of these terms and concepts.⁹**
- **Energy efficiency was the fourth most often mentioned (and the last mentioned by at least one-fourth of the contractors).**
- **Most contractors believe price and their reputation are the most important factors in customers’ purchase decisions**

- **Others identified an interesting set of other factors:**
 - **Comfort**
 - **Satisfaction**
 - **Response to problems**
 - **Lower utility bills**
 - **Quality**
 - **Reliability**
 - **Trust and confidence [in contractor]**
 - **Equipment performance**
 - **Referrals**
 - **Noise [reduction]**

In addition to these factors, contractors also listed professionalism, thoroughness, truthfulness, craftsmanship, timeliness, equipment benefits and features, concern for the whole house, and information / performance on warranty service.

Customers' Level of Knowledge

We asked contractors how knowledgeable customers are about HVAC equipment and probed to find out if contractors believe they understand efficiency ratings and if the customers rely on contractors to recommend or select equipment.

- **Almost one-third of contractors said most customers have “no clue.”** Some provided illustrations, including one who said he had a customer inquire how to light the pilot on an A.F.U.E. 80 furnace.
- **One-fourth said many customers know of efficiency ratings and some may ask about the SEER of a unit.** Others added that customers are “relatively uneducated” and “marginally knowledgeable.”
- **One-fifth said customers rely on the contractor.**
- **Two contractors noted that customers are becoming more knowledgeable because they get information on the Internet.**

⁹ Some manufacturers promote reliability as their brand identity, for example Trane says, “It takes a lot to stop a Trane.”

Providing Cost Estimates for High-Efficiency Units

Contractors were asked how often they provide customers with cost estimates for high-efficiency as well as standard-efficiency furnaces and air conditioners. Table 3 shows the responses for furnaces and air conditioners.

Table 3: Number of contractors providing cost estimates for energy-efficient units

Provide cost information in . . .	Furnaces	Air Conditioners
1 - All sales situations	3	5
2 - Most sales situations	7	6
3 - Some sales situations	2	3
4 - Very few sales situations	3	4
5 - Never	5	2

An average “score” for furnaces is 3.0 (meaning that contractors provide cost estimates for energy efficient units in “Some sales situations.” The average “score” for air conditioners is a little “higher,” at 2.6 (meaning they provide information in between “Some” and “Most” sales situations).

Providing Utility Bill Savings Estimates

We also asked how often they provide customers with estimates of utility bill savings for high-efficiency compared to standard efficiency units. And, we followed up by asking how they estimated those utility bill savings for furnaces and then for air conditioners.

- **The average score for how often contractors provide estimates of bill savings was 3.7, or they provide estimates in close to “Very few sales situations” (4.0).** (One-third of respondents said “Never.”)
- **The largest number (one-quarter of respondents) use manufacturer’s charts or tables to estimate bill savings.**
- **Some others use manufacturer’s slide rules, calculators or computer programs.**

- **Still others give general percentage savings, or just explain differences between units or the efficiency ratings.**

Our impression is that contractors are reluctant to provide utility bill savings estimates because they do not want to create ‘false’ expectations. Few of the contractors had tools that they trusted to accurately account for local climatic conditions. Also, contractors “live by referrals from satisfied customers” and “never want to disappoint customers” in any way.

Benefits Contractors Receive

- **Contractors identified many benefits they receive from selling energy-efficient furnaces and air conditioners:**
 - **More money.**
 - **Better customer satisfaction that leads to better word-of-mouth / referrals.**
 - **Higher margins.**
 - **Better quality—fewer callbacks.**
 - **Better warranty.**
 - **Distributor recognition.**
 - **Ecological benefits for all (use less electricity).**
- **However, several contractors also said they receive “no benefits” and some said that problems and callbacks with energy-efficient furnaces (especially) cost them more than they made.**

Contractors noted that the anticipated benefit of more money and higher margins were accompanied by many concerns. The most important concerns to many of the contractors related to anything that might get in the way of their ability to keep “their” customers happy over the long run.

Early Experiences with Energy-Efficient Units

Contractors were also asked the reasons they first began selling and installing energy-efficient furnaces and air conditioners and what problems—if any—they had encountered during those early days. The reasons they began were mostly customer focused:

- **Most of the contractors who sell energy-efficient units said they began selling them because of customer demand / interest.**
- **The next most often mentioned reasons relate to customer benefits: saving customers money, units are more efficient, have better warranties, are better products, provide better comfort, and are less noisy.**
- **Some contractors began selling efficient air conditioners because of PG&E, SMUD and factory rebates.**
- **Contractors also mentioned making more money / higher markups and needing to stay competitive and to offer more competitive product lines.**

Most contractors had no problems when first selling energy-efficient units. Most who did sell early energy-efficient units reported typical problems one could expect—learning to sell new concepts and service new technologies. Several still do not sell “energy-efficient” equipment (defined here as any equipment more efficient than the federal minimum standards).

- **Most said energy-efficient units were harder to sell, they needed to train all their staff, and they had reliability problems with the early energy-efficient furnaces.**
- **Among “other” problems they reported lack of service schools, “bugs,” problems with building inspectors regarding furnace venting, noise (with the Lennox Pulse furnace), and that the “equipment was different.”**

Sizing HVAC Equipment

Due to the importance of proper furnace and air conditioner sizing for operating efficiency / costs and occupant comfort, we asked separate questions on how the responding contractors sized furnace and air conditioners. Their answers were identical in most cases and are reported together.

Existing Homes

- **The largest number of contractors base sizing replacement units for existing homes on their experience plus some consideration of the floorspace of the home (square footage), the size of the old heating or cooling unit and, possibly, any efficiency improvements.** The following list captures the major methods used.
 - **Experience or ‘Intuition’** (some have learned Manual J and D and now have gone back to just using experience).
 - **Square Feet** (per Ton or per 20,000 BTUH heating).
 - **Manual J calculations**—using Wright-J or Elite software or Lennox computer (Sharp).
 - **Heat gain / loss calculation** taking into account insulation levels, window area / type and other factors.
 - **Consider duct capacity as limit on size** of air conditioner that can be installed (without rebuilding ducts).
 - **Consider types of rooms**—high ceilings and other factors.
 - **Consider date of construction** (as a proxy for insulation levels and quality of windows).

- **One contractor stressed his belief that, under California law, he has to put in the same size unit he took out, unless the old unit was grossly oversized.**

We also asked contractors what efficiency improvements they examined before they determined the size of the HVAC equipment that will be needed. We recorded their initial answers and then probed for several specific items.

- **Less than one-half of all contractors said they visually inspect ductwork for damage.** Some also check plenums and one checks the size, layout and quality.

- **Only about one-third of all contractors said they check for or suggest improvements to insulation and windows.**
- **Only a few test ductwork for air leakage (with a duct blaster or blowerdoor) or check airflow through the duct system.**
- **Several comments indicate a lack of interest among contractors in going beyond looking at the old unit to be replaced and having a brief discussion with the customer:**
 - **“Customers don’t like you poking around their homes.”**
 - **“No, I don’t check unless there’s a dramatic need or they are going to do something themselves.”**
 - **“I look at the whole picture but don’t change the size from the old equipment.”**

New Construction

- **Title 24 calculations provide the required energy efficiency and unit capacity (size).** In some cases an engineer working for the contractor will perform the Title 24 calculations. Contractors made several interesting comments on the accuracy and usability of the Title 24 recommendations.
 - **Title 24 is occasionally inaccurate or way off.**
 - **Several do their own calculations to check the Title 24—One contractor who uses an in-house computer program, believes that Title 24 is “usually wrong.”**
 - **Others make “corrections” to the Title 24-recommended sizing—One contractor typically installs ½ ton more than the builder’s Title 24 specification.**

Contractors’ Role in Selecting Size and Efficiency

- **When asked how often they recommend or select the specific unit size and efficiency rating to be installed in existing homes, almost all contractors indicated that they do this all or almost all of the time.**
- **For new construction, one-third indicated they recommend or select the size and efficiency rating in less than 35% of their new construction jobs, almost one-third said they do no new construction, and some indicated they do this in a major proportion of their new construction jobs.**

A new series of questions exploring the sizing methods used for HVAC equipment was developed for the telephone survey. In addition, we added a question sequence on contractors' opinions of the Title 24 sizing recommendations they receive from the general contractor for new construction jobs.

HVAC-Related Products and Services

In addition to proper selection and sizing a furnace or air conditioner, several associated products and services are critical for achieving and maintaining total HVAC system efficiency. These product and services include: 1) duct sizing and layout; 2) duct testing, repair, and sealing; 3) installing programmable thermostats; 4) applying zoned systems where appropriate; 5) measuring airflow across heat exchangers; 6) checking refrigerant charge; and 7) selling service and maintenance agreements. Another service—related to occupant safety—is testing for carbon monoxide.

Duct cleaning, repair and sealing

- **Almost three-fourths of the respondents do not clean ducts.** In fact, several of these who do not offer duct cleaning made negative comments on the service:
 - **“Fifty percent of the ducts that get cleaned don’t need it. It’s a sales gimmick.”**
 - **“It’s a bad idea—tears things apart. Spend a little more for new ductwork. Most providing duct cleaning now are not qualified.”**
 - **“Some environments may call for it, but most of the time it’s a rip-off.”**
- **Some of those who do not offer duct cleaning refer customers to others who do.**
- **Three-fourths of the contractors perform some duct repairs, most often when installing replacement units.** One-fourth does not offer duct repairs or sealing and do not believe you can make money on it.
- **Even several of those offering duct repair and sealing do not believe they can make money on these services.**
- **One-fourth believes their products meet UL 181 requirements.** They use tape and mastic (with two providing the name “Versagrip”).

Duct sizing and layout

Duct design is critical to proper functioning of central heating and cooling systems. Yet there is considerable concern that few contractors use systematic methods to size and lay out duct systems. We included four questions on this topic.

- **Only one contractor acknowledged using the ACCA Manual D procedure for sizing ductwork.**
- **Six other contractors described other calculations and procedures.** These included: Wright-J and cubic feet per minute (cfm) to each room; Ductulator (duct calculator); SMACNA; load calculation; static method, equal friction throughout the ductwork; and slide rule and experience.
- **All others listed intuitive, experience-based methods.** These considered room sizes, downsizing when converting from gravity furnace, routinely upsizing ducts and registers and other rules of thumb.

Measuring airflow

- **Two-thirds of contractors said they measure airflow.** However, almost one-half of those contractors said they rarely did this for residential jobs. One has just acquired a blower door and is planning to offer a complete service soon.
- **One-half of all contractors reported having flow hoods and / or anemometers.**

Checking refrigerant charge

Another critical service action is checking that the proper amount of refrigerant is in a system. We asked a specific question on this, accepted answers and probed for clarification. Nineteen contractors provided a total of 28 responses.

- **Almost one-half of the contractors mentioned using temperature and pressure or pressure gauges.**
- **One-fifth mentioned manufacturers chart, superheat, temperatures and pressures.**
- **One-fourth mentioned superheat.**
- **One-fifth mentioned digital scales.**

- **One-seventh mentioned subcooling.**
- **And a few mentioned sight glass and prefilled at the factory.**

Several of these responses are “indicative” that a contractor is probably using proper methods of ensuring a cooling unit has the correct refrigerant charge. Mention of using instruments to measure temperatures and pressures, manufacturer’s charts, superheat and subcooling are all positive signs that the contractor may be employing industry-approved service practices. We used our understanding of how well our questions and contractors’ responses ‘worked’ to design questions for the quantitative telephone survey.¹⁰

Service and maintenance agreements

- **More than one-half offer service or maintenance agreements or schedule regular service calls with their customers.** Some commented that not many people wanted agreements, while others commented that they are doing more and more each year.
- **Six contractors sold agreements to new construction.** Their average success in selling agreements was 35%.
- **Ten contractors sold agreements to replacement customers.** Their average success in selling agreements was 55%. Some indicated that the agreement comes with the installation and that agreements sell best when they install a filtration system.

Other products and services

- **All but one contractor sell clock / setback (or programmable) thermostats regularly with installations.** Twelve reinforced their affirmative response with “always” or “every job.”
- **Three-fourths of the contractors have installed zoned systems.** One-half of them qualified their positive response with “a few,” “very few,” or “rarely.”

¹⁰ There is some ambiguity inherent in trying to establish how closely a firm’s technicians are following proper procedures through a telephone interview. A much better method is to have a technically knowledgeable observer ‘ride-along’ and employ a formal evaluation tool to note the methods a sample of technicians are using.

- **More than 4 out of 5 contractors have installed electronic air filters.** One-half of them qualified their positive response with “rare,” “some,” “not common,” or “occasionally.” And, several mentioned the better media filters (Space Guard) and electrostatics. Many cautioned about the need for frequent cleaning.
- **More than 4 out of 5 contractors have not installed any heat pumps.** They cited high cost, lack of market in mild climate (no A/C), and lack of experience as reasons they do not try or, when they have tried, they have not had success.
- **“Whole house” and “total system” concepts were mentioned by a small number of contractors.**
- **Contractors also reported that their customers have asked about air balancing rather than a full test for duct leaks, duct cleaning and energy efficient equipment, and electronic air filters.**

Safety check

- **More than one-half of all contractors test for carbon monoxide with an instrument.** Some test every home, others only if they are asked or the customer suspects a problem. One-third of the contractors performs visual checks of the furnace, the flame, and / or the venting.
- **Most of those who believe there may be a liability problem with performing carbon monoxide checks always have their customers also call the local gas company.**

Adopting new technologies

We asked contractors about how quickly they would adopt new technologies and what types of support would be most important when they did adopt a new technology.

- **Contractors descriptions of their speed in starting to offer “new and innovative products or services” allowed us to categorize them as “early adopters” or “late adopters.”** The others were labeled “majority adopters.” Table 4 shows the distribution of contractors across these categories and their respective interest in various types of support for new products or services.

Table 4: New product support desired by contractors

New Product Support	Early Adopters (n = 7)	Majority (n = 8)	Late Adopters (n = 5)
Product Training	7	3	5
Technical Support	6	3	5
Marketing Materials	5	3	4
Sales Support	2	2	0
Track Record	0	0	2
Product Information	1	1	2

Contractors clearly need new products to be well supported with training, technical support and marketing materials. And, as they begin doing more upselling, they may discover the usefulness of sales support.

Incremental Costs of Energy-Efficient Units

When asked for the incremental costs to their customers of going from standard to energy-efficient units, contractors were willing and able to provide figures *where they had experience*.¹¹ Thus, all contractors gave estimates for going from A.F.U.E. 80 to A.F.U.E. 90 furnaces, but only 8 gave estimates for going from 80 to 95. For air conditioners, 16 contractors gave estimates for going from SEER 10 to SEER 12, 12 contractors gave estimates for going from 10 to 13 or 14, and only 7 contractors gave estimates for going from 10 to 14+. Table 5 shows the mean, standard deviation, minimum and maximum estimates for the incremental costs.

¹¹ Those not having experience installing some types of units responded “don’t know.”

Table 5: Contractors' estimates of incremental costs

Equipment	Usable Estimates	Mean	Standard Deviation	Minimum Estimate	Maximum Estimate
Furnace, A.F.U.E. 80 to 90	19	\$511	\$211	\$130	\$1,000
Furnace, A.F.U.E. 80 to 95	8	\$925	\$271	\$700	\$1,500
Air Conditioner, SEER 10 to 12	16	\$412	\$188	\$70	\$750
Air Conditioner, SEER 10 to 13,14	11	\$823	\$339	\$350	\$1,300
Air Conditioner, SEER 10 to 14+	7	\$1,121	\$398	\$700	\$1,600

Financing HVAC Purchases

We began our exploration of financing HVAC purchases with questions on how contractors are paid for installations in newly constructed homes and in replacement situations. We then asked if they offer financing for equipment purchases, how important they believe financing to be from a competitive standpoint, and if they finance equipment installations or major repair or service work.

New Construction

- **For installing HVAC systems in new homes, most contractors receive progress payments.** These may be 1/3, 1/3, 1/3 or two draws, one draw when the rough-in work is completed and a second when the finish work is done.
- **In some cases, the builder pays them within 10 days of completion.**

Replacement

- **While there is more variety in contractors' payment arrangements for replacement jobs, most contractors require a lump sum payment upon completion.**
- **Many contractors noted that they extend "informal financing" by allowing some customers (especially those on fixed incomes) to pay over 30, 60 or 90 days.**
- **Many contractors require a down payment of \$100 or 10% of the bid price with the balance due upon completion.**
- **Many accept cash or credit cards.**
- **There were few who reported the percentage of jobs where the buyer financed their HVAC purchase.** One said 40% and another about 30% of their customers financed the purchase.

The next question specifically asked if the contractor offers financing and the following question asked about the competitive importance of financing.

- **Two-thirds do not offer financing or arrange financing for their customers.** One put it bluntly, "I'm not a bank—work it out and call me back."
- **The others do offer financing through a variety of sources.** The sources they mentioned include:
 - **Supply houses (distributors).**
 - **Manufacturers.**
 - **Local finance companies.**
 - **Local banks.**
 - **Independent, national finance companies.**
- **The largest number giving one response were the one-fifth who said there is not much demand for financing.**
- **Only one-eighth said financing was very important or was important because competitors offer it.**
- **Another one-eighth said "probably," "customers ask," "most contractors offer, few customers use."**

- **Other answers included “customers don’t want it, they want me” and “I never asked my customers.”**

Finally, we asked if customers finance just equipment installations or also major repairs.

- **One-third of respondents said that financing is only for equipment installations.** Only one contractor said it was offered for both.

Qualifications and Training

In this sub-section we present all of the information we obtained from contractors regarding qualifications and training of technicians and installers. This includes both qualitative and quantitative findings, from the In-depth Interviews and the Contractor Survey, respectively.

Qualitative findings

We asked each contractor what training they looked for when hiring technicians (for service and repair work) and installers. We also asked if they felt there was a shortage of qualified, well-trained technicians and installers. Finally, we asked if a shortage of qualified technicians and installers limit the amount of work they can do.

- **Technical school course completion or degree was the most sought after qualification for technicians.**
- **Good work experience was the second most desired qualification (one-quarter of the contractors).** Some contractors wanted 5 years experience.
- **Freon recovery certification ranked next (one fifth of the contractors).** Some contractors specified certification by the Federal EPA or the City of Fresno.
- **A few contractors want technicians who have completed a union apprenticeship, while others look at the amount of training.**
- **Finally, other contractors mentioned references, manufacturer’s certification, work style, good attitude, customer relations, and sales ability.**

When asked where technicians get the desired training, contractors listed the following sources:

- **Trade and technical schools;**
- **Manufacturers' and distributors' training sessions;**
- **On-the-job training (OJT) with other companies; and**
- **Refrigeration Service Engineers Society (RSES).**

Contractors look for simpler qualifications for installers, because these are generally entry level, minimum wage positions:

- **Most look for a good work ethic, fast and thorough, some mechanical aptitude, possibly a positive attitude that will make them good at customer service.**
- **Beyond these characteristics, most contractors want to provide OJT and teach new hires their way of doing things.**

Contractors do see shortages of qualified, well-trained technicians and, to a lesser degree, of qualified installers. However, among this small group of respondents (from the In-depth Interviews), the shortage is seldom a limiting factor on the amount of work they can complete.

Quantitative results

However, these and other reports of shortage of qualified, trained technicians and installers justified further attention. We asked questions in the quantitative survey to measure the dimensions of the problem. We present those results here for continuity.

- **Most contractors (79%) look for technicians with formal training.** More contractors in both the Coastal and Desert / Mountain climate zones want formal training (91% for both areas).
- **Eighty-six percent of contractors believe there is a shortage of qualified, well-trained technicians.** Somewhat more contractors (91%) in the Hill climate zone feel there is a shortage.

- **Slightly fewer contractors (75%) believe there is a shortage of qualified installers.** More contractors in the Coastal (85%) and Hill (83%) feel the shortage of installers.
- **Even fewer (63%) contractors feel that the shortage of qualified technicians and installers limits the work they can do.** Only 48% of contractors in the Desert / Mountain zone feel limited by the shortage, while 77% of the contractors in the Coastal zone feel the effects of the shortage.

Competitive Issues

Near the end of each In-depth Interview, we asked contractors what were the most challenging competitive issues they faced. The following responses illustrate their major concerns.

Consolidators,

- **“Consolidators are hard to compete with. They have the ability to do more advertising and offer more benefits to the customer.”**
- **“Maintaining my reputation. Consolidation will affect larger businesses, but smaller contractors will survive because of low overhead.”**
- **“Consolidation has had no impact yet, but large retailers selling HVAC equipment could have an impact.”**
- **“Consolidation is not affecting me, as an independent I can charge less. SCE is putting service on their bill, that’s a concern.”**

Utilities

- **“Utilities getting into the HVAC business.”**
- **“I face competition from utilities—they have unlimited funds and resources.”**

Other large competitors

- **“Pricing against large firms, not consolidation, not Sears.”**

- **“Larger companies are buying up small companies which will eventually cost the consumer more.”**
- **“Other companies advertise and do lots of service and repair [giving them more exposure]. I get almost all my business from referrals [for replacements in existing homes].**
- **“The market share of larger companies that advertise and the shortage of trained technicians limits my ability to grow.”**

Pricing and unions

- **Flat rate pricing [versus his time and materials prices].”**
- **“Non-union contractors”**
- **“Low ball pricing companies”**

Standards and poor work

- **“Set higher standards. Improve the current workmanship including some kind of monitoring. Saving people money on energy bills.”**
- **“Bidding unlike installations. Poor workmanship.”**
- **“Contractors are not installing to manufacturers’ standards, especially AC. Ductwork is also not being installed correctly by a lot of contractors.”**
- **“The one man contractor who is in and out of business. They are not very competent.”**

Shortage of well-trained technicians

- **“Shortage of well-trained technicians. It restricts the growth of our service department. This is a concern for a lot of contractors.”**

PG&E Should . . .

The final question gave contractors the opportunity to tell PG&E what else they should consider in designing programs to improve the energy efficiency of residential heating and cooling equipment, systems and installation practices.

Educate consumers and advertise

- **“Stress savings of energy-efficient units.** Although the price for high efficiency equipment is too much compared to the weather around here.”
- **“Educate the consumer! Promotion of energy efficiency.”**
- **“Educate customer, concentrate on distribution [duct] systems.** *Do not do something only with equipment.*”
- **“Advertising efforts about lowering utility bills.** Build awareness of saving money.”

Program measures and incentives

- **“Sponsor programs to rework old ductwork. Insulation programs. Windows.”**
- **“Emphasize duct sizing. Many Comfort Homes have poorly sized ducts with 12 SEER units.”**
- **“Why no duct sealing program yet?** If I had known what I learned at [PG&E’s] Stockton [Training Center], I would have done [that] years ago.”
- **“Offer rebates to motivate people to update their equipment.** Rebate duct sealing / insulation. Offer low interest financing. Demand Manual J load calculation in order to participate in rebate program.”
- **“I could see rebates to customers for installation and duct sealing.** Lots of homes get done so fast you can’t get to areas were ducts are leaking.”

Program procedures

- **“Ensure jobs are done to a high standard and verify it was done correctly.** They didn’t verify jobs were done correctly in the past. Incentives to the customer.”

- **“Implement stricter and higher guidelines which are difficult to do in such a competitive market.** Promote consumer awareness of quality versus poor installation practices.”
- **“Parameters have not been good for past programs.** They did not maintain good control over who was actually completing the work as intended by the programs. The work was not inspected, and some contractors cut corners. Require building permits with future programs and ensure the work is done correctly.”
- **“Bring back EGIA on improving home efficiency.** Design programs to the climate zone.”

Training

- **“Offer current technicians additional courses, certify and qualify.”**

Other recommendations

- **“Safety is important.** Manufacturers don’t realize that customers will try to quiet a noisy furnace by plugging combustion air inlets.”
- **“Clarify issues on the 90+ furnaces with the San Francisco Building Department.** It’s OK elsewhere [in the Bay Area].”

Section VI: Summary and Conclusions

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹² In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. The primary objective of this report is to help PG&E understand the equipment sales and installation process from the perspective of residential HVAC contractors. A better understanding of the barriers to the installation of energy efficient HVAC equipment and related services among HVAC contractors will lead to future market transformation efforts targeting the residential HVAC market. All respondents in this study provide HVAC equipment or services to the residential sector.

To address the research issues, Opinion Dynamics Corporation (ODC) conducted 20 in-depth, telephone interviews with residential HVAC contractors located within PG&E's service territory. Specific objectives of these interviews begin by profiling each contracting firm and confirming contractors' willingness and ability to provide data on their sales / installations of both forced air furnace and central air conditioning sales by efficiency level. We then explore important factors in the customer purchase decision process, especially the role financing plays. Of major importance is exploring the hypothesis that contractors are the primary source of information customers consult during their purchase decision process. We also explore contractor service and installation practices. Key research findings are summarized below and the summary of each topic is followed immediately by related conclusions (*designated by text in italics*).

¹² For a general discussion of market transformation issues, see "A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

Typical firms

Most of the HVAC contracting firms that participated in the in-depth interviews are small, independent, local firms providing services to residential and light commercial customers. They sell a limited number of brands and deal with a few suppliers.

Thus, most HVAC contractors have limited internal resources and limited access to external support. And, although smaller firms have greater needs for technical, sales and management training, they will be the least likely to be able to make time for such development activities.

Geographic diversity

Each contractor's energy efficiency beliefs and results appear to be related to the climate zone in which he or she works. The efficiency level they consider "energy-efficient" and their sales of more efficient units appear to vary with their location. Those in the Valley and Desert / Mountain zones are more likely to be concerned with energy-efficiency and sell higher proportions of efficient units.

Both the baseline situations and the potential for energy efficiency vary by climate zone. Program efforts and expectations will also need to be tailored by climate zone.

The contractor's time budget

The contractors we interviewed were difficult to contact. It was even more difficult to schedule an hour on the phone with them and then find them there at the scheduled time.

Because most small contractors rely on one (or two) key individual(s), their time for anything new is virtually priceless. The implication for the Residential HVAC program is that all means of communicating messages and providing training must be as time-efficient as possible.

Replacement timing

Contractors report that more than half of customers with broken down equipment want it replaced within 3 days. And, customers want an immediate response to their call, a quick proposal and next day service.

Thus, contractors feel that they do not have as much opportunity to discuss options when equipment breaks down during the middle of the cooling or heating season. A clearer

definition of the breakdown purchase situation is needed to determine what the customers' interests are and what their willingness to consider a better alternative is.

Selling HVAC equipment

The topics contractors mentioned as “options they discuss” and “benefits they stress” produced lengthy lists without many “most often mentioned” items.¹³ This suggests that HVAC contractors encounter a wide variety of situations. It may also mean there is little “industry-wide” agreement on a few ways to provide the greatest improvement in energy efficiency for most customers.

Proposed market transformation efforts for the Residential HVAC market will need to be flexible to support appropriate efficiency efforts across a range of situations. The program may also need to support efforts to engage people throughout the California HVAC industry to identify the most effective options (by climate zone).

Customers need information that contractors have

Contractors' described important factors in customer decisions, customers' level of knowledge, and how often they provide cost estimates of high-efficiency units and estimates of utility bill savings. Comparing five key findings points out some conflicts:

- **Price / cost is most important in customer purchase decisions.**
- **Energy efficiency is fourth most important.**
- **Customers know of efficiency ratings, but that is about all.**
- **Contractors provide cost estimates for standard and efficient units in only “some” situations.**
- **Contractors provide estimated utility bill savings in “very few” situations.**

It appears contractors are not providing needed information to help customers balance the benefits of energy-efficient units with the incremental costs. Contractors are rightly viewed as the experts and have access to key information. Proposed efforts to influence the Residential HVAC market may need to help prepare contractors for a new role as “consultants.”

¹³ Of course, the most frequently mentioned option discussed was “cost/price.”

Benefits contractors receive from selling energy-efficient equipment

Contractors mention the additional money and higher margins from selling and installing energy-efficient equipment almost as a secondary benefit. It appears the most important benefit to them is customer satisfaction. Listening closely to their list of benefits it becomes apparent they are committed to serving customers needs with quality equipment and sound craftsmanship.

Some contractors—especially the smaller ones—stated their goal is to get better and more referrals. The downside of “trying to please people” may be that many contractors then undersell both the equipment and the value of their labor and expertise.

Sizing equipment and ductwork

Overall, it appears that there is *significant* room to improve the equipment sizing practices of HVAC contractors. Most contractors’ responses showed that they ‘know’ that proper sizing affects the operating efficiency of furnaces and air conditioners. However, it appears they are not doing what may be required to properly size every installation. Their investigation of existing conditions and their calculation procedures are too informal. And, in new construction some do not trust the Title 24 sizing recommendations and “adjust” them.

It appears that in addition to teaching proper sizing procedures, it may be necessary to stress the importance and proven benefits of proper sizing. Here again contractors need to learn to “sell” customers on the value of spending more time discussing their situation and their needs.

Other products and services

We explored seven of contractors’ other HVAC-related product and service offerings.¹⁴ Their responses suggest that few of them are applying these products and services in all appropriate situations or applying them correctly when they do use them. It appears that few contractors believe the benefits these products and services could bring to their customers or their business are worth the extra effort to sell and install them properly.

¹⁴ These included 1) duct sizing and layout; 2) duct testing, repair, and sealing; 3) installing programmable thermostats; 4) applying zoned systems where appropriate; 5) measuring airflow across heat exchangers; 6) checking for proper refrigerant charge; and 7) selling service and maintenance agreements.

It appears that additional training, possibly certification and some incentives to use proper methods will be required to make these products and services approach their potential.

New products—experiences and needs

Contractors' recollections of their experiences with the first energy-efficient furnaces and air conditioners demonstrate difficulties with unfamiliar and sometimes unreliable equipment. They note the lack of service schools, their difficulties selling, and problems with building inspectors. Contractors also said they want new products to be fully supported by manufacturers and distributors.

Because so many HVAC contracting firms are very small and have few links to distributors, introducing new products will require a strong and sustained outreach effort to reach the contractors.

Technical training

It is clear that the shortage of qualified, well-trained technicians and installers is a significant problem. Given the variety of existing training sources and the demands for improvements, PG&E's role in addressing this problem is less clear. Options may include supporting others' efforts (such as the Consortium for Energy Efficiency efforts to develop standards for training and certification), providing more training through PG&E's Stockton Training Center, or providing incentives for contractors and their staff to participate in existing training opportunities.

It appears that PG&E should first consult with distributors who supply contractors in PG&E's service territory with HVAC equipment and training. These discussions should clarify what training is most needed and who can best supply which training. The distributors and contractors should also be able to provide useful recommendations on other steps to improve technical skills required to help make energy-efficient equipment perform at its potential efficiency in most installations.

PG&E Residential HVAC Market Transformation HVAC Contractor In-Depth Interview

Contact Name:		Notes, Callback
Title:		
Phone Number:		
Business Name:		
Address:		
Interview Date:		

STARTING TIME: _____ AM / PM

[INTRODUCTION:] I'm calling from Opinion Dynamics for Pacific Gas and Electric Company. PG&E is planning a new multi-year program to increase the energy efficiency of residential heating and cooling equipment and systems.

PG&E would like to better understand the current products, services, and practices of heating and cooling contractors. They need this information to design their new energy efficiency program.

You are one of 20 contractors we would like to conduct a strictly confidential interview. This is a critical stage in our research and, in appreciation for your participation, we are prepared to offer you \$100. Do you have some time to talk with me, it should take about one/half hour. (IF NOT NOW → When would be a better time for you? SCHEDULE A CALL BACK) Who should the check be made payable to? I also need to confirm your mailing address.

General Business Characteristics

- 1) I'd like to begin by learning a little about your business. I'm going to read a list of types of services your company may provide. After I read each service, please tell me if your company provides it. **Are you engaged in . . .**
- 2) Do you serve Residential, Light [small] Commercial (using basically residential type equipment) or Large Commercial / Industrial customers with your _____ .

(1) Service	(2) Res	LtCml	Lg.C/I
1 Dealing / selling heating and cooling equipment → (2)	R	SC	C/I
2 Installing heating and cooling equipment → (2)	R	SC	C/I
3 Servicing / maintaining heating and cooling equipment → (2)	R	SC	C/I
4 Financing heating and cooling equipment → (2)	R	SC	C/I
5 Distributing heating/cooling equipment to other companies → (2)	R	SC	C/I

- 3) Are you an independent business or a subsidiary of a larger company?
- 1 Independent (Sole proprietor, other: _____)
 - 2 Subsidiary → what company? _____
- 4) Do you and your employees do all your own work, do you subcontract, or a mix both?
- 1 Do own work
 - 2 Subcontract → About what portion of your work is subcontracted? _____ %
 - 3 Mix of do own work and subcontract
- 5) How many employees in each of the following categories do you have? [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

Number of Employees

- _____ HVAC Installers
- _____ HVAC Technicians
- _____ HVAC Sales People
- _____ Other Staff (Please describe: _____)

6) What brands or makes do you sell and install? [listen and check off, Probe for others]

- Air [?from Energy Star survey]
- Amana
- American Standard
- Armstrong
- Bard
- Bryant
- Burnham
- Carrier
- Coleman
- Day & Night
- Fedders
- Frigidaire
- Fujitsu General America
- G.E. / General Electric
- Heil
- Honeywell
- Janitrol
- Kenmore
- Lennox
- Luxaire
- Mitsubishi
- Payne
- Rheem
- Ruud
- Sanyo Fisher
- Tappan
- Tempstar
- Thermal Zone – Pameco’s brand
- Trane
- Whirlpool
- York
- _____
- _____
- _____

- 7) Which HVAC equipment distributors do you buy equipment from regularly?
- 8) Which distributors do you buy supplies from regularly?
- 9) And which do you buy materials from?

7)Equip	8)Supplies	9)Mtls.	Distributor name
_____	_____	_____	Air Treatment Corporation
_____	_____	_____	Amana
_____	_____	_____	Bryant Heating and Air Conditioning
_____	_____	_____	CFM Equipment Dist.
_____	_____	_____	Commercial Industrial Sales Company "CISCO"
_____	_____	_____	Duckworth Environmental
_____	_____	_____	Edward B. Ward & Company
_____	_____	_____	Familian Pipe and Supply
_____	_____	_____	Geary Pacific
_____	_____	_____	Heating and Cooling Supply Inc.
_____	_____	_____	Heieck Supply
_____	_____	_____	Lennox Industries
_____	_____	_____	Pameco Corporation
_____	_____	_____	Sam Alexander Distributing
_____	_____	_____	Slakey Brothers
_____	_____	_____	Southern California Air Conditioning Distributors
_____	_____	_____	Specialty AC Products (Pacific Coast)
_____	_____	_____	The Trane Company
_____	_____	_____	Valair
_____	_____	_____	Western Air Systems & Controls, Inc.
_____	_____	_____	Westburne Supply
_____	_____	_____	York Heating and Air Conditioning
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Segments Served and Sales Data

- 10) About what percentage of your work (gross sales revenue) is residential, what percentage is light commercial, and what percentage is large commercial and industrial? [Note: By RESIDENTIAL I mean single family homes, duplexes and townhouses – not apartments; and by Light Commercial I am referring to small commercial buildings that utilize heating and cooling equipment that is similar to residential equipment.]

Percent of Total Gross Sales Rev.
_____ Residential
_____ Light Commercial
_____ Large Commercial and Industrial
100%

(Note: Must Have ‘Residential’ Sales in Order to Continue)

INTERVIEWER READ: During the rest of the interview, I would like to focus on your residential HVAC business.

- 11) First, I’m going to ask the percentage splits of your residential heating and cooling work across new construction, replacement, installations in existing without central heating and cooling and service & repair. Remember, RES is Single Family, Duplexes and Townhouses.
What percentage of your gross sales revenue is new construction? What percentage is replacement of existing equipment? What percentage is... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

Percent of
Residential
Gross Sales Rev.
_____ New Construction
_____ Replacement of existing equipment
_____ Installations in existing homes without central heating or cooling
_____ Service and Repair
100%

Next, I'd like to ask about your sales to new construction.

- 12) In "Ballpark" numbers, I'd like to know about how many units of each type your company installed in new homes in 1998? How many furnaces did you install in new construction? How many . . . [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

Residential

New Construction

1998 Unit Sales

- _____ Furnaces
- _____ Central Air Conditioners
- _____ Heat Pumps
- _____ Evaporative (Swamp) Coolers →regular _____ or Two-Stage _____

- 13) Now, of those [NUMBER] of furnaces you installed in new homes last year, approximately what percentage had AFUE ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

<u>Percent</u> _____	<u>AFUE Rating</u>
_____	80s (79 to 84%)
_____	90s
_____	95s
100%	

- 14) And, of those [NUMBER] of central air conditioners you installed in new homes last year, approximately what percentage had SEER ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

<u>Percent</u>	<u>SEER Rating</u>
_____	10s (10.00 to 10.99)
_____	11s
_____	12s
_____	13s (good single-speed units)
_____	14.0 and up (any of these two-speed / two-stage units)
100%	

Now I'd like to ask similar questions about your installations in existing homes.

- 15) Again, in “ballpark numbers” about how many units of each type did your company install in existing homes (replacements or additions) in 1998? About how many furnaces did you install in existing homes? About how many . . . [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

Residential

Existing Home
1998 Unit Sales

_____	Number of Furnaces
_____	Number of Central Air Conditioners
_____	Number of Heat Pumps
_____	Evaporative (Swamp) Coolers → regular _____ or Two-Stage _____

16) Approximately what percentage of the gas and oil furnaces you installed in existing homes (replacements or additions) during 1998 had AFUE ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

<u>Percent</u>	<u>AFUE Rating</u>
_____	80s (79 to 84%)
_____	90s
_____	95s
_____	100%

17) Approximately what percentage of the central air conditioners you installed in existing homes (replacements or additions) during 1998 had SEER ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

<u>Percent</u>	<u>SEER Rating</u>
_____	10s (10.00 to 10.99)
_____	11s
_____	12s
_____	13s (good single-speed units)
_____	14.0 and up (two-speed units)
_____	100%

18) Now, please think about all the equipment replacement work you do. What percent of the replacements are breakdown replacements and what percent are planned (including remodeling)? [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

% of all replacements

_____	Breakdown → how quickly do customers need these?	_____	Days
_____	Planned → how quickly do customers need these?	_____	Days / Weeks
_____			100%

18b) How often do you work with remodeling contractors? Never / Sometimes / Regularly

18c) How often are they doing work that reduces heat losses or gains?
[PROBE: adding insulation, putting in better windows?]

Selling HVAC Equipment and Services

INTERVIEWER READ: Next, I'd like to ask you a few questions about selling forced air furnaces, heat pumps, and central air conditioners.

19) Does your company have salespeople who sell HVAC equipment directly to residential customers?

1 Yes → How knowledgeable are these sales people regarding energy-efficient product and service options? _____

1 _____ 2 _____ 3 _____ 4 _____ 5
Not at all knowledgeable Very knowledgeable

2 No

20) Do you use the services of independent, residential home improvement sales people?

1 Yes → How knowledgeable are these sales people regarding energy-efficient product and service options? _____

1 _____ 2 _____ 3 _____ 4 _____ 5
Not at all knowledgeable Very knowledgeable

2 No

Heating Equipment

21) What options do you (or your sales staff) typically discuss when selling a forced air furnace to a residential customer? [PROBE: Different models? Different brands? Different features? Different price ranges? Setback / Clock Thermostats?]

22) What efficiency level do you consider to be “energy efficient”? Energy Star minimum for gas and oil furnaces is AFUE 90%. [FILL IN BLANKS]

23) What benefits does your company get out of selling energy-efficient forced air furnaces?
[Probe: higher margins? Opportunity to sell other services?]

24) How do you generally determine the size of the forced air furnace that you are going to install?

Existing Homes (replacement situations)? [PROBE: Rule of thumb? Simple Calculation based upon square footage? ACCA Manual J for equipment sizing? Manufacturers' sizing programs/tables? Do your methods provide "room-to-room loads"?]

About what percentage of the time are you actively involved in recommending or selecting the specific unit size and efficiency rating to be installed?

_____ %

New Construction? [PROBE: Title-24 Calculations provided by builder? (Micropass, Comply 24, Energy Pro), Rule of thumb? Simple Calculation based upon square footage? ACCA Manual J for equipment sizing? Manufacturers' sizing programs? Do your methods provide "room-to-room loads"? Other software?]

About what percentage of the time are you actively involved in recommending or selecting the specific unit size and efficiency rating to be installed?

_____ %

25) When you began offering higher efficiency forced air furnaces, what were your reasons?
[PROBE: PG&E rebates? Energy Star? Other promotions?]

26) When you began offering higher efficiency forced air furnaces, did you have any problems? [DO NOT READ LIST; RECORD ALL THAT APPLY]

- 1 (Had reliability issues)
- 2 (Had venting problems)
- 3 (Had problems with condensate drains)
- 4 (Higher maintenance cost)
- 5 (Needed to train sales staff, installers, technicians, office staff)
- 6 (Harder to sell higher priced equipment)
- 7 (Other, please describe: _____)
- 98 (Don't know / Not sure)

27) What is the increase in your price to a customer to move up from an 80% efficient furnace to a 90% efficient furnace? (Note: Assume 80,000 BTUH input.) What about improving from a 80% efficient to a 95% efficient?

\$ _____ 80% AFUE to 90% AFUE

\$ _____ 80% AFUE to 95% AFUE

28) What benefits do you stress when selling higher efficiency forced air furnaces? [PROBE: benefits that help you sell higher efficiency furnaces? DO NOT READ LIST; RECORD ALL THAT APPLY]

- 1 (Comfort)
- 2 (Reliability)
- 3 (Noise reduction)
- 4 (Low operating costs/Lower utility bills)
- 5 (Low maintenance costs)
- 6 (Better for the environment)
- 7 (Better warranties)
- 8 (Other, please describe:_____)
- 98 (Don't know / Not sure)

Cooling Equipment

29) What options do you (or your sales staff) typically discuss when selling central air conditioners to residential customers? [PROBE: Different models? Different brands? Different features? Different price ranges? Replacing refrigerant lines? Installing a better air filter? Improving ducting or registers?]

30) What efficiency level do you consider to be energy efficient? [PROBE: Energy Star minimum efficiency is SEER 12.0.] [FILL IN BLANKS]

31) What benefits does your company get out of selling energy-efficient central air conditioners? [Probe: higher margins? Opportunity to sell other services?]

32) How do you generally determine the size of the central air conditioner that you recommend for existing homes (replacement situations)? What about for new construction?

Existing Homes? (replacement situations)? [PROBE: Rule of thumb? Simple calculation based upon square footage per ton? ACCA Manual J for equipment sizing? Manufacturers' sizing programs? Do your methods provide "room-to-room loads"?]

About what percentage of the time are you actively involved in recommending or selecting the specific unit size and efficiency rating to be installed?

_____ %

New Construction? [PROBE: Same methods? Title-24 calculations provided by builder? (Micropass, Comply 24, Energy Pro)]

About what percentage of the time are you actively involved in recommending or selecting the specific unit size and efficiency rating to be installed?

_____ %

33) When you began offering higher efficiency central air conditioners, what were your reasons? [PROBE: PG&E rebates? Energy Star? Other promotions? Other?]

34) When you began offering higher efficiency central air conditioners, did you have any problems? [DO NOT READ LIST; RECORD ALL THAT APPLY]

- 1 (Had reliability issues)
- 2 (Higher maintenance cost)
- 3 (Needed to train sales staff, installers, technicians, office staff)
- 4 (Harder to sell higher priced equipment)
- 5 (Other, please describe: _____)
- 98 (Don't know / Not sure)

35) What is the increase in your price to a customer to improve from a 10 SEER **3 Ton** central air conditioner to an 11 SEER unit? And from an 11 SEER to a 12 SEER? [READ LIST AND RECORD A RESPONSE FOR EACH INCREMENTAL INCREASE]

\$_____ From 10 SEER to 12 SEER

\$_____ From 10 SEER to 13 or 14 SEER – the best single-speed

\$_____ From 10 SEER to 14 + SEER – a two-speed

36) What benefits do you stress when selling high-efficiency central air conditioners? [DO NOT READ LIST; RECORD ALL THAT APPLY]

- 1 (Comfort)
- 2 (Reliability)
- 3 (Noise reduction)
- 4 (Low operating costs/Lower utility bills)
- 5 (Low maintenance costs)
- 6 (Better for the environment)
- 7 (Better warranties)
- 8 (Other, please describe: _____)
- 98 (Don't Know/Not Sure)

Selling High-Efficiency Furnaces and Air Conditioners

- 37) Which of the following categories best describes how often you provide customers with cost estimates for high-efficiency as well as standard efficiency furnaces? Is it . . .
- 1 All sales situations
 - 2 Most sales situations
 - 3 Some sales situations
 - 4 Very few sales situations
 - 5 Never
- 98 (Don't know / Not sure)
- 38) Which of the following categories best describes how often you provide residential customers with cost estimates for high-efficiency as well as standard-efficiency air conditioners? Is it . . .
- 1 All sales situations
 - 2 Most sales situations
 - 3 Some sales situations
 - 4 Very few sales situations
 - 5 Never
- 98 (Don't know / Not sure)
- 39) What efficiency improvement opportunities do you examine before you determine the size of the HVAC equipment that will be needed? [PROBE: Do you **test** the ductwork for leaks? Use a duct blaster? Do you check the windows for effectiveness? Do you check insulation levels? Do you do a blower door test of the air leakage of the whole house? Do you recommend adding a setback / clock thermostat? Do you check shading for the south and west windows?]

Do you ever conduct energy audits? [PROBE: When did you start doing audits? Do you ever examine the energy efficiency of the "whole house" in conjunction with HVAC installations?]

40) And which category best describes how often you provide customers with estimates of utility bill savings for high-efficiency compared to standard efficiency furnaces and air conditioners? Is it . . .

- 1 All sales situations
- 2 Most sales situations
- 3 Some sales situations
- 4 Very few sales situations
- 5 Never
- 98 (Don't know / Not sure)

41) How do you estimate those utility bill savings? [PROBE: Typical percentage? Furnace / Air Conditioner Manufacturers' information or charts? Calculation based on ____? Review customer's utility bills? Software that comes with RetroTech or Energy Conservatory Blower Doors?]

42) [PROBE: For air conditioners, do you use about the same or different methods as for estimating furnace savings?]

HVAC Related Products & Services

[INTERVIEWER READ:] Now, I would like to ask you about other types of residential heating and cooling services your company may provide.

43) Do you provide duct-cleaning services? [If 'No', What is your opinion of this service? Do you have any interest in providing this service?]

44) Do you provide duct repair or duct sealing services?

[If 'No', What is your opinion of these services? Do you have any interest in providing these services?]

[If 'Yes', Do you use mastic? IF YES, is it mastic that meets UL 181 requirements? Do you do duct sealing just with installations or also as a separate service? Can you make money on duct sealing?]

- 45) Does your company offer service or maintenance agreements to your residential customers? [PROBE: How do these agreements work? What are the terms? What is covered (labor, parts, etc.) and for how long? Do you sell any "3rd party warranties – marketed through distributors? How important are they to have from a competitive standpoint? Do you sell these services up-front or after installation? How aggressive or proactive is your company in selling them?]

(If offer service / maintenance agreements)

- 46) For what percent of new installations sales do you also sell a service / maintenance agreement?

- 47) For what percent of replacement installation sales do you also sell a service / maintenance agreement?

- 48) Do you recommend or install clock / setback thermostats? [Required under Title 24 for new and additions. **If 'No'**, What is your opinion of these thermostats? Do you have any interest in providing this service?]

49) Do you recommend or install zoned systems? [If 'No', What is your opinion of zoned systems for residential customers? Do you have any interest in providing these systems?]

50) Do you recommend or install electronic air filters to improve indoor air quality or address concerns about allergies? [If 'No', What is your opinion of this type of equipment? Do you have any interest in installing this type of equipment?]

51) Do you recommend or install air-to-air heat pumps? Geo-thermal heat pumps? [If 'No', What is your opinion of air-to-air heat pumps? What is your opinion of geo-thermal or ground source heat pumps? Do you have any interest in installing this type of equipment?]

52) Do you check for carbon monoxide problems?

[If 'Yes, Do you use the equipment on all service-related work? Do you use the equipment only when a CO problem is suspected or a customer requests it? What is the lowest parts per million – or 'PPM' – of carbon monoxide your equipment will measure?]

[If 'No', What is your opinion of this service? Do you have any interest in providing this service? Is liability an issue?]

53) How does your firm decide upon the size, configuration, and layout of duct work in residential new construction or duct replacement situations? [PROBE: Rules of thumb, software, simple calculations, ACCA Manual D?]

54) Does your firm have equipment to measure proper airflow through ductwork to individual rooms of a home? [PROBE: This would include **flow hoods** and/or **hot-wire anemometers**. How often do you use this equipment on residential jobs? In what situations do you use this equipment on residential jobs?]

55) How do you make sure that you have the correct refrigerant charge in air conditioners and heat pumps? [PROBE: use manufacturer's data and measure temperatures and pressures]

56) Do you provide any other new or innovative services (that I have not asked about) to improve the comfort, efficiency, or safety of a home?

57) What services do your customers ask for?

58) Relative to the industry, how quickly do you begin offering new and innovative products or services? [PROBE: Are you the first contractor in your area to begin offering new products or services? Do you wait to see any new product or service idea prove itself in the marketplace before you offer it?]

59) What types of support would be required for you to try offering a new product or service? [PROBE: Product training, technical support, marketing materials, sales support, etc.?]

Training

60) When hiring new technicians, what training do you look for? [PROBE: Manufacturer's certificate/training? ACCA training? NATE training? Two year technical degree?]

61) Where do they (technicians) go to get the training they need? [PROBE: What classes? What schools or technical schools? Utilities? Manufacturers? Distributors? ACCA? NATE? Does this training lead to certification or licensing?]

62) When hiring new installers, what training do you look for? [PROBE: Manufacturer's certificate/training? Trade school?]

63) Do you feel there is a shortage of qualified, well-trained technicians?

- 1 Yes
- 2 No
- 98 (Don't know / Not sure)

64) Do you feel there is a shortage of qualified, installers?

- 1 Yes
- 2 No
- 98 (Don't know / Not sure)

65) Does a shortage of qualified technicians and installers limit the amount of work you can do?

Customer Purchase Decision Making
--

66) What factors are important in a typical residential customer's heating and cooling system purchase decision? [PROBE: Price? Reliability? Brand? Energy-Efficiency? Warranty? Reputation? Safety? Comfort? Cost? Energy Star label?]

67) Which factors are most important to customers? [PROBE: Why?]

- 68) How knowledgeable are consumers about HVAC equipment? [Probe: Do they understand efficiency ratings? Do they rely on you to recommend or select equipment?]

Financing

- 69) How do customers generally pay you for heating and cooling equipment for new construction? How about for replacement equipment? [PROBE: 10% in advance with balance upon completion, net 10 days, net 30, cash/check, credit card, wait for them to get financing / loan)

New Construction _____

Replacement Equipment _____

- 70) Do you offer financing? [PROBE: Why?/Why not? What types? Do you offer “retail installment” financing? Is financing available through manufacturers, distributors, local banks/finance companies? What are the terms, rates, etc.?)

- 71) How important is financing from a competitive standpoint? [PROBE: Do competitors offer financing? Do customers frequently ask about it?]

72) Are the financing packages only for the installation of new equipment or do you also provide financing for major repair or service work that you provide? [FILL IN BLANKS]

Competitive Challenges

73) What are the most challenging competitive issues you face? [Probe: How does industry consolidation impact you? What about large retailers in you area]

74) And finally, is there anything else PG&E should consider in designing programs to improve the energy efficiency of residential heating and cooling equipment, systems and installation practices?

I just have one last question for you.

75) Have you participated in any of PG&E's air conditioning programs over the past five years? [PROBE: Rebate programs, incentive programs?]

- 1 Yes → Which program? _____
- 2 No

Thank you very much for being willing to respond to this interview.
I will have our check for \$100 issued as soon as possible, you will receive it in about 10 days.

ENDING TIME: _____ AM / PM

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Appendix A: Manufacturer Interview Protocol

Appendix B: Distributor Interview Protocol

Section I: Preface

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. Research was conducted with HVAC equipment / system consumers, contractors, distributors, and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes research conducted with HVAC manufacturers and distributors. The primary objective of the research is to help PG&E to understand the equipment production, distribution, marketing and sales processes from the perspective of the manufacturers and distributors.

The research consists of qualitative, in-depth telephone interviews with 20 distributors and four manufacturers of residential HVAC products. A wide variety of topics were covered in these interviews, averaging one hour in duration. The responses from these interviews provide key industry perspectives.

Please note that the results of this qualitative research are not projectable to the entire population of residential HVAC product manufacturers and distributors.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs.” (Eto, et. al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs. Today, market transformation has emerged as a central policy objective of future publicly funded energy-efficiency programs in California. Market transformation has been defined as "a reduction in market barriers due to a market intervention, as evidenced by a set of market effects that last after the intervention has been withdrawn, reduced, or changed."²

In order to adapt to this new policy framework, PG&E is pursuing detailed market research regarding the residential heating and cooling market across 44 California counties in which they provide electricity or natural gas. This research is designed to improve PG&E's understanding of barriers to the installation of energy-efficient heating and cooling equipment and related services in the residential sector—leading to market transformation efforts targeting the residential HVAC market.

This report is part of a comprehensive market research effort designed to address the residential heating and cooling market.³ This report summarizes the key findings from the qualitative research conducted with heating and cooling (or "HVAC") manufacturers and distributors. We selected only manufacturers producing, and distributors handling, at least some residential products for installation in the parts of California served by PG&E.⁴ Two project managers completed in-depth telephone interviews with 4 manufacturers and 20 distributors during the period from April 16 to May 13, 1999.

² For a general discussion of market transformation issues, see "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs" (Eto, et.al., July 1996)

³ The overall research project includes interviews with 1) heating and cooling manufacturers, 2) heating and cooling equipment and component part distributors, 3) heating and cooling contractors, and 4) single family homeowners who purchased heating and cooling equipment in the past 5 years. It also includes secondary research on the residential heating and cooling market.

⁴ These products are often referred to collectively as Heating, Ventilating and Air Conditioning or "HVAC" products. In the residential sector they are basically heating and air-conditioning units and systems.

Section III: Objectives

The primary objectives of this manufacturer and distributor research are to:

- 1) Explore the barriers to the sale and installation of energy-efficient residential HVAC equipment and whole house energy services;
- 2) Identify marketing and program strategies which may help to eliminate or reduce the barriers; and
- 3) Understand the influence HVAC manufacturers and distributors have on the residential HVAC-related products manufactured, distributed, and marketed in California.

The manufacturer and distributor in-depth interviews are a very important component of the overall research effort. We believe they have unique perspectives and understanding of the residential HVAC market. Thus, the primary purposes of the in-depth interviews are to:

- 1) Provide the research team with a better understanding of the range of issues, concerns, opinions, attitudes, and views of manufacturers and distributors; and
- 2) Provide insight into issues that may be useful in developing cooperative approaches to transforming the residential HVAC market in Northern and Central California.

Discussions with the PG&E Residential HVAC project team produced a comprehensive listing of key research issues associated with manufacturers and distributors of residential HVAC equipment:

- Size and focus of the firm.
- Competitive issues facing the firm and the industry.

- Residential HVAC equipment production and stocking practices.
- Residential HVAC equipment sales information by efficiency level and market segment.
- Attitudes toward and perceptions of energy efficient equipment.
- Training and other support provided to contractors and dealers.
- Opinions of and attitudes toward various PG&E incentive programs.
- Perceptions of the residential HVAC contractor community.
- Barriers manufactures and distributors see that need to be overcome in order to sell more energy efficient units and systems.
- Willingness to produce (and issues concerning) technologies that have a regional rather than national focus.
- Manufacturer and distributor recommendations for communications approaches to increase consumer demand for energy-efficient equipment and systems.

Section IV: Methodology

We obtained a list of major distributors handling HVAC products for installation in areas served by PG&E. As part of our interviews with distributors we asked for contact names for each of the manufacturers whose products they handled. We also obtained a listing of manufacturers with major shares of the U.S. market from the April 12, 1999 edition of *The Air Conditioning Heating & Refrigeration News*.

We made several attempts to contact each distributor and manufacturer. In several cases we were unable to complete an interview within the time available. This most often happened when a contact missed a scheduled interview appointment and then was unable to schedule another appointment or we were unable to reestablish contact.

These in-depth telephone interviews employed a guide consisting of 36 open-ended questions for the manufacturers and 43 open-ended questions for the distributors. Each question also included up to 8 items to pursue as “probes” to prompt more detailed responses. Twenty interviews were completed between April 16, 1999 and May 13, 1999. The interviews averaged 59 minutes in duration, with the shortest taking 30 minutes and the longest 95 minutes.

Use of Qualitative Research Findings

The reader should keep in mind that in-depth interviews are a qualitative research method. They are designed to play an exploratory role in research, and were primarily used in this research to clarify issues and identify specific topics to be quantified in the subsequent contractor survey.

The information presented in this report should be considered within this context and understood to have the following limitations, fundamental to all qualitative research:

- Qualitative research results may not be representative of what would be found in the population (of manufacturers and distributors doing HVAC work) and thus are not projectable;
- This report is a synthesis of comments from a small sample of individuals. Collectively, respondents discussed many issues. Individually, respondents expressed deeply held views and opinions, while covering a more limited range of issues; and
- Because of small sample sizes, we may not have identified all important views.

Section V: Findings

Marketing Energy-Efficient Products

Market Areas

Distributors appear to have a clear perspective on the market areas they serve. The general picture of the PG&E territory includes these features:

- **The Central Valley has a high demand for efficient air conditioning compared to the Bay Area.**
- **The area from Modesto south to Bakersfield is relatively “cash poor,” making it somewhat harder to sell energy-efficient units.** In addition, there is less availability of energy-efficient models among the packaged unit product lines that have a larger market share in the southern part of the Valley.
- **In the area from Modesto to Redding there is a better market with generally more educated and affluent customers around Sacramento.** Also split systems—with more energy-efficient models—are more widely used in this area.

Major Barriers

Manufacturers and distributors both have good perspectives on the residential HVAC equipment market. They are the only levels of the industry that have real marketing capabilities.⁵ They shared their views openly and seem willing to continue to do so.

Incremental cost of equipment

- **Almost all manufacturers and distributors believe the major barrier is the high incremental cost of “stepping up” from equipment that just meets the Federal minimum requirements to more energy-efficient equipment.**
 - Awareness of benefits is there, but savings are modest and paybacks are longer than in other parts of the country.

⁵ “Consolidators” also have marketing capabilities, but are not yet considered a major force in Northern and Central California.

- One distributor estimates payback (to go from a SEER 10 to a 12 or 13) in California at 5 to 6 years. Another says payback is longer than 10 years. Yet another distributor says flatly that “investment return on higher SEER is not there *unless[units are] rebated.*”
- However, other distributors note that energy costs are a significant part of the total cost of owning and operating a system, and those costs could be used to help sell high efficiency equipment.

Low energy cost combined with mild climate

- **A distributor cited the low cost of energy and the mild California climate as major barriers.** (This comment applies to some geographic areas—especially the coastal areas and the Bay Area—and not others—such as the southern part of the Central Valley.)

Low consumer awareness

- **A manufacturer noted that overall consumer awareness of HVAC products is low.** The manufacturer said, “most people do not even maintain their furnaces or air conditioners until they have a problem.” He reinforced his point by saying, “furnaces and air conditioners are out of sight and out of mind.”
- **A distributor indicates that customers rely on a contractor for information on the type of air conditioner to purchase.** “It’s an intangible product, not a necessity. It is not a ‘fun purchase.’ The customer relies on a contractor for the information and ‘education’ they need to make a purchase.”
- **A manufacturer pointed out that there is a discrepancy between customer attitudes and behaviors.** “Consumers say they are interested in energy efficiency and reliability, but they do not buy energy-efficient products.”
- **A manufacturer explained reasons for bundling energy efficiency with other product features.**
 - Energy efficiency is packaged with other premium features in many products. In a national market manufacturers must make products that offer several features to appeal to a broad range of customers.
 - Consumers make many trade-offs in each purchase. “Give them a choice of features and benefits and more will buy the premium units—not all for the same reasons.”
 - Customers are shortsighted and give up more than higher efficiency when choosing a lower priced unit.

Contractor / dealer behavior

- **Contractors believe they have to sell with low bids and are wary of trying to “upsell.”**
 - One distributor characterized contractors’ sales practices: “Selling better value is too much of a challenge, especially when they are busy. Thus, high efficiency sales drop off during the peak seasons when they are busy [and when most units are replaced].”
 - A distributor pointed out that one manufacturer’s research shows that “consumers would buy more energy efficient, premium products if they were offered.”

- **In general, there is little knowledge of energy efficiency and how to sell energy-efficient units among the sales staff.**
 - Contractors are entrenched in their old ways and reluctant to learn new things.
 - There is a lack of education and training on how to overcome the price objection.
 - There is a high turnover in staff because selling air conditioning equipment is seasonal in the Central Valley.
 - One manufacturer who makes a lot of “Kenmore” products for Sears noted that “they have a sales force that does a better job selling options and benefits.”

- **Contractor development is desperately needed.** Contractors are very independent and it is hard to get them to training and business development sessions. Some consolidators are offering their dealers development support.

Lack of sales approaches

- **A distributor identified the lack of effective methods to explain the long-term benefits and savings from installing energy-efficient units as a major barrier.**
 - “You need to discuss energy costs and savings and show them a lower monthly cost.”
 - “You also need to emphasize comfort and better reliability in talking long-term benefits.”

- **One distributor suggested the major barrier was that marketing and sales approaches have not addressed the high mobility [and short average tenure in one home] of California homeowners.** Specific approaches need to be used to show which benefits can be realized, depending on how long the owner expects to remain in the home.

Barriers in new home construction

- **A distributor described new construction as a tough sell, with the production builder / general contractor a major barrier.**
 - Production builders do not want to spend extra on HVAC, *because the equipment is “invisible” to prospective buyers.* Builders install the lowest efficiency units they can “get away with.”
 - Production builders do not even want to get involved in offering HVAC upgrades; they just want to sell the home. “They let us put a small display on the counter in the kitchen and something by the thermostat.”
 - Custom homebuilders may install energy-efficient units, if the owner is knowledgeable enough to insist on it.
- **Distributors reported varying splits in their sales to residential new construction, ranging from 60% to 95% going to production (tract) builders.** An average of 83% of their sales goes to production builders.

Piecemeal implementation, not a total system approach

- **Several distributors identified the common “piece-by-piece” approach to replacement and installation of HVAC equipment as a major barrier to achieving “true” energy efficiency.**
- **One distributor was emphatic, “Consumers are paying for energy-efficient equipment, but usually are only replacing the outdoor unit—not the indoor coil.”**
- **According to one distributor, “Duct leakage is also a big problem that is not addressed.”** He added that his manufacturer was addressing air leakage by tightening up the seals on furnace doors. This will have noticeable effects wherever furnaces are installed in unheated parts of a home [such as in California].
- **Other distributors also noted that installation practices are not “up to par” for energy-efficient equipment.**

Equipment Replacements

We asked manufacturers and distributors if they have any data on how many people wait until their furnace or air conditioner breaks down before replacing it and how many replace before breakdown occurs.

- **Overall, distributors estimated that 77% of all replacements are not done until breakdown.**⁶ A typical description of customer behavior was, “Nobody thinks ahead . . . [even if they have some idea that] when dealers are busy it will be more expensive.”
- **Manufacturers’ comments on replacements due to breakdowns were varied.** One manufacturer said she “doesn’t really have data on breakdown replacement.” Looking at shipment data, she believes some people who need repairs past the middle of the season just “baby the unit along” and wait until the next year. She sees a lot of replacements of central air conditioners from April to July [on a national basis]. Another manufacturer cautioned that “Many people think that customers buy real fast, but they take more time than many think. The contractor is in a hurry—they want a quick sell. They don’t offer more. If the salesperson will take the time, features will sell.”

Encouraging Planned Replacements

- **Manufacturers offer stocking programs for distributors and floor plans for dealers to make sure they have units on hand.** One manufacturer explained their logic for spending money on stocking and floor plans, “In the middle of summer, customers won’t wait.”
- **Several distributors suggested that PG&E time their promotional efforts to coincide with the industry’s regular preseason advertising and sales.**
 - One distributor said the preseason ads let customers know that the preseason-discounted prices are the best they will get all year.
 - Most distributors only feature energy-efficient units in their ads.
 - Another distributor pointed out that there are few or no ads during the season—everyone is already too busy to solicit more work.
 - If PG&E were going to promote energy-efficient units at all, the best timing would be during their preseason sales campaigns.
 - Coop ads during the preseason would be good. Advertising high efficiency units would only require 15 to 20% funding from PG&E.

⁶ The estimates of the percentage of all replacements that are only installed when the existing unit has broken down ranged from a high of 98% to a low of 25%.

- Some distributors want PG&E to send bill stuffers during the preseason, while others think bill stuffers during the peak season will be more effective.
- **Some distributors and one manufacturer questioned the effectiveness of the preseason advertising and discounts.**
 - One distributor felt that the main effect of the preseason ads might be just creating some name recognition for dealers. Thus, customers know a name to call when their unit breaks down during the peak season.
 - Another distributor describe all their efforts (mailers and ads to contractors, discount on equipment to get them to do more work earlier) and then said, “Customers are still not interested until it’s broken—not much equipment is sold preseason.”
 - Another distributor said he has done a lot of preseason advertising, but the returns on the ad expenditures were not good.
- **Several distributors commented that PG&E should concentrate on contractors to influence the breakdown sales.** Contractors have contacts with customers for service and repair and could tell people when they should replace an aging unit.
- **One distributor suggested encouraging people to replace both the furnace and air conditioner when one breaks down.**
- **Other distributors added that PG&E should provide an incentive for contractors to approach customers about planned replacements and should provide an incentive for homeowners to plan ahead.**

Business Challenges

Manufacturers and distributors identified a large number of challenges in promoting and selling energy efficient equipment.

Consolidation

- **Many manufacturers and distributors discussed consolidation of dealers and distributors and the entry of energy utilities into the HVAC industry.**
 - Most agree that consolidation is moving less quickly in Northern and Central California than in Southern California or other areas in the U.S.
 - Some distributors said that if utilities enter the market [as potential competitors], they would rather partner with [the utilities] than compete.

- **Distributors believe that consolidation of contractors/dealers in Northern and Central California now affects less than 5% of the units being sold and installed.**
- **With manufacturers buying dealers, “consolidation” has a new face. That takes the “middle” out of the industry.** Lennox appears to be doing this, but their small market share makes them a relatively small threat.
- **Distributors say that consolidators appear to be selling solutions to small contractors’ woes.** Distributors also believe that consolidation is creating other problems and is unlikely to continue to grow.

Increasingly competitive environment

- **One distributor noted that the Bakersfield area is overcrowded with dealers and distributors.** Twelve to fifteen distributors are selling ten brands into the area.
- **Competition in the Central Valley is intense and margins are very low.**
- **Large retailers are beginning to sell HVAC equipment directly to consumers.** So far, this does not seem to be a major problem [to HVAC distributors].
- **Increasing competition and decreasing distinctions between the equipment from one manufacturer to another leaves competition on price assuming a more important role.**

Shortage of qualified workers and managers

- **Several distributors and some manufacturers identified the lack of qualified sales, installation and service workers as the most serious challenge for the HVAC industry.**
- **Some also listed the shortage of HVAC business owners and managers as a serious problem.**
- **Several distributors also identified the challenge of training the dealers to effectively “upsell” to energy-efficient and premium models.** It is also a challenge to get dealers to take on new products. Distributors also believe dealers and smaller contractors have ‘poor’ business skills.

- **One manufacturer noted that they now need better-trained dealers, salespeople and technicians to respond to better-informed consumers.**

Regulatory changes

- **Manufacturers identified the changes being imposed by regulations as the biggest challenges they face.** These changes require educating contractors and consumers in the next few years.
 - The Montreal protocol continues to phase out Freon refrigerants—with steps coming in 2004, 2010 and 2020. The need to shift to R410A will mean that contractors will need different tanks and gauges.
 - The minimum efficiency levels [now A.F.U.E. 78 and SEER 10] will increase in 2006.
 - Manufacturers are facing redesign costs for regulatory changes coming in 2004 and 2006 across all their cooling products and redesign of heating products in 2006.
 - Many manufacturers are now redesigning products to meet both the 2004 refrigerant change and the 2006 minimum efficiency standard change at once.

Market Trends

Distributors and manufacturers identified two market trends that may impact the HVAC market by increasing demands for energy-efficient or premium HVAC systems.

Focus on comfort and health

- **Manufacturers and distributors identified a growing focus on comfort and health as a significant trend.**
 - Some noted that with more people working at home, there was more emphasis on improved comfort.
 - Many noted the increasing attention to improved air filtration. Some mentioned increasing awareness of the benefits to allergy-sufferers of installing better filtration components. Others mentioned consumers generally increasing concerns for maintaining a healthier environment.
 - Concerns for indoor air quality and better filtration are driving demand for variable speed fan motors.
 - Demands for improved comfort are increasing interest in two-stage heating and cooling units.

- **All manufacturers and distributors we interviewed said that they have higher efficiency units coming to market in the next few years.** They expect minimum efficiency standards to rise and several manufacturers are introducing more air conditioner models in the 13 to 14 SEER range and top models in the 16, 17 and 18 SEER range.

More knowledgeable consumers

- **Some manufacturers and distributors noted that they are starting to see consumers becoming more knowledgeable about HVAC equipment by using the Internet.**
 - Homeowners with problems—or wanting to add heating or cooling—would, in the past, ask neighbors or friends for the name of a good contractor and then trust the contractor’s recommendations.
 - Recently, consumers have begun to realize that for a major purchase costing several thousand dollars, they can get information on the Internet.
- **However, some distributors cautioned that the demand for new, higher efficiency products would not grow unless efforts to educate consumers are increased.**

Industry Views of Energy Efficient Equipment

- **Manufacturers and distributors acknowledged greater gross revenues and the possibility of increased margins from energy-efficient products.** Some manufacturers noted the higher costs to produce energy-efficient products and the higher prices they charge for them. As a “step-up” product, high-efficiency products *offer opportunities for larger margins.*
- **Some manufacturers noted that with few utilities promoting energy-efficient HVAC units, there are smaller opportunities to sell these “niche products” in many markets.**
- **Distributors echoed comments from dealers: selling a better product creates greater customer satisfaction, and that, in turn, leads to future benefits.** Among the secondary benefits are
 - Better word-of-mouth and increased referrals to “their” dealers and contractors.
 - Building brand image for efficiency, quality, and reliability.
 - Growing demand for products that are more saleable.

- **Manufacturers offering a full line of residential HVAC models may strategically position their energy-efficient products as premium alternatives for key spots in their lines.** Some manufacturers offer a “builder” step-up model for new construction. Most manufacturers offer one or more step-up models primarily for the replacement market.
- **Most manufacturers refer to their energy-efficient models as “niche products.”** For some manufacturers it is only their highest efficiency products that are positioned as “niche products.” Intermediate efficiency products are part of their “regular” product line. For others, who place less strategic emphasis on energy-efficient premium products, all their efficient models are positioned as “niche products.”
- **The few distributors with marketing plans will promote the flagship products of their manufacturers, offer some floor plans to selected large dealers, or offer some “spiffs” to salespeople for energy efficient units.**
- **Very few distributors have plans for marketing efforts.** Most marketing programs come from the manufacturers. Also, the dealers / contractors do some advertising.
- **Most manufacturers have ongoing plans to bring out new energy-efficient models in the next few years.** Most commonly mentioned models are air conditioning condensing units with SEER levels increasing 1 or 2 points.

Promotional Techniques / Messages

Manufacturers and distributors shared information on the audience and message for their promotions and communications. Manufacturers do most marketing to consumers. Distributors focus on promotions to contractors and dealers. Of course, the actual sales depend on the contractor or dealer.

- **Several distributors report not doing much marketing for energy-efficient products.**
 - “We do very little marketing toward energy-efficient products. We make lower margins and they are not economic in [this] climate.”
 - Others said they did nothing specifically for energy-efficient equipment.
 - One was just “getting into” marketing of energy-efficient air conditioners.
 - Another distributor does not advertise. Instead, he offers classes, dealer programs, and dealer meetings; and he stresses selling high efficiency equipment. His manufacturer does the marketing.

- **Some distributors participate in cooperative advertising programs with the manufacturer and the dealers.**
 - Key messages include savings on energy costs, better efficiency, and home comfort.
 - Some manufacturers focus on saving money on cooling bills and their use [in some units] of the new ‘ozone-friendly refrigerants.’ They stress the environmental benefits in their messages.
 - One distributor reports only using coop ads to promote energy-efficient products.
 - Others promote payback from savings on utility bills and utility rebates.

- **Other distributors promote manufacturers’ financing and extended warranties. Most of the marketing and advertising is driven by the manufacturer’s promotional efforts.**
 - One distributor says his only advertising is to support [his] dealers. The distributor gets manufacturers’ ads and customizes them for dealers in his area. The goal is to make the dealers more enthusiastic about selling the manufacturer’s premium equipment.⁷
 - Another distributor stresses that he does all he can with messages that stress energy savings, better warranties, and quality of the products.

- **One manufacturer’s promotional efforts for premium products offer customers the option of extended warranties or better financing terms.**

- **Other manufacturers’ marketing stresses several product features and benefits.** These include savings in annual operating costs, reduced sound levels of outdoor units, and improved quality of components. Among the operating cost savings they identify are better blower motors that save electricity in addition to better cooling and heating components.

Messages used in the HVAC industry

Among those manufacturers and distributors who do advertise, there is a considerable range of messages being employed. Many are quite basic and obvious.

- **Some manufacturers focus on saving money with energy-efficient furnaces and air conditioners and also note other improvements, including reduced noise levels, higher comfort, and quality.**

⁷ Most manufacturers and distributors pointed out that their advertising shows their premium, or most energy-efficient, models.

- One manufacturer recommends emphasizing quieter operation and increased comfort where occupants work at home.
- Quality of components is linked to greater reliability.
- **One distributor stressed that his message to customers is “You can save a lot of money. Air conditioning is 35 to 40% of your electricity bill in the hottest months. You could save 10% of your total bill with an efficient air conditioner.”** This distributor supports their dealers with computer programs to calculate cooling and heating loads and month-by-month savings.
- **A distributor noted that the Energy Star program provides computer programs to calculate how much less a customer’s total monthly payments for a new, efficient unit will be than if they bought a standard unit.**
- **Other manufacturers and their distributors who offer rebates believe that “cash goes with anything!”** (One distributor notes that in California the law requires that rebates must not show up in the contractor’s invoice. The customer cuts their best deal with the contractor and the rebate goes from the manufacturer directly to the customer.)
- **Manufacturers and distributors also offer financing and extended warranties to those who buy energy-efficient products.** This reinforces overall lower costs (efficiency and financing) and no worries about equipment problems (they’re covered).

Recommended PG&E Messages

- **Market to both customers and contractors.** A distributor stressed that PG&E must market to both customers and contractors. Contractors will do what customers demand, and contractors “need to feel that energy efficiency is right, that it’s not a waste of money.”
- **Talk about payback “and more.”** One distributor suggests that PG&E should discuss value in addition to saving money. “Many customers only live in one home for 5 years. Tell them that in addition to saving money while they live there, a better heating and cooling system will distinguish their home and create added value.”
- **Stress the many benefits of high efficiency HVAC products.** One manufacturer suggests that PG&E emphasize utility bill savings, less noise, better quality, and reliability.

- **Stress energy savings with messages directed to consumers.** A manufacturer urged PG&E to use their “big voice in the community” to stress energy savings with the consumer. He suggested that they should also support contractor training and education of contractors.
- **Put messages on summer bills.** One distributor said PG&E should show how much a customer could have saved if they had energy-efficient air conditioning. Another distributor feels that messages with the bills, during the cooling season, will be more effective than TV or newspaper ads. “Get the message in front of them while they are paying their largest bills of the year.”
- **Stress social responsibility.** One distributor said that PG&E should stress social responsibility, indicating that you “sell more with guilt than with common sense.” He suggested emphasizing the following:
 - Resources are not unlimited.
 - It is a social responsibility to be efficient.
 - Consider others.
 - Leave your children a better world.
- **Promote higher SEER air conditioning.** A distributor said that there are many ads promoting gas units, so PG&E should stress higher SEER air conditioning.

Recommended PG&E program ideas

- **Focus on what you want to accomplish and address the entire system at the house.** A distributor urged PG&E to focus on the entire home system by addressing the following program elements:
 - Methods for properly installing systems.
 - Proper ductwork installations and proper air delivery.
 - Contractor testing and documentation. The contractor is in control of what gets sold and how it gets installed.
 - Monitor installations.
- **Include proper installation and duct integrity in your program.** A distributor urged PG&E to go beyond high efficiency equipment and include proper installation and duct integrity. He suggested that for high efficiency equipment make it “really high, higher than a 12 SEER because DOE may raise the minimum to 12 soon.” He indicated that “duct sealing is scary” for a lot of contractors with questions about liability and condition of 20-year-old ducts.

- **Offer rebates to contractors.** Some distributors suggested offering rebates to contractors, not distributors. If incentives are given to the distributor, the branches never see the rebate and prices never get reduced.
- **Offer rebates to customers.** Some distributors suggest that PG&E give rebates to customers. One distributor said that “contractors give customers options, but the customer is not sure how the payback will work. They just look at the bottom line [and need to know how much the rebate will be].” Another distributor said contractors do not want to do the paperwork, while the customers will do it. He said, “Contractors don’t even do the Express Efficiency and a program would be over before the distributors figure out how to administer it.” The distributor further recommends keeping the rebate program simple.
- **Offer customer financing.** Although there are some mixed feelings regarding the value of utility financing for energy-efficient residential HVAC equipment and system improvements, there is agreement on the desired features of any financing program. Desired features include: low interest rate (below 10%), long terms, monthly charges (to appear on utility bill), easy application (with minimal or no contractor involvement), and accept applicants with lower credit ratings (take “C and D paper”). In addition, financing programs should require people to replace early (not at breakdown), to improve installation practices, and to include other “total system” and “whole house” measures.
- **Train and support contractors in selling energy efficient equipment.** Some distributors emphasized the need for contractor training in order to sell energy efficient equipment. Distributors suggest providing them with software to calculate loads, model different efficiency levels of equipment, and provide monthly bill comparisons for homeowners. They also suggest supporting the contractors with coop advertising.

*Federal Energy Star Program*⁸

- **Manufacturers were marginally supportive, but not overly impressed with results of Energy Star labels.** One manufacturer felt the “education is OK and Energy Star labels add some credibility to our products.” Another said “we are now seeing some product recognition from participating in Energy Star, but no more, really, than from the energy guide label.”

⁸ The Energy Star program has been *rating* residential heating and cooling products, but has just started labeling products. For that reason, it may still be too early for manufacturers and distributors to see consumer reactions.

- **Distributors also gave Energy Star mixed reviews.** Many said they were unaware of it, did not know what it was supposed to do, or that it has no value to customers and has not affected their sales of energy-efficient equipment. A few found some positive aspects as noted below:
 - One distributor said that it's a well-received program that helps sell equipment.
 - Another distributor said the computer software that allows calculating total monthly operating costs is effective. It shows how much less a homeowner will pay per month taking into account the utility bill savings and the monthly cost for financing the energy-efficient equipment.
 - One distributor urged PG&E to go beyond the Energy Star program and promote the Green Seal program. It adds environmental standards (non-chlorine refrigerants) to energy efficiency.

Training and Certification

One of the major issues in the HVAC industry currently is the shortage of qualified, well-trained technicians and installers. In addition, the large number of small contractors and dealers are lacking in business and management skills. And, from the manufacturers' point of view, distributors staff need additional training.

Situation Assessment

- **Overall, most manufacturers and distributors said that the level of knowledge and training is poor.** Of course, they recognize that there are excellent technicians and installers working in the field. The concern is maintaining knowledge of current technologies and the level of knowledge among entry-level technicians.
- **When one manufacturer brought in their distributors' staff they "found it scary how little they knew."**
- **Manufacturers and distributors point out that knowledge and skill levels vary by the size of the contracting firm:** larger organizations provide more training while small, one to two truck operations don't. The owner of a small firm may be good, but not the helper.

- **Distributors note that as older, qualified dealer staff retire, their entry-level replacements appear to be much less qualified.**
- **Sales staff also need training and updating.** As noted above, there is a need for new sales approaches to selling energy efficiency.
- **Manufacturers and distributors see an ominous trend—enrollments in trade school courses to learn refrigeration and HVAC have dropped.** Students are shifting to training for computer-related careers.
- **Several distributors emphasize that, compared to auto mechanics and other technical trades, HVAC pays less to technicians, does not charge enough for their labor, and has not created a widely-recognized certification that establishes technician's knowledge and skills.**
- **There is some difference of opinion as to the extent that the shortage of trained personnel is holding the industry back.** Some believe that the amount of equipment that can be properly installed is limited by labor shortages. Others say the shortage of labor is not having any effects on contractors' capacity.

Training providers

- **Fundamental training has been provided through technical colleges and by apprenticeship programs.**
- **Manufacturers have provided training, often delivered locally with the cooperation of their distributors.**
- **Consolidators offer technical and management training to their local dealers.** Several distributors commented that consolidators are "raising the bar" in many areas of practice, including training.
- **The Air Conditioning Contractors of America (ACCA) and the North American Technician Excellence (NATE) provide training and certification for technicians.**
- **The Consortium for Energy Efficiency is developing standards for training and certification, with support from utilities.**
- **The Refrigeration Service Engineers Society (RSES) provides training. Its membership is strongest in larger metro areas and weaker in small towns.**
- **Pacific Gas and Electric Company has been providing training through its Stockton Training Center for several years.**

Manufacturers' & Distributors' Involvement

- **Manufacturers and distributors provide significant amounts of training for contractors and dealers.**
 - They tend to focus on their 'recognized' dealers.⁹ (For one distributor they supported 35 'recognized' dealers out of 300 in the area they served.)
 - They offer training for technicians, sales staff and business owners and managers.
 - Training is available with live instructors, on videotape, and on CD-ROM.
 - Many manufacturers and some distributors offer a range of training from basic or introductory topics to advanced topics and refreshers.
 - Many manufacturers and distributors stress the need to charge a modest fee for their courses to create a commitment for contractor and dealer staff to attend once registered.
 - Manufacturers are supporting ACCA and NATE certification. Some have had their training staff certified.
 - Basic, intermediate, and advanced courses are offered on job related technical topics, including: systems, refrigeration, theory, duct design and layout, installation practices, charging units, load calculations, diagnosing and troubleshooting, and other service and repair topics.
 - Most of the manufacturers' and distributors' training is product-related. They use their products as a basis for everything from fundamentals to diagnosing problems in the most advanced electronic / microprocessor based controls.
 - Sales techniques and familiarization with new products are covered in courses for sales personnel.
- **Distributor involvement in training varies with their size.**
 - One of the largest offers 15 to 20 full week sessions each year.
 - Another large distributor offers 300 hours in sales training and 400 to 500 hours in service training (including residential and commercial) each year.
 - Larger firms offer training year-round, while some smaller distributors only offer it when business is slow—typically in early Spring and in early Fall (each time between the end of one HVAC season and the beginning of the next).

⁹ 'Recognized' dealers are typically medium- to larger-sized contractors. Some manufacturers and their distributors require contractors wishing to install and service their products to attend training covering proper installation and service procedures. Through coop advertising the manufacturers and distributors support these dealers in developing and maintaining a positive "brand image" as knowledgeable, trustworthy, local "experts."

- Some smaller distributors just arrange a few local sessions taught by manufacturers' trainers.
- Some commented that they do not have enough margin to pay for training.
- **Most manufacturers and distributors advocate certification.**

Suggested Training Roles for PG&E

Most manufacturers and distributors have positive responses to the idea of PG&E (or other utilities) offering training. However, some raised concerns about why a utility would get involved and what other steps they were planning to take in the HVAC industry.

- **Most manufacturers and distributors indicate PG&E should offer training covering the technical basics and energy efficiency practices.** However, some manufacturers and distributors have doubts about utilities' role in training and questioned their expertise.
 - One distributor mentioned that PG&E had tested hundreds of homes in the Valley and found many leaking ducts. He supported training on duct design, sizing, locating returns, proper thermostat location, etc.
 - Other distributors said PG&E should teach selling energy efficiency and improving energy-efficient practices. But, leave the basic installation practices to the distributors and manufacturers.
- **Some manufacturers and distributors suggested that utilities should support the national certification efforts (ACCA's ACE and NATE).**
- **Several respondents suggested it might be appropriate and necessary for someone to pay for training.**
 - Several mentioned paying for current employees to attend any training.
 - Others suggested paying for trade school education in refrigeration and HVAC.

Equipment for Western Climate Zones

There was some awareness of the AC2 unit and other concepts for hot / dry climates.¹⁰ However, there was not much interest among manufacturers and the major distributors.

- **Manufacturers saw the concept as a product that would be limited to a “niche market.”**
- **Many distributors felt that existing evaporative cooling provides a solution for the very hot and dry climates.** Furthermore, with evaporative cooling and other products already in the market, they questioned who would want to try a new product for a regional market.
- **One distributor noted that the high costs for certifying the efficiency of any new unit are a barrier to developing regional products.** He said that each piece in a new line cost at least \$10,000 for testing and certification.
- **There were a few positive responses about HVAC equipment.**
 - Some manufacturers are more innovative.
 - The introduction of “demand flow production” by several manufacturers allows smaller runs to be profitable.
 - Others manufacturers recognize the large size of the markets in Southern California, Arizona, and Las Vegas and see there could be potential for regional products in the future.

Utility Programs and the HVAC Industry

Manufacturers and distributors provided insights into their time requirements for responding to utility efforts to influence residential consumers’ behavior. While their lead times for manufacturing are becoming shorter, the time required for distribution is not changing as quickly. In addition, they require a longer lead time to plan and prepare communications efforts designed to influence customer purchasing behavior.

¹⁰ The AC2 unit, manufactured by RTI incorporates techniques applicable to climates with high sensible temperatures and very low latent loads.

Lead Time for Stocking

Production times are shortening, but filling the entire distribution channel with a different mix of products still takes time. The consensus is that distributors must order a minimum of 90 days before the date when sales are planned to begin. Utilities should share news of programs that may affect sales of energy-efficient equipment well before that deadline. That will allow distributors to discuss the possible program influence with manufacturers in time to make decisions about orders.

- **Until recently, stocking decisions have usually been made 90 days in advance of need.**
- **Now with “demand flow” and “just in time production,” lead times for some manufacturers have been reduced to 60 days.**
- **One manufacturer in the Midwest clarified that production would only take 21 days.** However, distribution would still take time and shipping to California takes the longest. In addition, while some units would reach distributors within 4 to 6 weeks, it would take 3 to 6 months until the entire channel was fully stocked and supported.

Lead Time for Communications

Manufacturers and distributors endorsed the concept of discussing utility programs and promotional plans far enough in advance for cooperation and coordination to occur. Planning should take place six to nine months before a campaign is to begin.

- **Manufacturers and distributors suggested that coordination of utility and manufacturer / distributor preseason promotions would require planning discussions during the first quarter for pre-heating season promotions and during the fourth quarter for pre-cooling season promotions.** The preseason promotions for cooling start in March or April and end in May. The preseason promotions for heating are usually September and October. The promotion budgets for manufacturers are set in September and October for the following year.

Sales Tracking

There was a mixed reaction to the concept of having a Northern and Central California (or California-wide) HVAC equipment sales tracking system. Many distributors noted that they get information now from ARI and GAMA. Most acknowledged that it did not give them detail by efficiency level. Some would need approval from higher levels within their firm; others would need approval from their manufacturer. Some expect it may need to be done by regulation. Others would prefer that, if done at all, it be done through their industry.

Section VI: Summary and Conclusions

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California residential heating, ventilation, and air conditioning (HVAC) market. The primary objective of this report is to help PG&E understand the equipment manufacturing, distribution process and the marketing, training and other support offered to contractors by manufacturers and distributors. A better understanding of the barriers to the sales, installation, maintenance, repair and replacement of HVAC equipment and systems may lead to more successful market transformation efforts targeting the residential HVAC market. All respondents in this study manufacture or distribute HVAC equipment to the residential sector.

To address the research issues, Opinion Dynamics Corporation (ODC) conducted 24 in-depth, telephone interviews with HVAC equipment manufacturers and distributors. Specific objectives of these interviews are addressed by exploring their views of important barriers to greater penetration of energy-efficient products, their marketing activities related to energy-efficient products, and their views of the residential HVAC market in Northern and Central California. Next, we asked about their views of the training needs and challenges facing the HVAC industry in California, their interest in developing air conditioning equipment better suited to hot / dry western climates, information on their production and stocking planning and its relationship to utility programs. Finally, we asked about their views of other competitive issues in the HVAC industry and their opinions of utility efforts to track unit sales by efficiency level. We also briefly profiled each firm, the market segments they serve, and obtaining sales estimates by type of equipment and efficiency levels (where available). Key research findings are summarized below and the summary of each topic is followed immediately by related conclusions.

¹¹ For a general discussion of market transformation issues, see "A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

Marketing Energy-Efficient Products

Market Areas

Distributors offered insights on the areas in which they sell the most energy efficient equipment.

- **The Central Valley has a high demand for efficient air conditioning compared to the Bay Area.**
- **There is a small but growing demand for energy-efficient equipment, which depends on contractors' sales efforts.**

A success-oriented strategy would focus on the best prospects for success. These two areas were identified by distributors as offering good prospects. The lessons-learned in these efforts could then be reviewed, adapted to other situations, and expanded.

Major Barriers

Manufacturers and distributors identified seven major barriers that limit the penetration of energy-efficient products. These include:

- 1. Incremental cost of equipment (*cost-effectiveness*)**
- 2. Low energy costs plus mild climate (*cost-effectiveness*)**
- 3. Low consumer awareness (*knowledge*)**
- 4. Contractor / dealer behavior (*knowledge, reluctance to sell*)**
- 5. Lack of sales approaches (*knowledge, reluctance to sell*)**
- 6. Production builder resistance (*reluctance to sell*)**
- 7. Piecemeal implementation (*knowledge, reluctance to sell*)**

These barriers relate to the cost-effectiveness of the purchase; customer or contractor knowledge, and the reluctance of contractors and builders to sell more valuable HVAC equipment and services.

Equipment Replacements

Manufacturers and distributors offered their views of a market full of procrastinating customers:

- Distributors estimated that breakdown replacements are 77% of the total.
- One manufacturer feels that many customers delay replacing almost worn out equipment by “babying it along” until the next season.
- Another cautioned that “Many people think that customers buy real fast. They take more time than you think.”

Although these views may appear pessimistic, they do offer some opportunities for market interventions. Contractors performing routine service calls could provide an “information kit” on efficient equipment and “total system” services to all customers with aging equipment. Contractors called to make “one last repair” could provide the information kit and perform a quick survey determining replacement unit size and total system measures required. Contractors called to breakdowns can be trained to take more time to listen to each customer’s needs and to offer each customer more options.

Encouraging Planned Replacements

Manufacturers and distributors employ a broad range of approaches to encourage planned replacements.

- Manufacturers offer stocking programs for distributors and ‘floor plans’ for dealers to encourage them to carry energy-efficient units in their stock.
- Much of the industry advertises preseason discounts. Although many are not sure if preseason ads and discounts work, they encourage PG&E to coordinate its promotions with theirs.
- Several distributors suggest that PG&E concentrate on training contractors to influence “breakdown” sales.
- Other distributors added that PG&E should offer incentives to contractors to “push planned replacements” and provide incentives to homeowners who purchase equipment before “breakdown.”

As noted above, training and equipping contractors to identify and influence potential breakdown sales is essential. In addition, training and equipping contractors to identify customer needs and offer customers a broader range of options when responding to breakdown calls is the only way to ensure that key information reaches a majority of replacement customers while they are making their decisions. Preseason ads were questioned by several distributors and stocking programs, floor plans and incentives may be expensive.

Business Challenges

Manufacturers and distributors identified four business challenges and identified possible impacts on energy efficiency efforts:

- Consolidation (positive)
- Increasingly competitive environment (negative)
- Shortage of qualified workers and managers (negative)
- Regulatory changes (positive)

These challenges appear likely to have different effects on energy efficiency efforts: Consolidation—where it is occurring—tends to ‘raise the bar’ for other contractors. The increasingly competitive environment will probably increase the tendency to compete on price—to the detriment of energy-efficiency. The shortage of qualified workers and managers is a critical problem and limits additional efforts to improve energy efficiency. Regulatory changes offer opportunities for more efficiency messages.

Market Trends

Manufacturers and distributors also identified two relevant market trends:

- Growing focus on comfort and health.
- More knowledgeable consumers.

Both of these trends may have small net effects, but could help sell additional energy-efficient units.

Industry Views of Energy-Efficient Equipment

Producing and distributing energy-efficient equipment offers benefits to most suppliers, yet many market actors are somewhat unsure of the status of these products in the national market:

- Manufacturers and distributors earn larger gross revenues and have opportunities to earn larger margins.
- Distributors and dealers sell better products and create greater customer satisfaction. They depend on this for better word-of-mouth referrals, to build brand image, and to increase demand for these more saleable products.
- Manufacturers may strategically position their energy-efficient products as premium alternatives for key spots in their lines.
- Most manufacturers have ongoing plans to bring out new energy-efficient models in the next few years.
- However, most manufacturers still refer to their energy-efficient models as “niche products.”

Energy-efficient products offer benefits and the promise of greater potential. They still are not widely sold and their status as “niche products” is evidence of uncertainty among some manufacturers.

Promotional techniques / messages

Understanding who does what in the HVAC industry to promote products will help PG&E know how to make possible market interventions coordinate with and leverage existing industry efforts. Some distributors use coop advertising to support their dealers, others promote manufacturers' financing and extended warranties, and other manufacturers stress a mix of product features and benefits to sell premium products that include energy-efficient features.

Messages used in the HVAC Industry

The messages now being used in the industry promotional materials focus on four key topics:

- Purchasing energy-efficient units can save a customer money and will also offer them reduced noise levels, improved comfort, and better quality.
- The major portion of consumers' summer electricity bills is going to pay for old, inefficient air conditioning.
- There are tools available to help sales staff show consumers how much less their total monthly payments for an efficient unit will be than if they bought a standard unit.
- Customer incentives can be effective in reinforcing the benefits of energy-efficient equipment.

The first message communicates all the benefits of energy-efficient units. The other three focus on payback and offer purely financial benefits. Emphasizing a wide range of benefits is suggested.

Recommended PG&E Messages

Manufacturers and distributors suggested messages, communications targets, and other program measures that will address specific barriers.

- Market to both customers and contractors.
- Talk about payback and adding value to a customer's home.
- Stress the many benefits of high efficiency HVAC products—bill savings, less noise, better quality and better reliability.
- Promote higher SEER air conditioning.
- Stress energy savings in messages to customers using your “big voice in the community.”
- Put messages on the summer bills telling customers how much they could have saved with energy-efficient air conditioning.
- Stress social responsibility and sell with guilt.

Most of these messages are sound and rather ordinary. By suggesting the last three, industry representatives urged PG&E to use its unique position (i.e., its direct access to customers and its authority) to deliver messages few others can.

Recommended PG&E Program Ideas

Looking at the program ideas, we see that leaders in the HVAC industry (equipment manufacturers and distributors) are ready to support programs that address the “total HVAC system.”

- Focus on what you want to accomplish and address the entire system at the house.
- Include proper installation and duct integrity in your program.
- Offer rebates to contractors (not distributors).
- Offer rebates to customers.
- Offer customer financing.
- Train and support contractors in selling energy-efficient equipment.

The first two ideas show that PG&E can build upon its long record of identifying ways to make high efficiency equipment able to achieve its potential. By focusing on what you know is important, you have a chance to deliver fresh messages. Offering rebates to anyone needs to be carefully considered in the context of market transformation (i.e., what's your exit strategy?) Financing, too, must be weighed carefully. Training and support for contractors is clearly needed.

Federal Energy Star program

Manufacturers and distributors gave Energy Star a very mixed review. It provides some education and an easily recognizable symbol that identifies efficient products; and some think it helps sell those products. Part of the effort has been to develop some software that some distributors recommend. One manufacturer who is out in the lead with a product line suggests that PG&E back the second step, the Green Seal program.

Training and Certification

The shortage of qualified, well-trained technicians and installers is a major issue in the HVAC industry.

- The situation assessment provided by manufacturers and distributors shows how serious the lack of trained people is.
- The review of training providers suggests that many training opportunities exist.
- Most manufacturers and distributors advocate certification of technicians.
- Most manufacturers and distributors indicate that PG&E should offer training covering basic technical concepts and energy efficiency practices.
- Some manufacturers and distributors suggested that utilities should support the national certification efforts (ACCA's ACE program and NATE's offering).
- Several respondents suggested it might be appropriate and necessary for someone to pay for training.

These statements of the situation and recommendations suggest PG&E should continue and expand its training at Stockton, actively support national standards and certification, and consider a voucher or scholarship program to pay for training.

Equipment for Western Climates

There is minimal interest among manufacturers and distributors in developing products for the hot / dry climates in the southwestern U.S.

- Manufacturers saw the concept as a product limited to a “niche market.”
- Distributors note existing evaporative cooling provides a solution for very hot and dry climates and there are high costs to certify efficiency of new designs.
- A few positive responses indicate some manufacturers are more innovative, the recent introduction of “demand flow production” allows smaller runs to be profitable, and some recognize the large market in the Southwest and see that interest might develop.

The market for HVAC products is dominated by large manufacturers who produce products for a nation-wide market. However, some flexibility may be developing.

Utility Programs and the HVAC Industry

Utilities and the HVAC industry each have some needs that must be acknowledged by the other party to facilitate cooperation.

- Manufacturers need 60 to 90 days notice to respond to major shifts in the mix of standard and energy-efficient products being ordered by distributors responding to utility program announcements.
- To fully stock and support the distribution channels in California will take 3 to 6 months.

- Coordinating communications and advertising plans should begin at least 6 months in advance of any campaigns. Preseason promotions for cooling start in March or April and end in May, those for heating start in September and end in October. Promotion budgets for the next year are set in September and October.
- Manufacturers and distributors have a mixed reaction to the concept of tracking sales of HVAC units by efficiency to monitor the market effects of market transformation programs.

These findings provide some information on timing and receptivity to new concepts in coordination. Market transformation will require establishing and maintaining a higher level of communications.

PG&E Residential HVAC Market Transformation HVAC Manufacturer In-Depth Interview

Contact Name: _____	<u>Notes</u> <u>Scheduled Callback</u>
Title: _____	_____
Phone Number: _____	_____
Business Name: _____	_____
Address: _____	_____
_____	_____
_____	_____
Interview Date: _____	_____
<u>START TIME:</u> _____ <u>AM / PM</u>	_____

Thank you for agreeing to speak with me. We are interviewing heating and cooling equipment manufacturers to help Pacific Gas & Electric Company better understand the residential market. PG&E is designing a new, multi-year program to increase purchases of energy-efficient HVAC related products and services in the residential sector.

As part of their program planning, they are considering offering financial incentives—*like the Express Efficiency program*—and other ways of increasing cost-effective efficiency measures. PG&E will target and work with customers, contractors, distributors, and *manufacturers*.

I would like to ask you some questions about several areas to help us better understand what program concepts may be most acceptable to current market players. These areas include:

- General business characteristics,
- View of Northern California residential market,
- Marketing energy-efficient products
- Training and Certification of Technicians and Installers
- Equipment for Western Hot/Dry Climates
- Lead Time Required to Accommodate Utility Programs
- Competitive Issues

The interview will take about 30 minutes. Do you have time now or should I schedule a time when we can talk.

General Business Characteristics

- 1. Please describe your company’s position in the residential heating and cooling equipment market. [PROBE: rank in overall Res HVAC market, strategic focus,]

- 2. What residential brands do you manufacture? [PROBE: How are each of the brands distributed? Through distributors? Do distributors have exclusive rights to sell these products in a certain geographical area? Is it possible that two distributors may try to sell the same brand to the same contractor?]

- 3. How does the sales/distribution process differ for the retrofit/replacement market versus the new construction market? [PROBE: Are all sales made through distributors or do you negotiate directly with some large builders? What about large retailers such as Sears? If you make a sale to a national account, does the equipment still flow through local distributors or does it go directly to the national account?]

Baseline Sales Data by Efficiency Levels

In order to properly budget for programs, PG&E staff must have a better understanding of the type and amount of residential equipment currently being sold in their service territory. Can you assist us in understanding unit flows and efficiency levels being sold into Northern California (either at an industry level or for your company)? If you can't provide unit sales information, could you at least give us some sense of how your sales break out by efficiency level?

(If Willing to provide)

4. Approximately how many residential heating and cooling systems did your company sell in Northern California in 1998? [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

Residential
N. California
1998 Unit Sales

- _____ Number of Furnaces
- _____ Number of Central Air Conditioners
- _____ Number of Evaporative (Swamp) Coolers

(If willing to provide)

5. Approximately what percentage of the furnaces you sold into Northern California during 1998 had efficiency ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

- | Percent | AFUE (Efficiency) Rating --- (Northern California) |
|---------|--|
| _____ | 79 to 84% |
| _____ | 85 to 89% |
| _____ | 90% and up |
| _____ | 100% |

(If willing to provide)

6. Approximately what percentage of the central air conditioners you sold into Northern California during 1998 had SEER (efficiency) ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH]

<u>Percent</u>	<u>SEER (Efficiency) Rating</u>	---- Northern California
_____	10 to 10.99	
_____	11 to 11.99	
_____	12 to 12.99	
_____	13 to 13.99	
_____	14.0 and up	
100%		

Do you have any information as to how these sales by efficiency level may differ between the new construction and the retrofit/replacement markets in Northern and Central California?

(If YES)

7. Approximately how many forced air furnaces did your company sell into the Northern California new construction market in 1998? How many forced air furnaces did your company sell into the Northern California retrofit/replacement market in 1998? [READ EACH CATEGORY; FILL IN BLANK FOR EACH; GO THROUGH THE SAME PROCESS FOR CENTRAL AIR CONDITIONERS]

<u>New Construction Units</u>	<u>Retrofit/ Replacement Units</u>	
_____	_____	Forced air furnaces (Units Sold)
_____	_____	Central air conditioners (Units Sold)

(If willing to provide)

8. Approximately what percentage of the furnaces you sold into the Northern California new construction market during 1998 had efficiency ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH] How about the retrofit/replacement market?

<u>New Construction Percent</u>	<u>Retrofit/ Replacement Percent</u>	<u>AFUE (Efficiency) Rating</u>
_____	_____	79 to 84%
_____	_____	85 to 89%
_____	_____	90% and up
100%	100%	

(If willing to provide)

9. Approximately what percentage of the central air conditioners you sold into the Northern California new construction market during 1998 had SEER (efficiency) ratings of... [READ EACH CATEGORY; FILL IN BLANK FOR EACH] How about the retrofit/replacement market?

<u>New Construction Percent</u>	<u>Retrofit/ Replacement Percent</u>	<u>SEER (Efficiency) Rating</u>
_____	_____	10 to 10.99%
_____	_____	11 to 11.99%
_____	_____	12 to 12.99%
_____	_____	13 to 13.99%
_____	_____	14.0 and up
100%	100%	

View of Northern California Residential HVAC market

Next, I'd like to ask you a few questions about the Northern and Central California market for residential HVAC equipment.

- 10. How would you characterize the residential market for energy-efficient furnaces, heat pumps and air conditioners in PG&E's service territory? [CLARIFY: PG&E's service territory includes almost all of Northern and Central California – the Oregon state line down to a line just from Santa Barbara to Bakersfield]

- 11. What trends do you see with respect to energy efficient products and services in the Northern California market? [PROBE: Is energy efficiency becoming more (or less) of an issue? What's driving the change (or the status quo)?]

- 12. What major challenges do you face in the Northern and Central California market? [PROBE: Consolidation/mergers of distributors? Consolidation of contractors /buying groups? Other issues?]

Role of Energy-Efficient Products

13. What benefits does your company derive from the sale of energy efficient forced air furnaces and central air conditioners? [Probe: higher margins? Strategic position in the market? Other?]

14. Please tell me about any energy efficient product development programs that you would be willing to share with PG&E.

15. What role will energy-efficient residential furnaces, heat pumps, and central air conditioners play in your overall marketing strategies over the next few years?

Marketing Energy Efficient Products

Next, I'd like to ask you a few questions about marketing energy efficient HVAC equipment.

- 16. What are the major barriers you see to increasing the market penetration of energy-efficient heating and cooling systems? [PROBE: Consumer/contractor awareness? Consumer/contractor knowledge? Low energy costs? Higher first costs? Apathy? Lack of engineering design or a systems approach for residential systems?]

- 17. In your own marketing materials for energy efficient products, what type of messages do you stress? [PROBE: Lower operating costs? Better comfort? Environmental (green) benefits? Higher quality construction? Higher reliability? Other benefits?]

- 18. What recommendations do you have for PG&E on how they might increase the market penetration of energy efficient residential HVAC equipment? [PROBE: What messages should they try to convey? What players in the market should they be working with? What approaches?]

- 19. What is your opinion of the federal Energy Star program? [PROBE: Does the Energy Star labeling program help you market energy efficient residential HVAC equipment? Why?]

Why not?]

- 20. One possibly significant barrier to selling more of the energy efficient HVAC equipment is the fact that many customers only replace equipment when it breaks down. Do you have any data on the percentage of units that are replaced because of a break-down compared to planned replacements? [PROBE: Does that split vary across furnaces and central air conditioners? across different parts of the country? By groups of customers?]

- 21. Early—or planned—replacements appear likely to offer a greater opportunity for selling energy efficient units and other products or services to increase HVAC system efficiency. What methods can be used to encourage customers to replace systems early? [PROBE: pre-season promotions (ads and discounts), what else?]

Training and Certification

Now, I would like to ask you a few questions about industry training programs and certification procedures.

- 22. Is the knowledge or skill level of HVAC service technicians and installers equal to the challenge of installing and maintaining energy-efficient equipment? [PROBE: What specific concerns? Does the shortage of trained technicians and installers limit the amount of equipment you can sell?]

- 23. What are the most critical needs for training HVAC technicians and installers? [PROBE: What types of training is needed? Diagnostics? Service and Repair? Sizing of equipment? Proper installation procedures? Where in the US is the need greatest?] What resources are available to train new technicians and installers?]

- 24. What is your company's involvement in providing training to distributors and contractors on residential products? [PROBE: Do you train distributor staff? How often? At your training facility or on-site? Do you train contractor staff (technicians, installers, sales

staff)? How often? At your training facility? At distributor’s training facilities? At contractors facilities?]

25. What is the focus of your training? [PROBE: proper sizing (Manual J), proper installation procedures, duct design guidelines and procedures, air flow measurement procedures, measurement and balancing or refrigerant flows? Carbon monoxide issues?]

26. Do you organize the topics you teach as “Initial” and “Refresher” or as “Fundamental” and “Advanced” or “Follow-Up”? [PROBE: what topics do you cover in the Initial sessions and what topics in “Refresher” sessions?]

27. What role do you see in training for organizations like ACCA, NATE, the energy utilities?

28. Currently PG&E is helping fund a nation-wide effort by the Consortium for Energy Efficiency to develop standards for a “national, third-party certification” of installers and technicians. What are your thoughts or recommendations concerning this concept?

Equipment for Hot / Dry Western Climates

29. Electric utility staff in several western states see a need for products that would provide significant energy savings in the hot/dry climate zones found in the areas they serve. Do you believe it is feasible to develop products for the large and growing population in such areas? [PROBE: Why? Why not?]

30. What size demand or market share would you have to see before your company would be interested in developing technologies that would provide increased efficiencies in such hot / dry climates? [PROBE: What type of support could utilities in these Western states provide to encourage development of such products?]

Lead Time Required to Accommodate Utility Programs

31. How far in advance of PG&E starting information, advertising, training or incentives would you like to know of their plans? How much lead time do you need to evaluate possible effects on sales of your products? To plan coordinated advertising? To plan coordinated training? To coordinate your discount or financing offerings and PG&E's incentive programs (Incentives may be financing or rebates)?

32. Who should utility incentive programs target? Why? [PROBE: Consumers, contractors, distributors, or manufactures?]

- 33. Which types of incentive programs do you think are most effective in increasing market penetration for energy efficient HVAC equipment? [PROBE: rebates to customers, equipment financing, rebates to contractors, spiffs to sales staff?]

Competitive Issues

- 34. What are the most important competitive issues your company faces today? [PROBE: globalization of the HVAC equipment market? shifts in consumer needs/wants? Consolidation of contractors/distributors?]

- 35. Are there any competitive issues in Northern California that you feel PG&E staff should be aware of? [PROBE: Any issues that might impact the viability of a HVAC incentive program?]

PG&E Residential HVAC Market Transformation HVAC Distributor In-Depth Interview

Contact Name: _____	<u>Notes</u> <u>Scheduled Callback</u>
Title: _____	_____
Phone Number: _____	_____
Business Name: _____	_____
Address: _____	_____
_____	_____
Interview Date: _____	_____

START TIME: _____ AM / PM

Thank you for agreeing to speak with me. We are interviewing heating and cooling equipment distributors in order to help Pacific Gas & Electric Company better understand the residential market.

PG&E is designing new programs to increase purchases of energy efficient heating and cooling products and services by residential customers. They are considering offering incentives—*like the Express Efficiency program*—and other ways of increasing cost-effective efficiency measures. These efforts will target customers, contractors *and distributors*.

I would like to ask you some questions about several areas to help us better understand how to plan programs that will be acceptable you and the dealers / contractors. These areas include:

- general business characteristics,
- information on residential markets,
- your recommendations on marketing energy efficient products to the residential market,
- challenges you face and challenges you know the contractors face,
- the needs for training HVAC technicians, and
- the timing of your stocking decisions and their relation to utility program planning.

General Business Characteristics

1. I'd like to begin by learning a little more about your company. [PROBE: Do you distribute residential, commercial, and industrial HVAC equipment? Do you distribute supplies and materials? How many branches do you have for residential equipment in Northern and Central California (PG&E's territory)? How many employees do you have?

Branches _____

Employees _____

2. Which brands do you distribute that have residential product lines? [PROBE: Do you have exclusive rights to sell these products in specific geographical areas? Do any other distributors sell the same brand in the same areas?]

Segments Served and Sales Data

In order for PG&E to properly plan, budget, and manage an incentive program, they need a solid understanding of the types and amount of residential equipment currently being sold in their service territory. I now have a few questions about the markets you serve in Northern and Central California.

3. Approximately how many residential heating and cooling systems of the following types, did your company sell in 1998 in Northern and Central California? (*That is, in the area that PG&E serves.*)

How many _____ did you sell in 1998 for installation in residences?

1998 Unit Sales

_____ Central Forced Air Furnaces

_____ Central Air Conditioners

_____ Central Heat Pumps

_____ Evaporative (Swamp) Coolers

I'd like your help breaking overall residential sales into efficiency levels. For furnaces I'd like to break sales into three categories: 1) "80%" AFUE (from 79 to 84%); 2) "90%" (from 90 to 94%); and 95% plus.

4. Overall, approximately what percentage of your furnace sales in 1998, for residential installations had efficiency ratings of...

<u>Percent</u>	<u>AFUE (Efficiency) Rating</u>
	79 to 84%
	90% to 94%
	95% and up
100%	

5. For central air conditioners, I'd like to break sales into 5 categories: "10s" (10.00 to 10.99 SEER), 11s, 12s, 13s, and 14 Plus. Approximately what percentage of your central air conditioners sales in 1998, for residential installations had SEER ratings of . . .

<u>Percent</u>	<u>SEER (Efficiency) Rating</u>
	10 to 10.99
	11 to 11.99
	12 to 12.99
	13 to 13.99
	14.0 and up
100%	

6. How does this differ for Packaged (rooftops) going to residential compared to Split Systems for residential?

7. Do you have information on how sales by efficiency level differ between the residential new construction and the residential retrofit / replacement markets?

8. [IF YES] Approximately how many forced air furnaces did your company sell in the new construction market in 1998? And, how many forced air furnaces in the retrofit / replacement market in 1998?

New	Retrofit/
Construction	Replacement
Units _____	Units _____

_____ Forced air furnaces (Units Sold)

9. Approximately what percentage of the furnaces you sold to the residential new construction market during 1998 had efficiency ratings of . . .
 And what percentage of your sales to the residential retrofit/replacement market had efficiency ratings of . . .

New	Retrofit/	
Construction	Replacement	
Percent _____	Percent _____	<u>AFUE (Efficiency) Rating</u>
_____	_____	79 to 84%
_____	_____	90 to 94%
_____	_____	95% and up
100%	100%	

10. [IF YES] Approximately how many central air conditioners did your company sell in the new construction market in 1998? And in the retrofit / replacement market in 1998?

New	Retrofit/
Construction	Replacement
Units _____	Units _____

_____ Central Air Conditioners (Units Sold)

11. Approximately what percentage of the central air conditioners you sold for installation in the new residential construction market during 1998 had SEER ratings of . . .

How about the retrofit/replacement market?

<u>New Construction Percent</u>	<u>Retrofit/ Replacement Percent</u>	<u>SEER (Efficiency) Rating</u>
_____	_____	10 to 10.99%
_____	_____	11 to 11.99%
_____	_____	12 to 12.99%
_____	_____	13 to 13.99%
_____	_____	14.0 and up
100%	100%	

12. We would also like to divide the market into major segments, and do it in a way that makes sense to you. We see four key areas: 1) Single Family homes; 2) Multi-Family buildings; 3) Production builders; 4) Consolidated HVAC Contractors. Are those important to you or do you track other segments? (Probe: what segments do you track?)

Approximately what percentage of your overall HVAC equipment sales is installed in [each segment that respondent tracks] ?

Percent _____

- 1) _____ % Single Family Homes _____
- 2) _____ % Multi-Family Households _____
- 3) _____ % Production Builders _____
- 4) _____ % Consolidated Contractors _____
- 5) _____ % _____
- 6) _____ % _____
- 7) _____ % _____

Totals to: 100%

Marketing Energy Efficient Products

Next, I'd like to ask you a few questions about marketing energy efficient HVAC equipment.

- 13. What are the major barriers you see to the increasing the market share of energy efficient heating and cooling systems? [PROBE: Lack of consumer/contractor awareness? Little consumer/contractor knowledge of benefits? Current low energy costs? Higher first costs for energy-efficient equipment? Apathy of Consumers? Contractors? Distributors? Manufacturers?]

- 14. In your company's marketing efforts for energy efficient products, what types of messages do you use to promote energy-efficient products? [PROBE: Higher quality materials and construction? Higher reliability? Lower operating costs? Better comfort? Environmental (green) benefits? Other benefits?]

- 15. Do you have any advice for PG&E on how to increase the market share of energy efficient residential HVAC equipment? [PROBE: What messages should they try to convey? What players in the market should they be targeting with their efforts?]

16. What is your opinion of the federal Energy Star program? [PROBE: Does the Energy Star labeling program help you market energy efficient residential HVAC equipment? Why? Why not?]

17. One possibly significant barrier to selling more of the energy efficient HVAC equipment is the fact that furnaces and air conditioners are often *purchased only when they break down*. Do you have any insights that might help PG&E understand the split between break-down replacement and planned replacement? [PROBE: Do you have any information on differences by types of equipment? By geographic areas in California? Other differences?]

18. Early — or planned replacements — seem to offer a greater opportunity to sell customers a more energy efficient unit and possibly other products or services to increase the overall heating and cooling efficiency of the home. What ideas/thoughts do you have on what could be done to encourage customers to replace systems early (planned replacements) rather than waiting until they are faced with an emergency replacement decision?

View of Residential HVAC market

Next, I'd like to ask you a few questions about the current market for residential HVAC equipment and your expectations for the future.

- 19. How would you characterize the current residential market for energy efficient furnaces and central air conditioners? [PROBE: Strength of current demand? Areas or situations with demand for higher efficiency – geography, climate?]

- 20. What trends do you see for energy efficient products in the residential markets you serve? [PROBE: Is demand growing? Which energy efficiency products or services do you think will drive future demand?] [FILL IN BLANKS]

- 21. What are the major business challenges you face in the residential HVAC markets you serve? [PROBE: Consolidation of contractors / large retailers expanding HVAC services / utilities offering HVAC service & repair? Other issues?]

22. What benefits does your company derive from the sale of energy efficient forced air furnaces and central air conditioners? [Probe: Higher margins? Opportunity to sell other services? Rebates/Incentives?]

23. Would you be willing to tell PG&E about any of the marketing efforts your company is planning to promote energy efficient products? [PROBE: Do you have goals to improve the market share of energy efficient products? What types of marketing efforts do you use to sell more energy efficient products? Are you going to participate in the expanded Energy Star program? Are you participating in PG&E's Express Efficiency? Are you going to?]

24. What role will energy efficient residential furnaces and central air conditioners play in your overall marketing strategies over the next few years? [PROBE: Is the energy efficiency market important to future sales? Would you do more if PG&E's programs reduced the barriers to selling more energy efficient products?]

Training and Certification

Now, I would like to ask you a few questions about industry training programs and certification procedures.

- 25. How well trained are the currently practicing technicians and installers? [PROBE: Is there a shortage (or surplus) of well-trained technicians and installers? Is there a shortage (or surplus) of technical schools and related training courses? Where is the industry headed in this regard?]

- 26. Do you see a need for more training or improved training of HVAC technicians and installers? [PROBE: What types of training are needed? Diagnostics? Service and Repair? Proper sizing of equipment? Proper installation procedures?]

- 27. What about the sales people? How well do they understand what they sell? [PROBE: Can they size furnaces, heat pumps and air conditioners correctly? Are they able to sell the benefits of energy-efficient units?]

28. How involved is your company, as a distributor, in providing training to contractors on residential products? [PROBE: Do you provide training for contractor staff (technicians, installers, sales staff)? Why? What benefits to you? Strategic reasons? How often? Where? How do you cover the cost of the training? Do you receive support, training materials, instructors from any of your manufacturers?]

29. What is the focus of your training courses? [PROBE: Manual J (proper equipment sizing)? proper installation procedures? Manual D (duct design)? air flow measurement procedures? measuring and correcting air flow / refrigerant charge? Combustion equipment safety / carbon monoxide issues?]

30. Is there a role for PG&E and the other utilities in California to play in enhanced training for HVAC technicians, installers, sales people, others? [PROBE: what specifically should they do?]

Equipment for Western Climate Zones

31. Electric utility technical staff and engineers see a need for products that would significantly improve energy efficiency in the hot/dry climate zones found in many Western states. Do you believe this is possible? [PROBE: Why? Why not? How soon?]

32. What would it take for your company to join in urging manufacturers to develop residential models that would be more efficient in Western states? [PROBE: What type of support could utilities in these Western states provide?]

33. **Is there someone you deal with at __(name of manufacturer-see Q2)__ who I could talk with about this and PG&E's planning? IF YES, Who would that be?**

name phone

Stocking/Program Planning

34. How much lead-time do you need in order to dramatically increase the amount of energy efficient equipment you stock? [FOR EXAMPLE: Say that PG&E planned to offer a large incentive to increase the sales of SEER 12 central air conditioning systems. When – **what month** – do you need to know program plans to ensure that you would have adequate stock to meet increased demand? If this was an incentive for furnaces, when would you need to know? [PROBE: Can you change contracted quantities during season?]

35. How else do utility programs impact your business? [PROBE? Do you participate in coop advertising with utilities? Do you change your own marketing efforts? Do you make any other changes in your operations?]

36. Do your manufacturers ever sell directly to large contractors or retailers? [PROBE: Does SEARS get HVAC equipment directly from the manufacturer or do they need to order through you? Can large contractors (consolidators) bypass you as a distributor and make large purchases directly from the manufacturer? Under what circumstances, if ever, will manufacturers sell direct?]

37. You may know that PG&E ran a pilot program to support residential air conditioners with evaporatively cooled condensers (the “AC2” unit). Do you believe there will be much demand for these types of air conditioners in the future? [PROBE: Why? Why not? When?]

38. If PG&E offers incentive programs for efficient equipment and system improvements, who should get the incentives? Why? [PROBE: Customers, contractors, distributors, or manufactures? Why?]

39. Which types of utility efforts do you think would be most effective in increasing market penetration for energy efficient HVAC equipment? Information? Training? Financing? [PROBE: Which programs will have the most impact on transforming the market into a more energy conscious market?]

40. Would utility-sponsored financing make much impact? [PROBE: How many purchases of furnaces, heat pumps or central air conditioners are financed? What could make financing more attractive to consumers? To contractors?]

Competitive Issues

41. Are there any competitive issues in Northern and Central California that you feel PG&E staff should be aware of? [PROBE: Any issues that might impact the viability of a HVAC incentive program?]

Sales Tracking

In at least one state, HVAC distributors make confidential reports of their equipment sales by efficiency level at the county level. This data is pooled and reported back to the distributors and to the state energy efficiency office and the utilities. Almost all of the distributors participate in this “sales tracking system” and most feel that they get excellent information. They know that this is the only source for such detailed information on sales.

You gave us valuable information at the start of this interview in exchange for a promise of confidentiality.

42. Would you be willing to give us information on your sales, by efficiency level and county?

43. Under what conditions would you give us this information?

Thank You Very Much. I appreciate your taking the time to share your expertise.

STOP TIME: AM / PM

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Section I: Preface

Market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California.¹ In order to adapt to this policy change, Pacific Gas and Electric Company (PG&E) is pursuing detailed market research regarding the California Residential heating ventilating, and air conditioning (HVAC) market. Secondary research was conducted followed by primary research with HVAC equipment consumers, contractors, distributors, and manufacturers.

This research was conducted to meet the California Board for Energy Efficiency (CBEE) milestone: “Conduct a market characterization and baseline assessment study to design a comprehensive market transformation strategy for the residential heating and cooling systems (HVAC) market.”

This report summarizes the secondary research completed to provide a context for the subsequent primary research. PG&E research and program documents were provided for our use. In addition, we conducted an extensive literature search.

¹ For a general discussion of market transformation issues, see “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” (Eto, et.al., July 1996)

Section II: Background

Pacific Gas and Electric Company (PG&E) has been a very active and influential market actor within California's energy efficiency markets. Their efforts, many of which began in the early 1980s, have extended from research, to educational programs, to various types of up-stream and down-stream incentive programs. Today, market transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California. Market transformation has been defined as "a reduction in market barriers due to a market intervention, as evidenced by a set of market effects that last after the intervention has been withdrawn, reduced, or changed."² In order to adapt to this policy change, PG&E is pursuing detailed market research regarding the California residential heating, ventilating, and air-conditioning (HVAC) market. This research is designed to improve PG&E's understanding of barriers to installation of energy efficient heating and cooling equipment and related energy services in the residential sector—leading to market transformation efforts targeting the residential HVAC market.

This report is part of a comprehensive market research project designed to address the residential heating and cooling market.³ This report summarizes the key findings from secondary research conducted to identify the key market actors, market barriers, and possible market interventions. Importantly, this secondary research framed the key issues for designing the primary market research to characterize the residential HVAC market and establish a baseline for potential indicators that will measure progress toward market transformation.

² For a general discussion of market transformation issues, see "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs." (Eto, et.al., July 1996)

³ The overall research project includes this secondary research and primary research. The primary research includes interviews with 1) HVAC manufacturers, 2) HVAC equipment and component part distributors, 3) HVAC contractors serving the residential market, and 4) consumers who have recently replaced or added HVAC equipment.

Section III: Objectives

The primary objectives of this secondary research are to: improve PG&E's knowledge of residential HVAC distribution channels serving customers owning single family dwellings, town houses and duplexes; identify market barriers to the purchase and installation of energy-efficient residential HVAC equipment and systems; and identify the key issues to be addressed through a primary market research effort (the second phase of this project).

Section IV: Methodology

Members of the PG&E Residential Energy Management Team provided a large number of documents from earlier PG&E market research and evaluation projects. These documents provided Opinion Dynamics Corporation (ODC) personnel with background information on the issues underlying the transformation of the residential market for HVAC equipment and services. ODC personnel also searched for additional information from energy efficiency related conferences, Federal and State government sources, manufacturers' business and product information, consumer information publications and other sources.

This report collects the most useful insights from the more than 80 sources we reviewed. We prepared comments on each topic, presented in Section V: Findings.

Please consider these findings somewhat tentative until confirmed for the current Northern and Central California market by the primary research.

Section V: Findings

Overview

An initial market characterization research study for a market transformation effort focuses on describing market actors involved in the chain of market events through which products and services are manufactured, distributed, installed, maintained and replaced.

Simply stated, market transformation attempts to understand the actors' behavior in specific events and to modify this behavior to achieve greater energy efficiency. "Behavior" includes many separate decisions by several levels of actors. For example, in residential HVAC markets the basic decisions include:

- **to produce more efficient models of HVAC equipment—or not;**
- **to stock and distribute such models—or not;**
- **to install such equipment using durable materials and proper techniques to ensure equipment and systems perform as designed—or not;**
- **to incorporate more sophisticated diagnostic and repair procedures, relying to a greater extent on instruments and other new tools, to maintain efficient operation of complex systems—or not; and**
- **to educate consumers to understand the impacts of their decisions when remodeling or renovating their dwellings on short- and longer-term energy consumption—or not.**

This secondary research component of the Residential HVAC Market Characterization study was tasked to review available information, produce initial information to inform program planners, identify information gaps, and propose strategies for filling the highest priority gaps.

The market characterization study must also balance the need to inform the program planners against the need to develop critical baseline information for comparison against later measures of possible effects. This balance is, ultimately, forced upon the research contractor and the market transformation team by two limits—time and money. Program planners must

meet specified milestones by set dates. Customer research budgets are finite. And, most importantly, PG&E customers and business allies have limited time to “educate” us and provide data for market tracking.

This report presents key findings describing the residential HVAC market, key actors (beginning with customers and working up the distribution channels), and current barriers to greater energy efficiency.

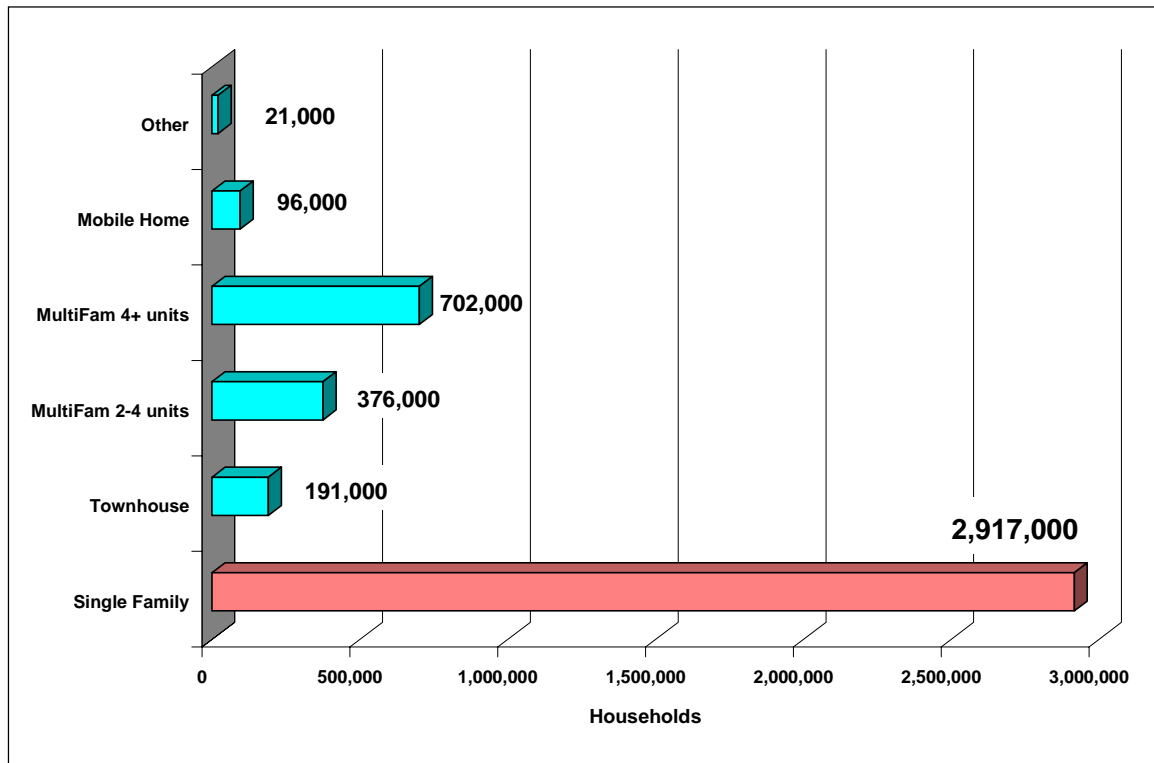
Customers in PG&E Service Territory

Customers served by PG&E are the ultimate purchasers of HVAC equipment and thus a major focus of the market transformation efforts. Their purchases of HVAC equipment, installation, service, repair and maintenance services directly drive the replacement portion of the residential HVAC market and purchases of new equipment for space additions. They play a less direct role in the HVAC equipment purchased for most new dwellings. Knowing the number of customers who occupy different types of residences, their status as owner or renter and other characteristics are fundamental to characterizing the ultimate customer for much HVAC equipment.

As of 1994, PG&E served 4,303,000 households across 47 counties in Northern and Central California. The distribution of these households across dwelling types and across geographic climate zones are two of the major influences on energy consumption for space heating and cooling.⁴

Figure 1 shows that two-thirds (67.8 percent) of PG&E residential customers occupy single family dwelling units. One-fourth of residential customers live in multi-family dwelling units. Small numbers live in townhouses (4.4 percent) and mobile homes (2.2 percent).

⁴ PG&E 1994, the most recent available detailed data on households and their equipment comes from the 1994 Residential Energy Survey Report (commonly known as a residential appliance saturation survey or RASS).

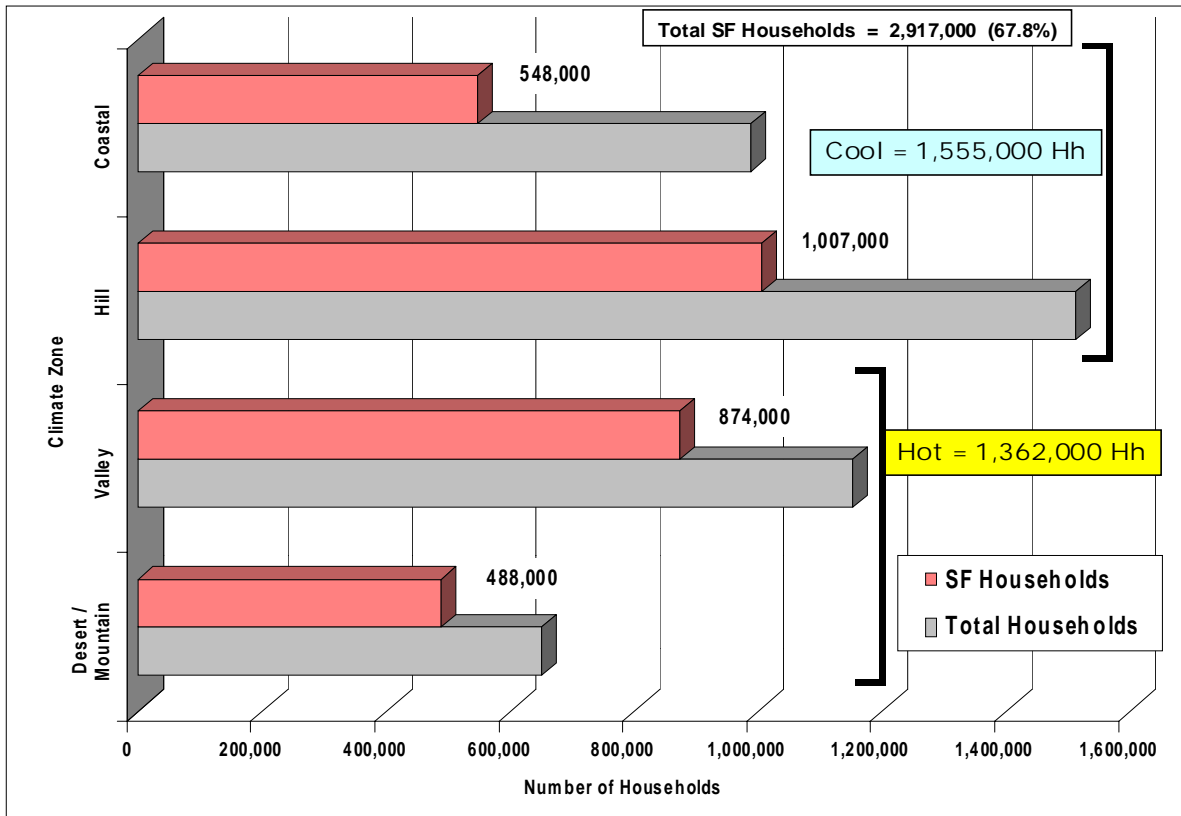
Figure 1: Households by Type of Residence

Source: Residential Energy Survey Report, PG&E, 1994

Figure 2 shows the distribution of the all households (numbering 4,303,000) and single family households (2,917,000) across the four “major” PG&E climate zones.

- **The two “cool” climate zones are the Coastal and the Hill zones. A total of 1,555,000 single-family households are located in the cool climate zones. This included 548,000 in the Coastal zone and 1,007,000 in the Hill zone.**
- **The two “hot climate zones are the Valley and the Desert/Mountain zones. A total of 1,362,000 single-family households are located in the hot climate zones. This included 874,000 in the Valley zone and 488,000 in the Desert/Mountain zone.**

Figure 2: Households by Climate Zone



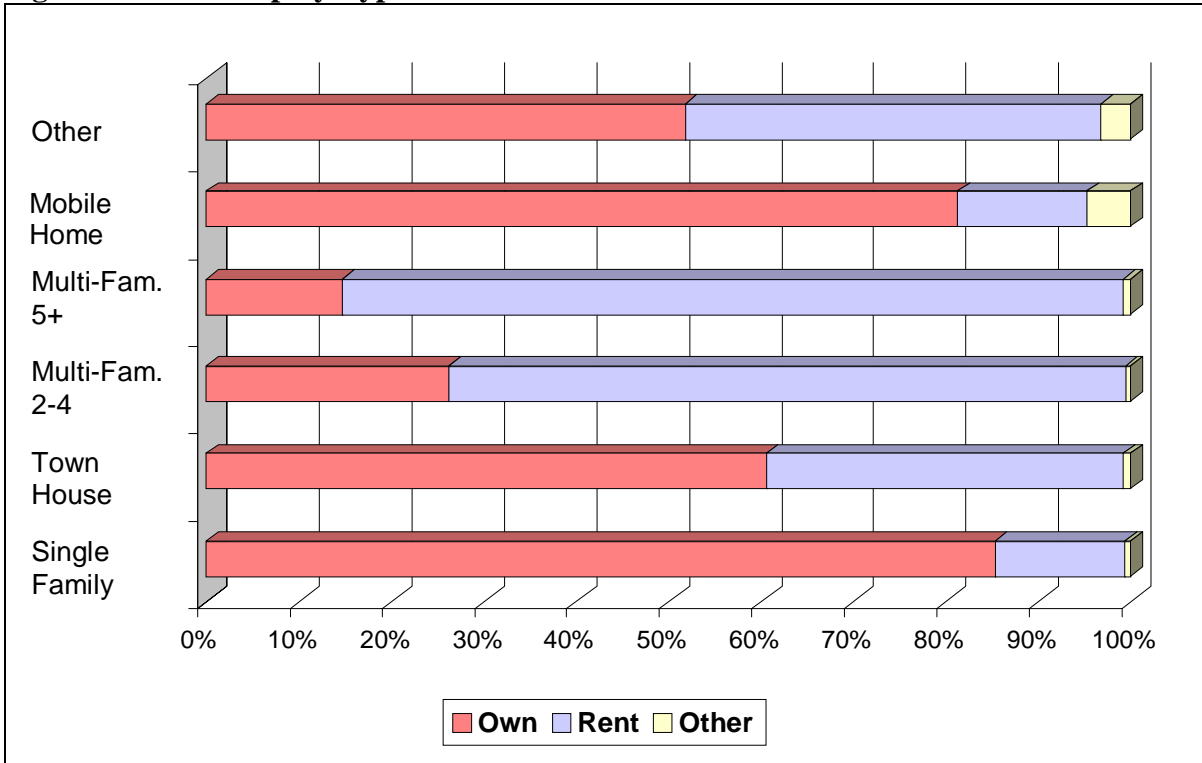
Source: Residential Energy Survey Report, 1994

The goal of the initial research supporting the Residential HVAC program is to characterize the single family, owner-occupied portion of the residential market. This market segment involves more straightforward decision making, without the “split incentives” barrier that applies to rental dwelling units. Thus, the next step in characterizing the target market is reviewing ownership.

Ownership by Residence Type

Figure 3 shows ownership for each of the six categories included in the 1994 Residential Energy Survey. Ownership is highest for single family at 85.4 percent, followed by mobile home at 81.3 percent, and town house at 60.7 percent. (Other is next in ownership at 51.8 percent but only includes a total of 21,000 dwellings of various types.)

Figure 3: Ownership by Type of Residence



Source: Residential Energy Survey Report, PG&E, 1994

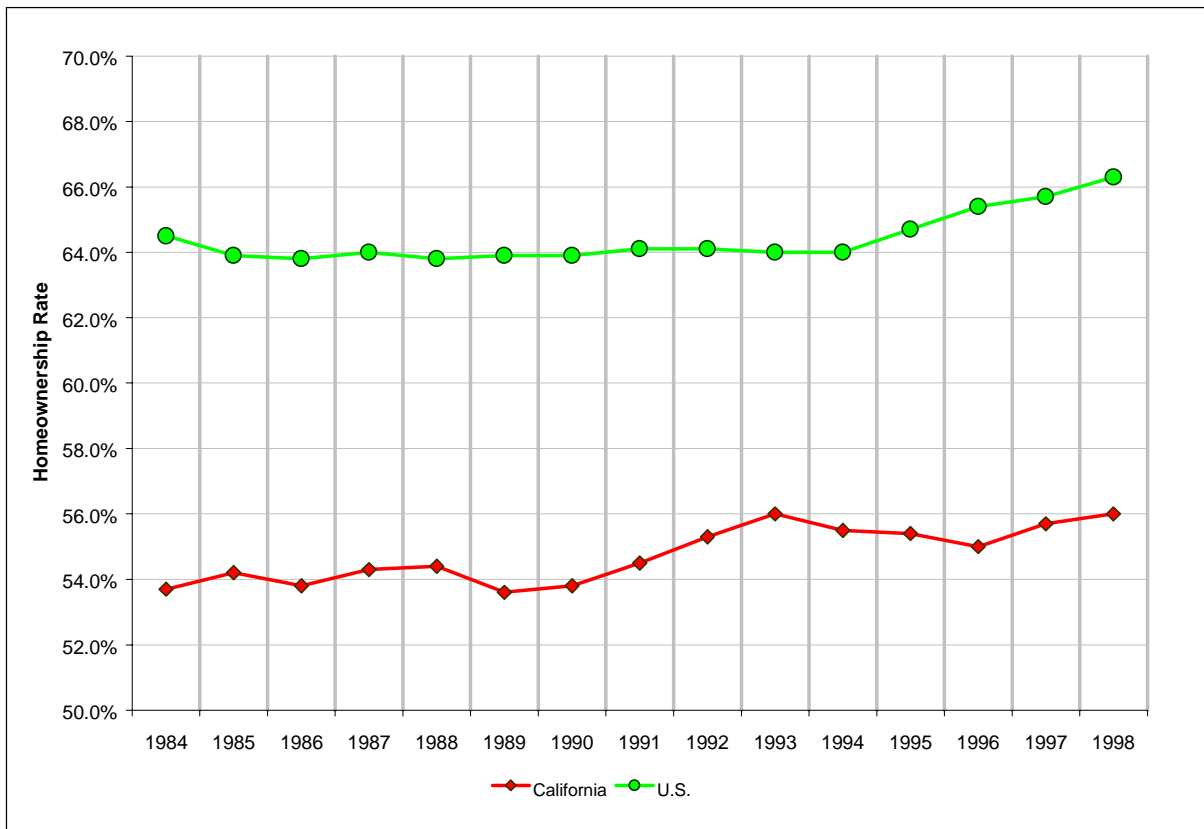
The primary research will identify households by residence type and by whether the respondent owns or rents the residence. We will then ask single family and town house owners additional questions on their replacement and new purchases of residential HVAC equipment and associated services. Further research covering mobile homes, manufactured and modular housing is being considered. We will report the percentages for each type of residence and for owners and renters.

Ownership Trends

Figure 4 shows trends in home ownership for the past 15 years for the United States and California. California has a significantly lower percentage of homeowners than the U.S.—California rates range from 53 percent to 56 percent from 1984 to 1998, while U.S. rates range from just less than 64 percent to more than 66 percent. The U.S. rate remained remarkably constant from 1986 through 1994 at 64 percent, plus or minus 0.4 percent. The

California rate rose from a minimum of 53.6 percent in 1989 to a maximum of 56.0 percent in 1993. From 1993 the rate dropped to 55.0 percent in 1996 and rebounded to 56.0 percent in 1998.

Figure 4: Homeownership rates for the U.S. and California—1984 to 1998



Source: U.S. Census Bureau, Housing Vacancies and Homeownership Annual Statistics: 1998

Construction and Real Estate Activity

California’s previous two economic expansions (1975 to 1979 and 1982 to 1990) were accompanied by abundant construction activity growth. The current expansion (continuing since 1993) has seen a very late and modest recovery in real estate and

construction activity.⁵ The absence of significant home building is the principal cause of this lag. Additionally, some of the state's fastest growing metropolitan areas have seen modest or even negative residential construction growth.

The measures that mark the magnitude of the differences between this California expansion and the previous two are shown in Table 1.

Table 1: Growth After 20 Quarters of Expansion

Expansion	Real Building Valuation (in 1992 \$s)	Housing Permits
1975—1979	117%	100%
1982—1990	95%	124%
1993—1998	39%	37%

Source: California Department of Finance, 1998. Page 6

Further, the state's two largest population centers showed much lower rates of home building in 1997 than in 1986—the peak home building year in the 1982—1989 expansion. In 1997, the Los Angeles area saw authorized housing units numbering 75 percent less than in 1986 and the San Francisco area saw authorized units numbering 44 percent less than 1986.⁶

⁵ California Department of Finance, 1998. P. 6.

⁶ California Department of Finance, 1998. Page 7

Market Structure

Two Major Segments—Replacement and New Construction

Most residential HVAC equipment is purchased to replace existing units in existing dwellings. The circumstances surrounding these replacement purchase “events” are of paramount interest in designing, implementing and evaluating the Residential HVAC programs. Other services may also be purchased when HVAC equipment is replaced. Of equal importance are the customer, supplier, and contractor decisions related to the types of services offered and the quality of services delivered in conjunction with replacement equipment purchases.

HVAC equipment is also purchased for the construction of new dwelling units and to provide comfort conditioning for additions to existing dwellings. We have included additions to existing dwellings with replacement units, because the existing owner is making the key decisions. Also, the suppliers and contractors involved are likely to have businesses that focus more on the remodeling and addition markets than on new construction.

Replacement Compared to New Construction

The replacement market is likely to be distinguished by some key features of the decision making process. We hypothesize that replacement decisions generally involve:

- **Shorter time available for planning, equipment selection and purchase;**
- **Significantly greater physical limitations from the existing structure on equipment choices; and**
- **Limitations on fuel choices due to geographic location and prior decisions.**

We contrast these features of replacement decision making to our hypotheses about typical characteristics of the decisions made in new construction:

- **Longer time for planning, equipment selection and purchase;**

- **Potential for making allowances for HVAC equipment and system space requirements during design (although we acknowledge that many new residences may be constructed based on poor designs that do not provide sufficient space for HVAC equipment, especially ductwork); and**
- **Greater choice of fuels.**

Defining Replacement

One part of our secondary research involved clarifying the terms being used to describe planned PG&E programs. We compared these terms to the terms used in the Home Remodelers Study PG&E had conducted in 1994.⁷ In Table 2 we compare the sets of terms we reviewed in our effort to clarify the scope of this research.

Table 2 Various Descriptions of the Replacement Market

Home Remodelers Study	Market Transformation Programs for 1999 to 2001	
	Residential HVAC Systems (Replacement Market)	Residential Retrofit and Renovation
	Emergency Replacements	
Space Additions	Planned Replacements	Discretionary Retrofit
Interior Remodels		Time-of-Sale Renovation
Interior Upgrades		

⁷ Market Strategies, Inc., 1994

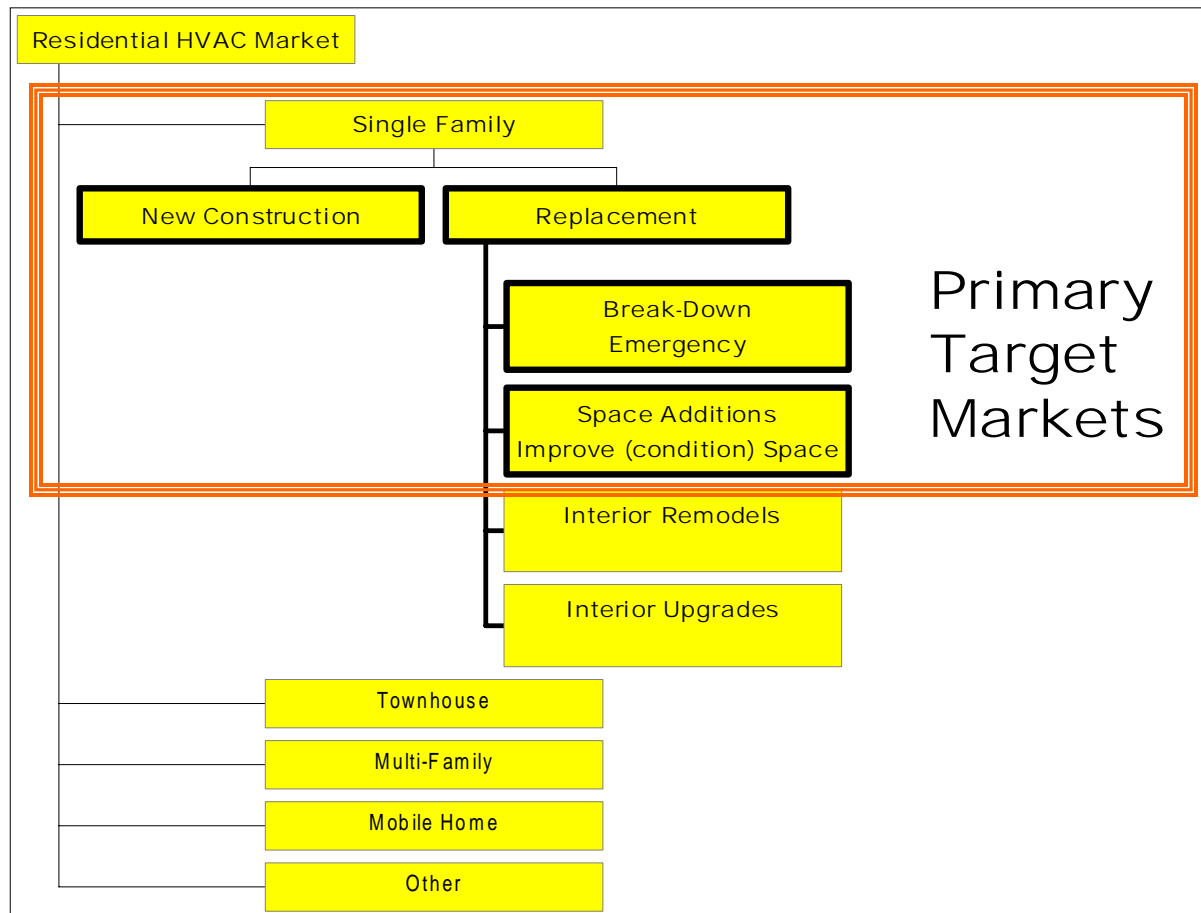
The definitions of the Remodelers Study terms show which categories are of concern to the Residential HVAC program:

- **Space additions** usually require building permits. This category also includes turning existing unconditioned space into habitable, conditioned space. These projects have the longest lead times for planning and decision making. They usually include some work on the HVAC system, from extending ductwork to increasing heating and cooling equipment capacity through replacement or additional units.
- **Interior remodels** involve changing walls; and adding doors, windows, or skylights. They may or may not require building permits. These projects have shorter lead times and seldom involve significant work on the HVAC system or equipment.
- **Interior upgrades** involve appliances and décor. They almost never involve work on the HVAC system.

Thus, we found the information in the Remodelers Study relating to space additions most relevant to characterizing the replacement HVAC market. Interior remodels and upgrades seldom require building permits or involve HVAC replacement.

Of course, in addition to HVAC units included in the planned remodeling work, large numbers of units are likely to be replaced at breakdown. We will present initial hypotheses for the characteristics of breakdown—or emergency—replacement below.

First, it is useful to look at Figure 5 for a schematic view of how the definitions in the Remodelers Study fit into an overall view of this market.

Figure 5: The Remodelers Study View of the Residential HVAC Market

From the information reviewed so far, we identified the portions of the overall market enclosed in the rectangular frame as the primary target markets. This designation is based on our understanding that these segments included the largest volume of HVAC unit sales.

ODC staff developed the following hypotheses about several decision-making characteristics of the replacement, retrofit and renovation markets. The Residential Heating and Cooling Systems Program targets the replacement market and defines two types of purchase events:

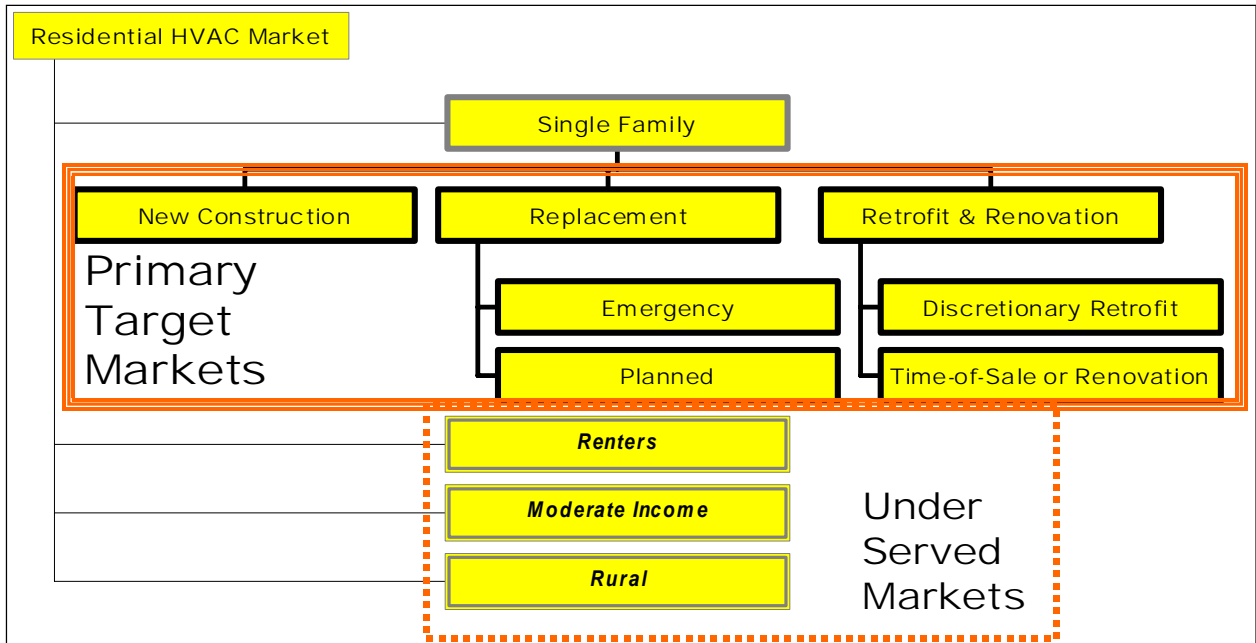
- **Emergency** [break-down] replacement with a very short time available for decision making—often just a few hours; and
- **Planned** [early replacement] with longer time available for decision-making—days, weeks or even months.

The Residential Retrofit and Renovation Program targets larger projects with a broader scope than just HVAC equipment replacement. The program description defines two types of planned replacement events:

- **Time-of-Sale** Renovation projects that may be required to complete a sale or may be planned to be completed immediately after a purchase. These projects have greater immediacy, but still allow some time for planning and decision making. They also offer the opportunity to include financing in a first or second mortgage, or to fund a project with short-term financing that will be repaid with proceeds from the sale.
- **Discretionary Retrofit** seems an equivalent for planned or early replacement. Long lead times for planning and decision making are available, as is the opportunity to include HVAC equipment and system modifications in project financing.

These program plans also identify “under-served markets” including renters, moderate income and rural residents. Many rural residents are also limited in their fuel choices, because natural gas is not available to them. These “all-electric” customers are also considered to have been under served by previous PG&E energy conservation programs.

Figure 6 identifies the primary target markets and under-served markets using the terms from the Residential Heating and Cooling Systems and Residential Retrofit and Retrofit program plans.

Figure 6: The Program Plan View of the Residential HVAC Market

Replacement Market Segments

We hypothesize that equipment is replaced during the three categories of events: breakdown replacement, planned renovation, and early / planned replacement. Our task is to characterize these events as completely as possible.

We hypothesized a “coordinated view” of the residential HVAC market from the structures used in the Home Remodelers Study and the program plans for Residential Heating and Cooling Systems and Residential Retrofit and Renovation:

A Break-down (or emergency) replacement

- 1) Paid by owner
- 2) Covered by home warranties

B Planned renovation

- 1) Time-of-Sale replacement / renovation
- 2) Major remodeling
 - 1 Space addition (including conditioning formerly unconditioned space)
 - 2 Other major remodeling

C Early / Planned replacement

- 1) Equipment
- 2) Whole house (envelope, equipment, ductwork, etc.)

In the next sections, we present the information we have found to date that characterizes key features of these segments of the replacement market.

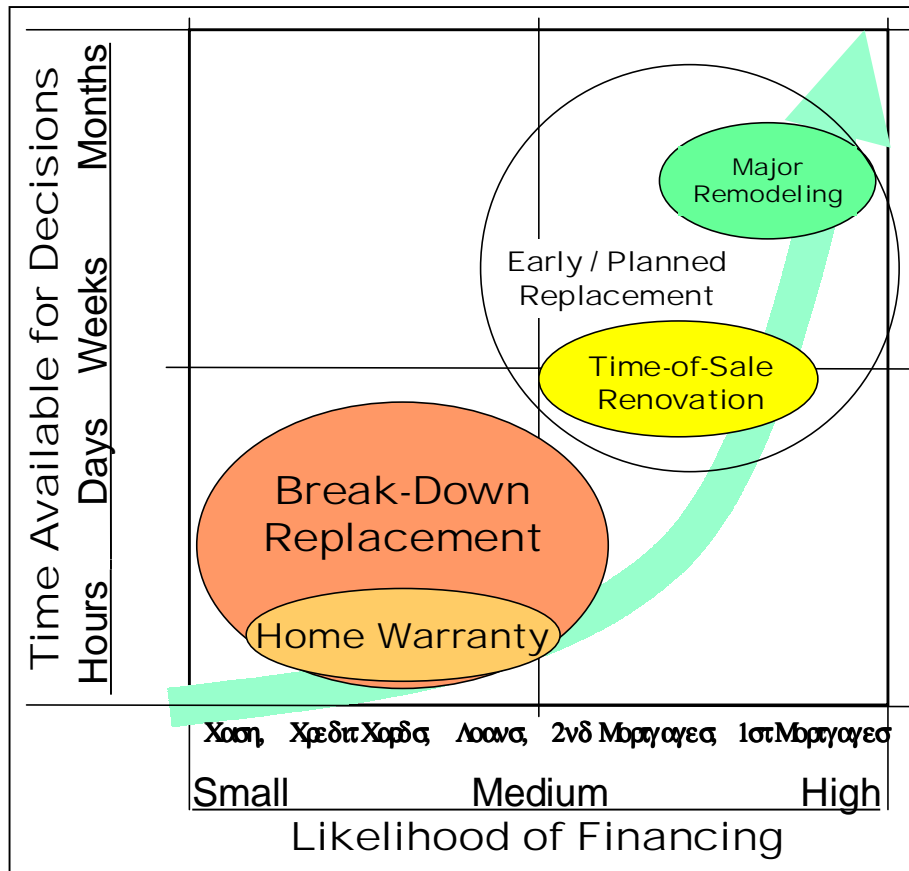
Time and Funding

Figure 7 displays these replacement events graphed against the time available for planning and decision making and the likelihood of using financing.

- **The vertical axis shows times starting with hours at the bottom, lengthening to days or weeks in the middle and to months at the top.**
- **On the horizontal axis the likelihood of financing starts on the left as “small”—customers usually use cash (savings or cash flow) or credit cards when time is especially short.**

As the nature of the replacement event changes, with planning and decision time lengthening and the scope of the entire event growing, eventually more customers may obtain loans. In two other cases related to selling or buying a home, financing may also be used. If a seller is forced to replace an end-of-life furnace or air conditioner or when a buyer decides to undertake a renovation just after buying a home, financing options are likely to be used. A seller may obtain a short-term loan to be repaid from the proceeds of the sale. A buyer has an opportunity to include the renovation in a first or second mortgage.

Figure 7: Hypothesized Time and Funding Available for Different Events



Overall, however, few customers pay for replacement HVAC equipment by financing. Several studies found *maximums* of about 25 percent of customers financing HVAC equipment purchases.⁸

Other research, for Fannie Mae, found that many contractors want to avoid financing—they prefer customers who can pay outright. Notably, those who worked in “emergency / basic livability” areas (including air conditioning and heating) seemed to have the most experience in financing. They also tend to accept credit cards because they are simple and they get paid quickly (in about 4 days).⁹

⁸ Neme, et al, 1998 found that in none of six utility programs offering loans did more than about 25 percent of customers use the loans. Further, PEPCO’s research found that 75 percent of customers purchased central air conditioners or heat pumps outright.

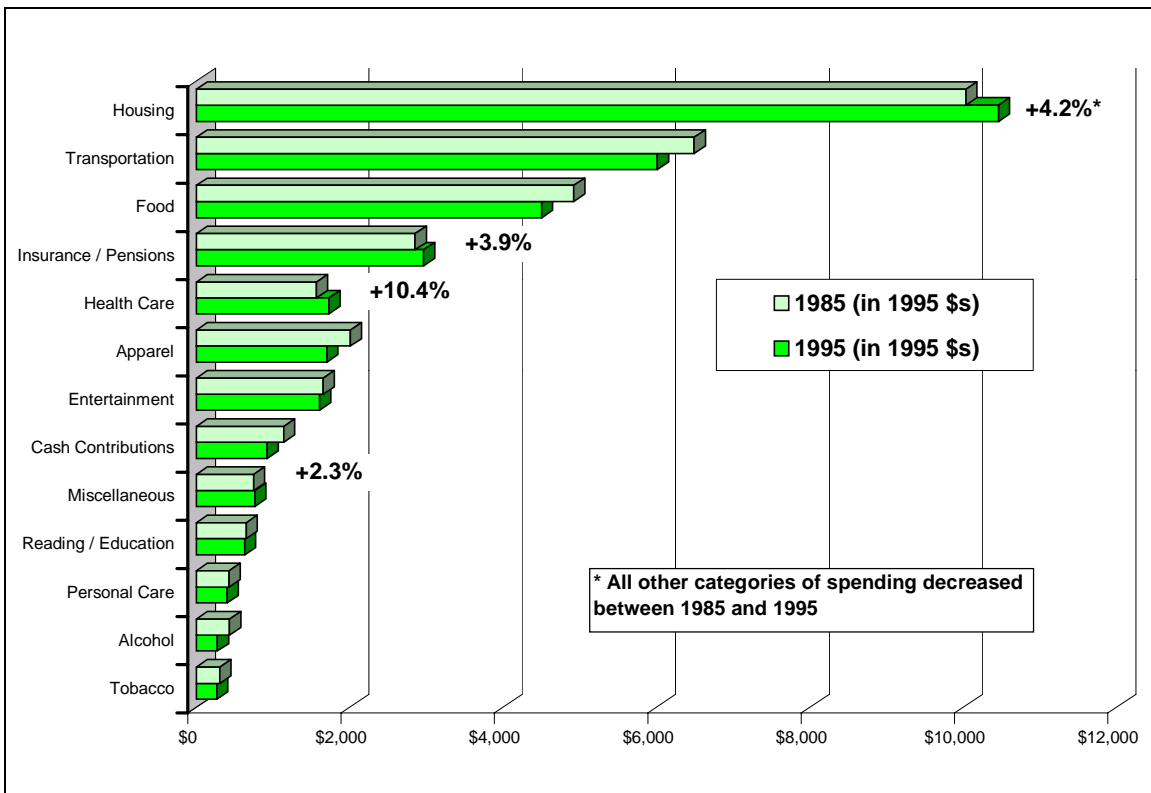
⁹ Fannie Mae, 1998

Household Spending

All HVAC replacement events are set in the context of household spending. It is informative to review recent trends in household income and spending. Between 1985 and 1995, overall spending by the average “consumer unit” (similar to a “household”) declined from \$33,270 to \$32,277, or -3.0%.¹⁰ (These and all spending figures are reported in constant 1995 dollars.) Figure 8 shows spending by nine categories, arranged from the largest average spending in 1995 to the smallest.

Housing is the largest component of total household spending, accounting for one-third (32.4%) of the total. In addition, housing was one of only four major household spending categories that increased between 1985 and 1995.

Figure 8: Household Spending 1985 and 1995, by Category

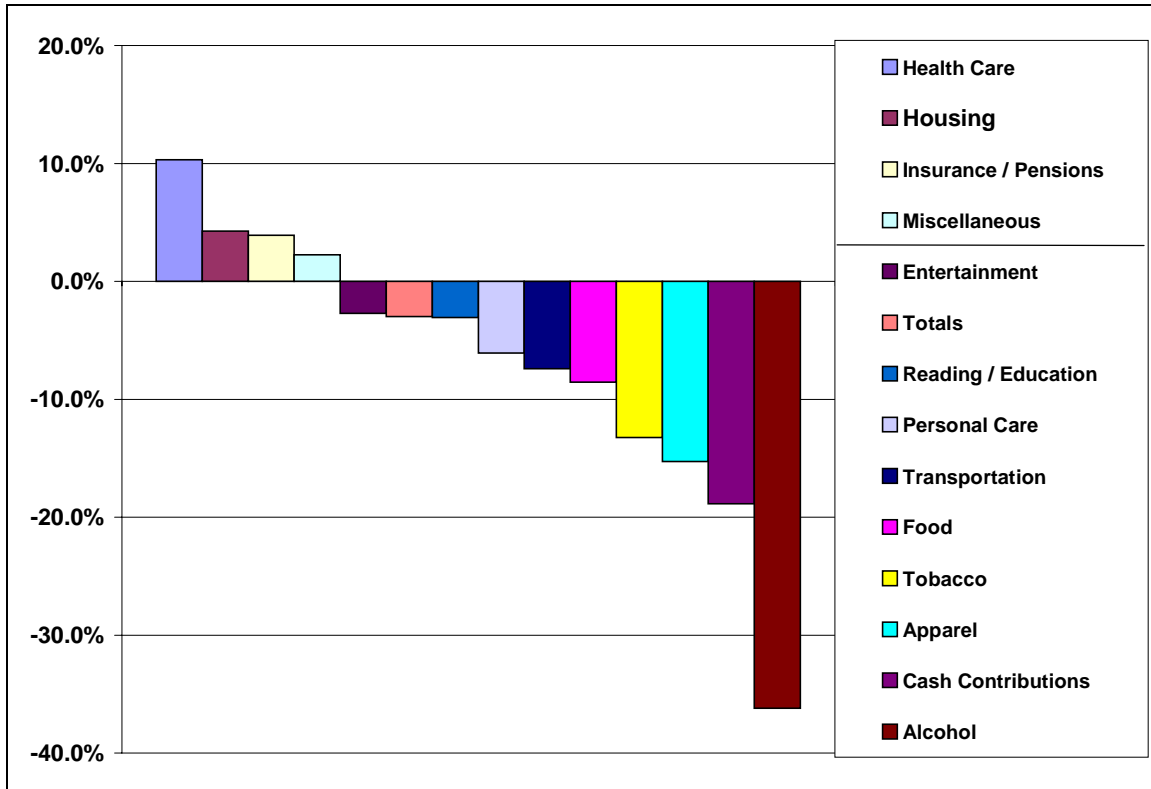


Source: Francese, 1997. Page 52

¹⁰ Francese, 1997. Based on the Consumer Expenditure Survey, Bureau of Labor Statistics.

Figure 9 shows the changes from 1985 to 1995, expressed as a percentage of 1985 spending, for each of the major household spending categories.

Figure 9: Changes in Household Spending by Major Categories



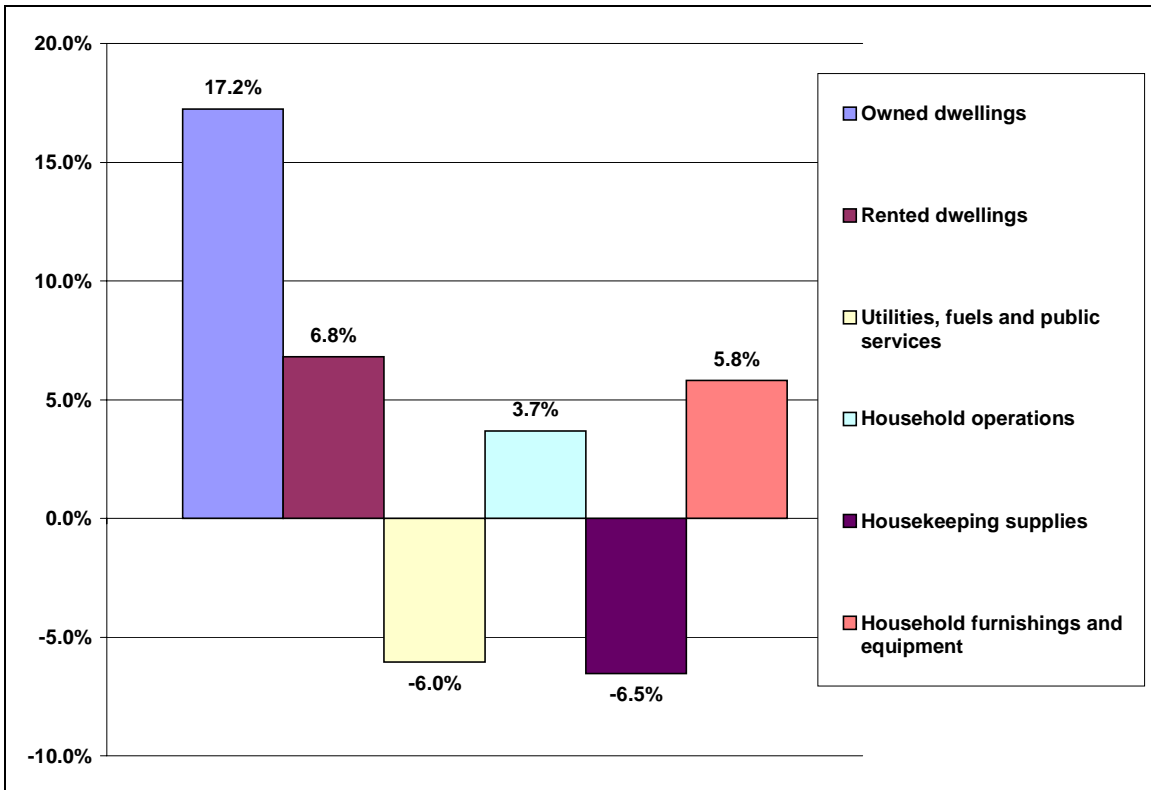
Source: Francese, 1997. Page 52

The only category of spending that grew more than 10 percent was health care. Housing spending grew 4.2 percent as an overall average.

In Figure 10 we have broken out the six components that comprise total spending on housing. While the average spending on housing for all households only increased by 4.2 percent, Figure 10 shows increases and decreases for the components of housing spending. Spending by homeowners grew 17.2 percent over this period. Across the U.S. the major cause of this increase was property taxes which more than doubled during the 1985 to 1995 decade. Mortgage interest and maintenance kept pace with inflation.¹¹

Spending by renters grew by 6.8 percent during the 1985 to 1995 decade.

Figure 10: Components of Spending on Housing



Source: Francese, 1997. Page 52

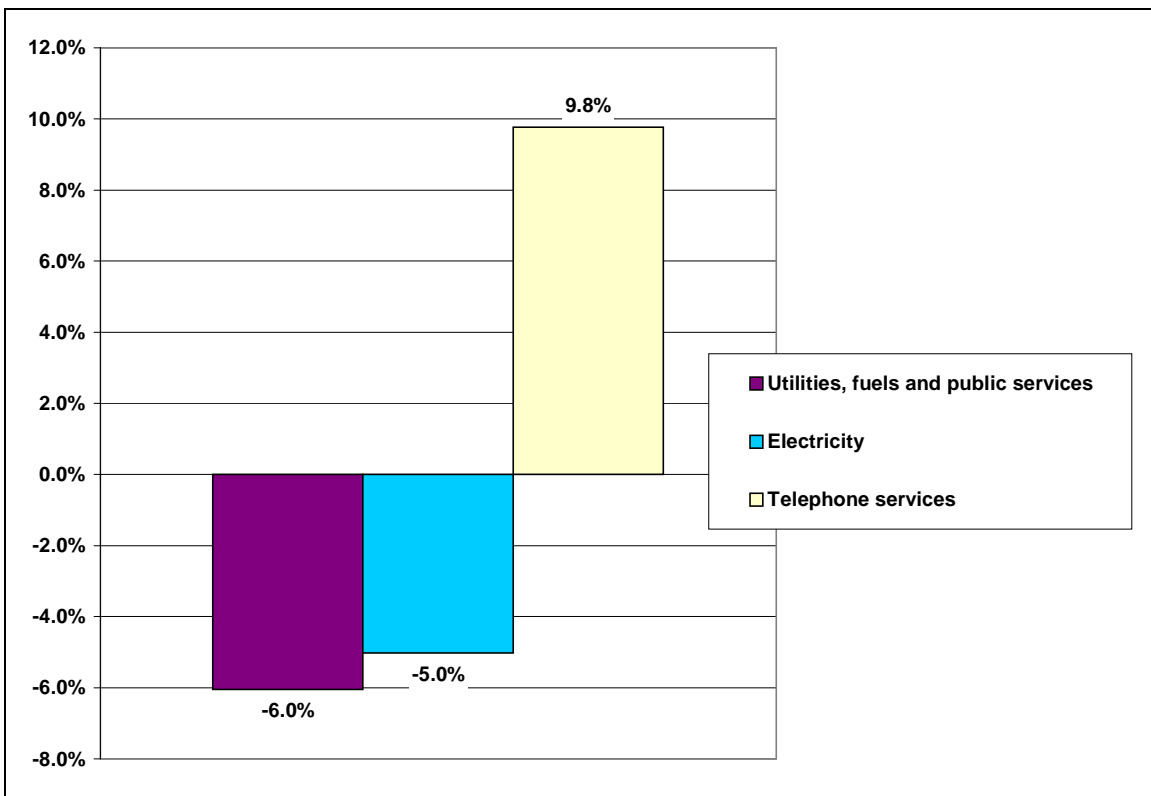
It is also clear that utilities, fuels and public services became a relative bargain—decreasing by 6 percent over this 10-year period.

¹¹ Francese, 1997. Page 52-53

However, household spending on this category is also more interesting when individual components are examined. In Figure 11, we see that spending for electricity decreased 5.0 percent, from an average of \$916 to an average of \$870. Telephone services increased 9.8 percent from \$645 to \$708 for the average household during the 1985 to 1995 decade.

Tracking electricity, natural gas and other fuel costs will provide valuable information during program implementation. It will be a useful gauge of customer interest in and payback from investments in energy efficiency.

Figure 11: Changes in Utility, Fuels and Public Services Categories



Source: Francese, 1997. Page 52.

As we have seen in the 1990s, declining real energy prices have reduced one source of interest in energy efficiency. In fact, more Americans in 1997 worried about drug abuse (32 percent), the homeless (21 percent), terrorism (13 percent), or foreign relations (10 percent) than worried about getting into a war or a fuel and energy shortage (5 percent).¹²

What are adults planning to purchase in 1999? USA Today reported the results of a Bruskin / Golring Research study-the most often reported planned purchases were a computer (26 percent), a suit (26 percent), a new car (24 percent), a used car (24 percent), a TV (21 percent), a watch (18 percent), a house (13 percent) and a refrigerator (12 percent).¹³ Not mentioned were heating or air conditioning equipment.

In the absence of subsidies (from utilities) even Whirlpool, the winner of the “golden carrot” contest to develop an extremely efficient refrigerator can no longer sell it. “We did have trial marketing and that was not successful,” says Richard Best, Whirlpool’s director of environmental safety and health. “There was just no interest at the non-subsidized price. Once the subsidy disappeared, so did the sales.”¹⁴

Replaced during Remodeling

The 1994 Home Remodelers Survey provides the following estimates for remodeling projects that involved replacing or adding heating or cooling equipment:

- **22 percent of all customers remodel in a two-year period - annual rate of 11 percent.**¹⁵
- **Of them, 6 percent replace space-heating equipment each year - or 0.66 percent of all customers annually. [Calculation (0.11 x 0.06) = 0.0066 or 0.66 percent.]**¹⁶

¹² Dortch, 1997. Page 6.

¹³ Hall and Laird, 1999.

¹⁴ Dortch, 1997. Page 8.

¹⁵ Market Strategies, Inc., 1994. “22% of all homes contacted [remodeled] in the past two years”, p. 22

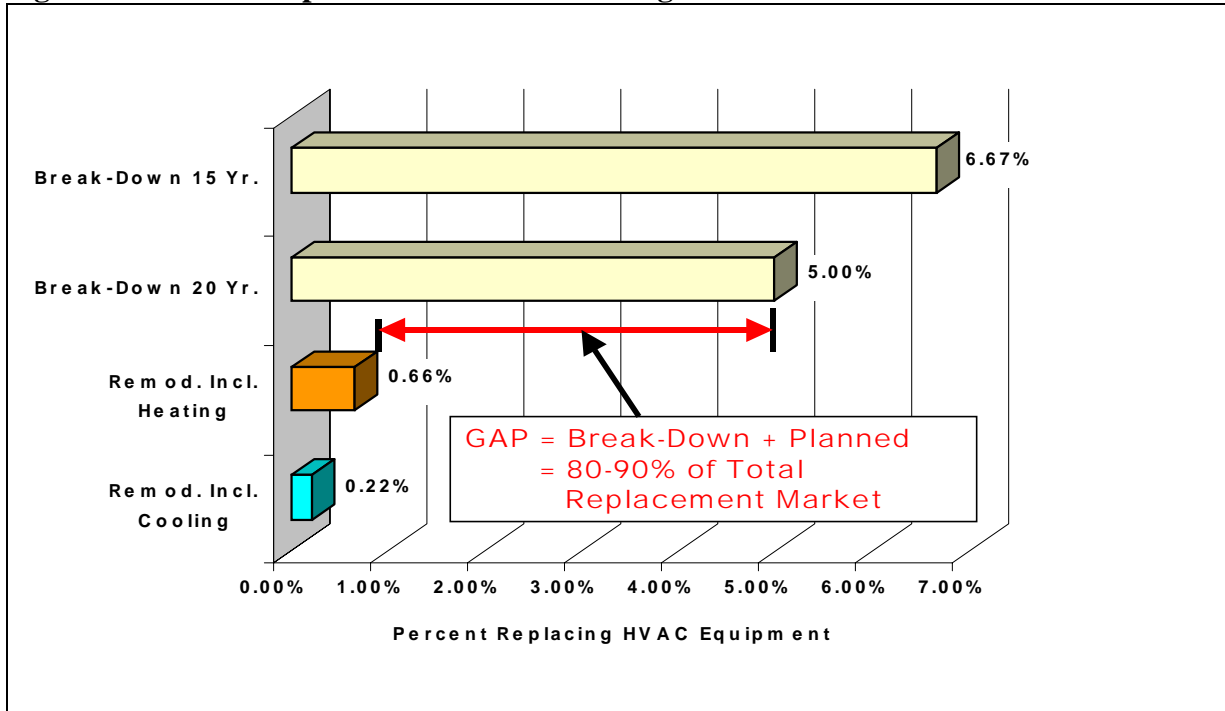
- **Of all remodelers, 2 percent replace air conditioning equipment—or 0.22 percent of all customers annually. [Calculation $(0.11 \times 0.02) = 0.0022$ or 0.22 percent.]¹⁷**

Generally accepted estimates of 15 to 20 year HVAC equipment lifetimes provide replacement estimates of 6.67 percent to 5 percent annual replacement rates. Figure 12 (next page) shows that more than 80 percent of the total replacement of HVAC units was not reported as done during remodeling.

To date, ODC has not obtained much data that allows us to characterize the relative sizes and nature of the breakdown and planned HVAC equipment replacement markets. Very likely, these markets combine to form the single largest portion of the total residential HVAC market in PG&E territory. Using the 1994 Residential Energy Survey estimates, there are approximately 960,000 central air conditioning units and 2,470,000 natural gas furnaces in single family dwellings. At a 20 year life / 5 percent per year replacement rate, one would expect to have 48,000 air conditioners and 123,000 furnaces replaced each year. A 15 year life / 6.67 percent per year replacement rate would produce 64,000 air conditioner replacements and 165,000 furnace replacements each year. Applying rates from the Home Remodelers Study to the total number of single family homes (2,917,000) provides estimates of 6,400 air conditioners and 19,000 furnaces replaced as part of remodeling each year.

16 Market Strategies, Inc. 1994. "Among all remodelers 6% have replaced . . . space heating equipment", p. 54

17 Market Strategies, Inc. 1994. "Among all remodelers . . . 2% replaced . . . cooling equipment", p. 57

Figure 12: Annual Replacement and Remodeling Rates

Source: PG&E RES, 1994 and Home Remodelers Survey (MSI), 1994

PG&E staff furnished ODC with an excellent study of the technical potential for air-conditioning technologies. It provides estimates of the sizes of the breakdown and early replacement markets. We review those results and then return to some additional information on remodeling.

Replacement of Central Air Conditioners

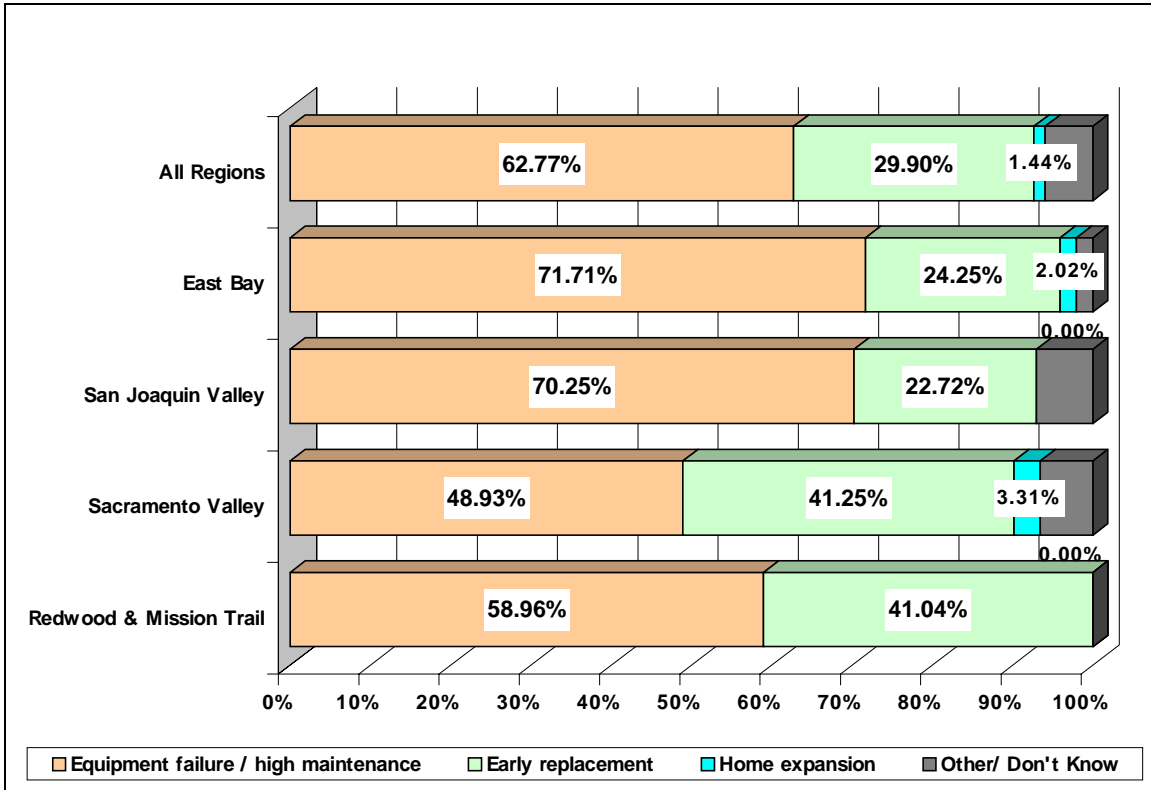
The 1993 Residential Air-Conditioning Technologies Market Assessment conducted by Research Triangle Institute (RTI) was the most complete source of market information we obtained. RTI segmented the residential air-conditioning market into existing home and new construction markets. The existing home market was subdivided into replacement and new acquisitions:

- **Customers are in the replacement market if they own (or are buying) their home and currently have central air conditioning.**
- **Customers are in the new acquisition market if they own (or are buying) their home and do not currently have central air conditioning.**

Each of these markets was segmented geographically to account for the variability of the California climate and the resulting differences in the use and importance of air conditioning.¹⁸

Figure 13 shows that most customers in the replacement market (63 percent) will replace their cooling system because of equipment failure [breakdown] or high maintenance.

Figure 13: Central Air Conditioner Replacement Market Installation Types



Source: Research Triangle Institute, 1993a.

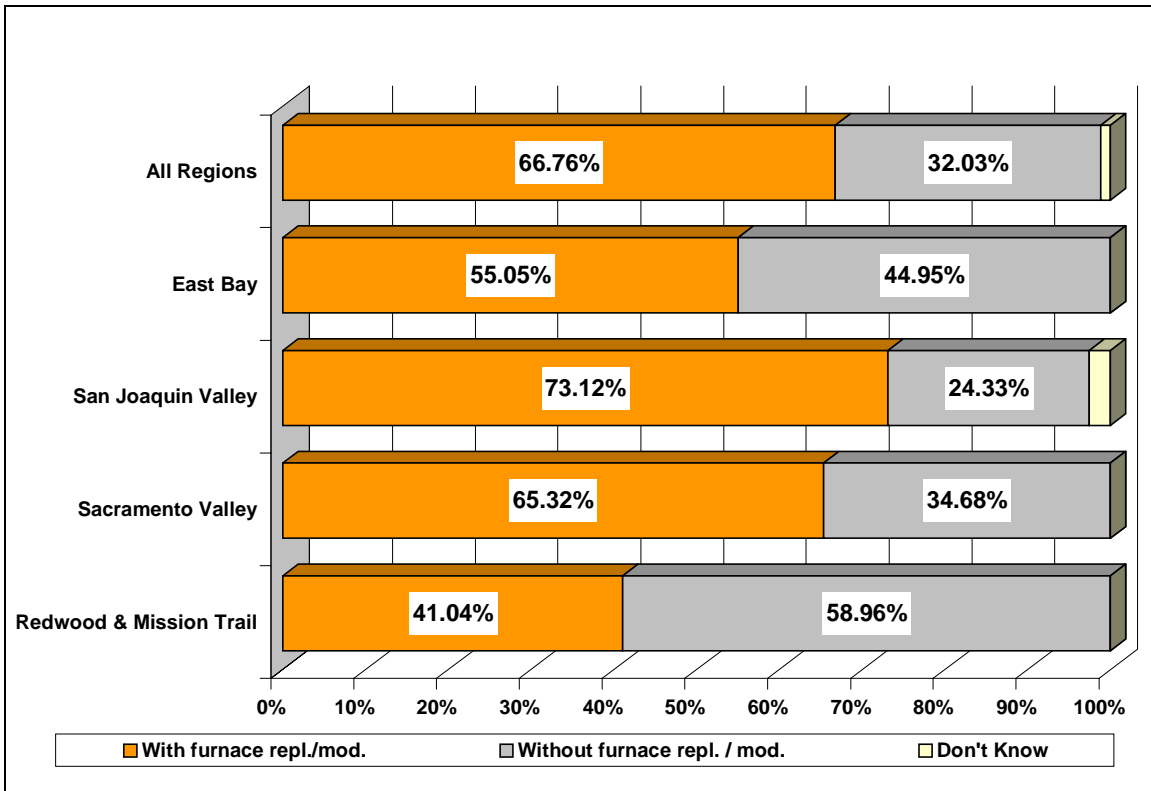
In addition, nearly one-third (30 percent) were estimated (at that time) to replace existing equipment with a more efficient system to save money on their utility bill (i.e., early replacers). Installations due to home expansions will make up less than 2 percent of the annual potential.¹⁹

¹⁸ Research Triangle Institute, 1993a and 1993b.

¹⁹ RTI 1993. Working Paper #5, page 2-11

Figure 14 shows the installation types for new acquisition market sales. Overall, two-thirds of the new acquisition central air conditioners were installed when a furnace was being replaced. The other one-third was acquired without replacing the furnace.

Figure 14: Central Air Conditioner New Acquisition Market Installation Types



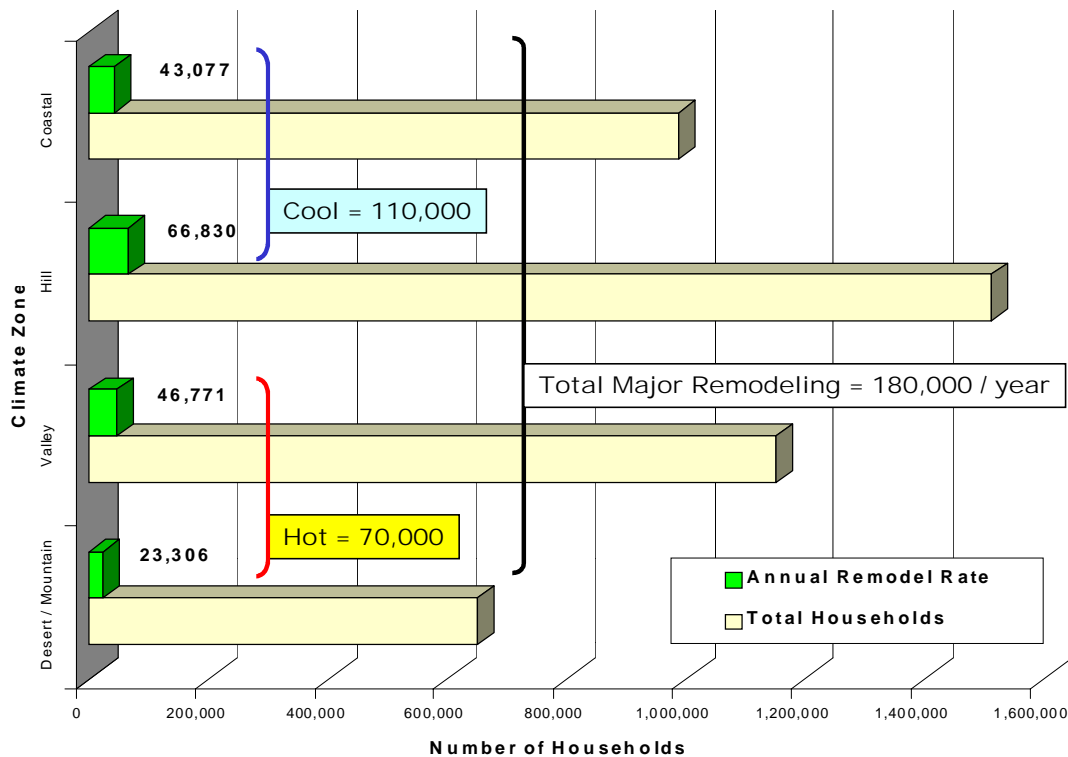
Source: Research Triangle Institute, 1993a.

Distribution of Remodeling Activity

The Home Remodelers Study does provide a considerable amount of further information on the distribution of major remodeling activity by climate zone and by the “vintage” or period when dwellings were constructed.

Figure 15 shows the estimates of the annual number of households undertaking major remodeling by climate zone.²⁰ A total of approximately 180,000 households remodel per year, with 110,000 (60 percent) located in the cool climate zones and 70,000 (40 percent) located in the hot climate zones. The cool climate zones include 43,000 households in the Coastal climate zone and 67,000 in the Hill climate zone. The hot climate zones include 47,000 in the Valley climate zone and 23,000 in the Desert / Mountain climate zone.

Figure 15: Estimated Annual Remodeling by Climate Zone



Source: PG&E Residential Energy Survey Report, 1994

The Home Remodelers Study provided estimates that 22 percent of all homes contacted had completed some form of remodeling or space addition work in the past two years or 11 percent per year.²¹ We would like to note that the term “major remodeling” is not

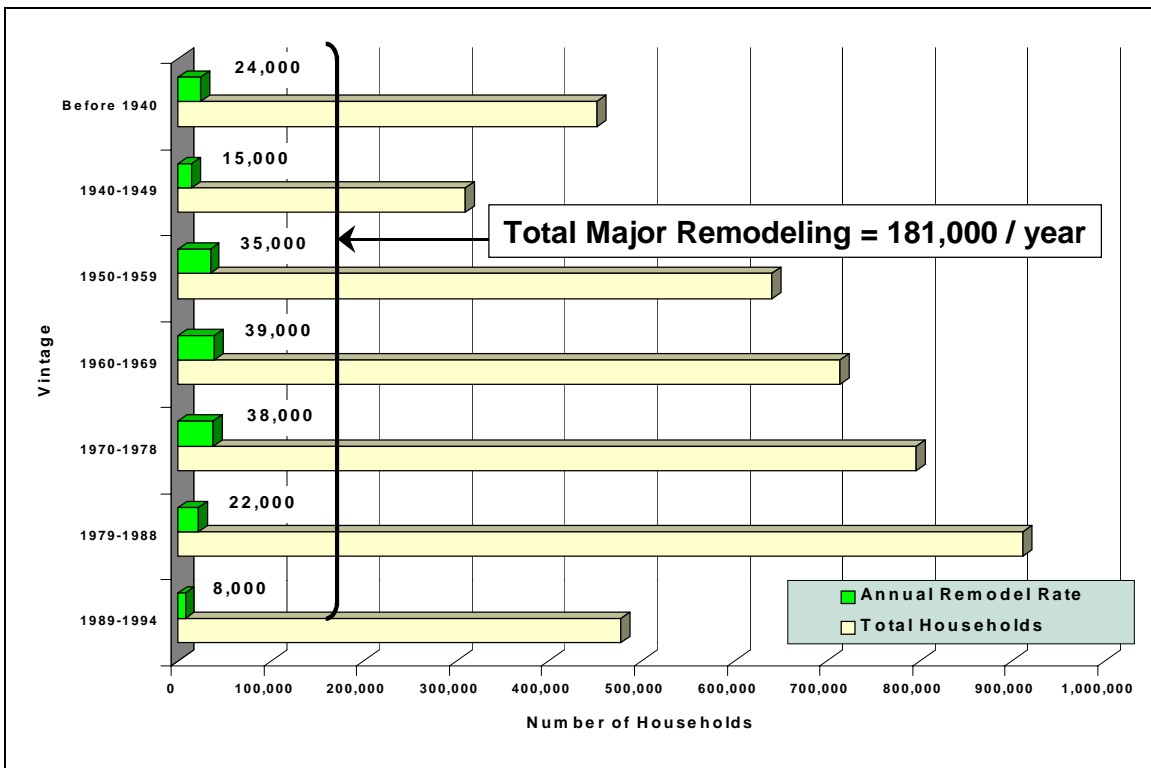
²⁰ PG&E, 1994. Annual rates are one-fifth of the number of households responding positively that they had conducted “major remodeling in the past 5 years”. This estimate is likely to be an upper limit because many respondents will respond yes to “5 years” when, in fact the remodeling was done longer ago than that.

²¹ Market Strategies, Inc., 1994 page 29.

clearly defined in the source document. The remodeling study included a great deal of useful information on many remodeling projects that do not include any significant work on the HVAC equipment.

Figure 16 shows the distribution of reported remodeling activity across the dwelling units of different vintages compared to the total stock of dwellings of each vintage. The first impression this graph reinforces is that remodeling activity is small compared to the total housing stock. As we saw above, this is true.

Figure 16: Annual Major Remodeling by Vintage of Dwelling



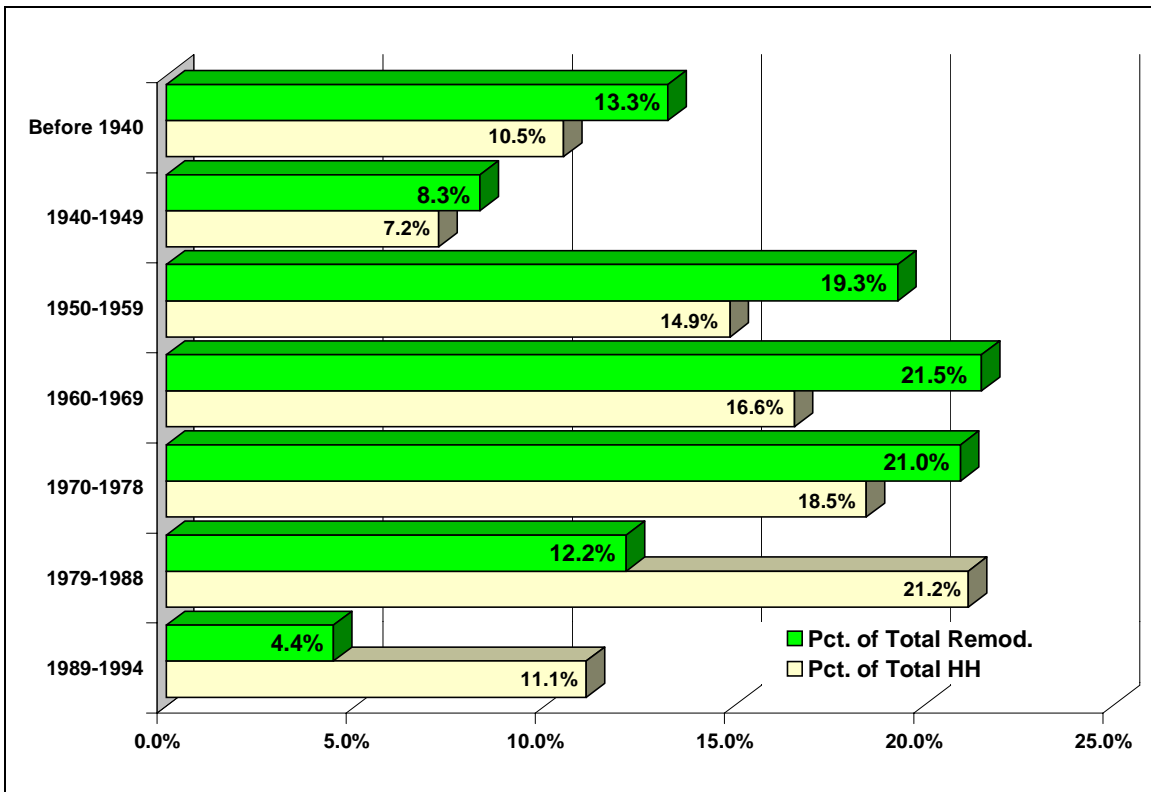
Source: PG&E Residential Energy Study Report, 1994

The higher annual remodeling rates are found in dwellings in three vintage groups—those constructed 44 to 16 years before the 1994 survey (1950 to 1959, 1960 to 1969, and 1970 to 1978). In these groups from 35,000 to 39,000 households reported remodeling each year.

Figure 17 clarifies the distribution of remodeling activity across the vintage groups. It displays the percentage of total households that each group represents. It also shows the percentage of total remodeling being done in each group. As noted above, only the three groups covering homes constructed between 1950 and 1978 each have about 20 percent of the total annual remodeling.

The distribution of remodeling across housing vintage groups appears bell-shaped. Little remodeling is done on relatively new homes. Most is done on homes between 16 and 44 years old, with less remodeling done on homes between 45 and 54 years old. (The higher percentage of remodeling in the oldest category is partly an “artifact” of the fact that this category includes all dwellings 55 years old or more.)

Figure 17: What Vintage Homes are being Remodeled?



Source: PG&E Residential Energy Survey, 1994. Pages C-2, C-38

High Use Customers

The Heat Pump Doctor program plan contains some interesting information on identifying and targeting high use customers. In 1995, there were an estimated 286,000 customers in PG&E's service territory whose summer cooling use exceeds 1,000 kWh. The average summer cooling use of these customers is 2,099 kWh. There are also 25,000 to 35,000 residential heat pump customers in PG&E's service territory whose winter seasonal use averages 7,200 kWh.²²

The Heat Pump Doctor program plan called for targeting these customers and for identifying subdivisions with a high percentage of high use customers.²³

It may be appropriate to investigate using targeting of high use customers as a strategy in the Residential Heating and Cooling System program.

Actors' Attitudes, Behavior and Characteristics

Many of the sources ODC reviewed during this secondary research effort contained information about the attitudes and behavior of customers, contractors, distributors and manufacturers. We have summarized the key points from important sources and present those points organized by the types of actors.

Fortunately, there are some groups of customers who may be good targets for messages about the importance of improving the energy-efficiency of their homes and HVAC systems. The "remodelers" tend to undertake one project after another. And, in many cases, they spend a long time planning their remodeling projects. Further, they consider PG&E a reliable source and want their utility to provide comprehensive information on product and service choices.

²² Proctor, 1995. Page 5

²³ Proctor, 1995. Page 6

Customers

Overview

By the mid-1990s, fewer Americans were concerned with possible shortages of energy than in the mid-1970s. The sales of “sport utility vehicles”, known for their gas-guzzling, have soared as gasoline prices fell to the lowest levels in more than 20 years. “Energy efficiency” was still as important as “cost” to remodelers in 1994, but we expect cost may be more important today. These trends are supported by the decline in the numbers and commitment of “green” customers.

Concerns about potential energy shortages²⁴

- **In 1997, 5% of Americans say a potential energy shortage is one of the top two or three things they are most concerned about, according to Roper Starch Worldwide. That’s down from 46% in 1974.**
- **Americans appear relatively complacent now about the current availability of residential energy, but they also recognize that ample supplies can’t last forever. In December 1994, 58% of U.S. adults said a shortage of energy supplies would be a serious problem 25 to 50 years down the road. That share is down from a peak of 68% in 1980, but it represents a substantial increase from 50% in 1984 and 46% in 1974.**

Importance of energy efficiency.²⁵

- **Trade allies perceive that energy efficiency is a secondary consideration to home remodelers, although it is almost always a consideration.**
- **Customers participating in focus groups rated cost and energy efficiency as about equal importance in remodeling.**
- **Remodelers who purchased HVAC equipment spent approximately the same amount whether they said they gave energy efficiency “primary consideration” or “secondary / no consideration”.**

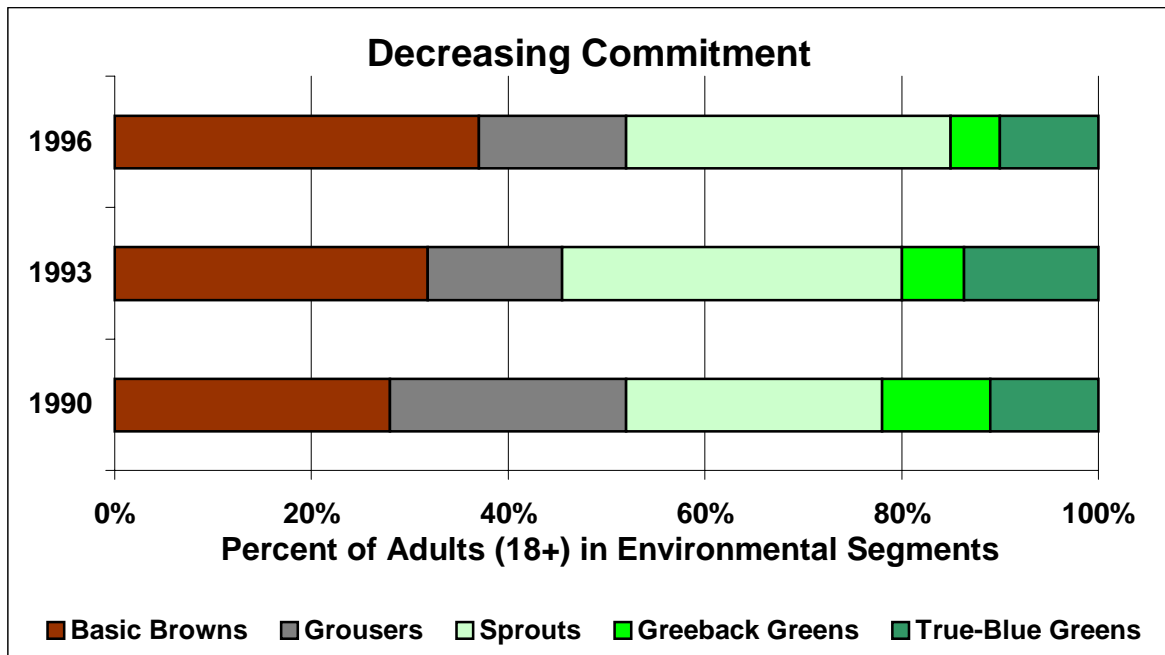
²⁴ Dortch, 1997.

²⁵ Market Strategies, Inc., 1994. Qualitative findings.

The Green Market²⁶

- **Americans’ relationship with the environment is evolving past the 1970s’ fervor that spawned Earth Day. On the whole, our affection for the earth has broadened and become incorporated into our everyday lives in small ways . . . We pay more attention to it on an ongoing basis, but the attention is less focused and perhaps more complacent.**
- **Our increased awareness of the environment coupled with our more casual attitude toward it poses a challenge for those who produce and sell environmentally sound products. How do you sell a product attribute that matters a lot to a few people, but just a little bit to most?**
- **“People talk about the green market, but I don’t believe there is one,” says Harvey Hartman, president and founder of the Hartman Group in Bellevue, Washington. His research and consulting firm specializes in environmental strategies. “We’ve gotten on an emotional bandwagon with this subject. We’ve developed a sense that the environment is more important in most people’s daily lives than it really is.”**

Figure 18: Profile of changes in the “Green Market”



Source: Green Gauge Report, Roper Starch Worldwide

²⁶ Speer, 1997. Pp. 46-47.

“The ecological friendliness of products was never of primary importance to consumers, and its importance is waning. The general public has become more lukewarm about the environment in the past few years,” according to the Green Gauge Report conducted by Roper Starch Worldwide of New York City. The Report uses the following segments:

- **True-Blue Greens** are the most proactively green Americans. Being environmentally aware is a way of life. They made up 10% of the American adult population in 1996, down just a bit from the 11% they represented in 1990. They are also well-educated and well off. They are more likely than average to be politically and socially active, which means they are opinion leaders and have influence on many other consumers. *But there’s one way in which they’re not the best green market: they are willing to pay only 7% more, on average, for ecologically friendly products.*
- **Greenback Greens** on the other hand, are willing to shell out up to 20% more for green products. But they are only moderately active in environmental causes in general, and their allegiance is faltering. They declined from 11% of adults in 1990 to 5% in 1996. Greenbacks are a little younger than average, and somewhat more likely to live in the West or Midwest. They’re the group most likely to hold white-collar jobs. Some former Greenback Greens have moved into the Sprouts group.
- **Sprouts** made up 33 % of the adult population in 1996, up from 26% in 1990. They care about the environment, but are less willing to pay premiums for green products. They have embraced environmentalism somewhat slowly. They reflect the general public in terms of their political orientation. They will pay eco-premiums of about 4%, on average.
- **Grouzers** view the environment as someone else’s problem. They care about the environment to some extent, but not enough to go out of their way to do anything about it. Grouzers say they’re too busy to shop green, or they complain about product quality and cost. As a group, they are slightly less educated than the average American, more politically conservative, and more likely to live in the South. The share of Grouzers shrank from 24% in 1990 to 15% in 1996.
- **Basic Browns** are the environmental deadbeats who don’t give much of a hoot about the environment at all. They grew from 28% in 1990 to 37% in 1996. Browns are the least educated group; like Grouzers, they’re more likely than average to live in the South.

Remodeling²⁷

Consumers-qualitative information on remodelers

- **The research found that most past home remodelers have future plans to remodel.** (This suggests that remodeling, once embarked upon, is an ongoing process.) (MSI, Page 2)
- **People are holding onto their homes longer** due to uncertain economic conditions, inability to sell homes, and the desire to upgrade homes either early (i.e., “fixer uppers”) or late in life (i.e., finally realizing “the dream” for the home). (MSI, Page 2)
- **Consumers tend to take a more active role in both decision-making regarding their home remodeling and as “do-it-yourselfers.”** This suggests that relevant, understandable and readily accessible information must be a critical component of any PG&E home remodeling energy efficiency program. (MSI, Page 3)
- **Quality of life** was the primary motivation to remodel in most instances; the **need for additional** space was cited as the next most common reason. (MSI, Page 5)
- **The idea for remodeling was usually under consideration for several years,** although the execution of the remodel varied from several months to more than a year. (MSI, Page 5)
- **The key influences on home remodeling are friends and building professionals** (architects to a lesser extent; contractors, more often used, are very influential). (MSI, Page 5)
- **Energy efficiency for focus group participants is a secondary consideration in home remodeling;** cost and aesthetics generally are the primary considerations (MSI, Page 5)
- **Remodelers assume that the architect/contractor takes care of energy efficiency code** compliance on space additions and interior remodels. (MSI, Page 5)
- **PG&E is seen to be a (potentially) valuable source of information.** (MSI, Page 6)

²⁷ Market Strategies, Inc., 1994.

- **Retrospectively, remodelers say they would pay for PG&E to come in after floor plans have been drawn and evaluate the plans regarding code compliance and energy efficiency** (and perhaps as a “final check” on the contractor’s competence). (MSI, Page 6)
- **Home remodelers (like contractors) would like PG&E to provide unbiased, neutral, comprehensive information regarding appliances and energy-related issues, like Consumer Reports.** (MSI, Page 6)
- **“Recommendations regarding HVAC systems” received the highest usefulness rating among remodelers.** (MSI, Page 16)
- **There are wide variations in competence and legitimacy expressed about contractors by focus group consumers** (MSI, Page 18)
- **While PG&E’s main interest is energy efficiency, the consumer’s main interest may be cost of aesthetics.** Therefore, any PG&E home remodeling program must be comprehensive enough to offer information beyond energy efficiency. Helping the consumer to navigate the process of home remodeling, in all of its facets, will be critical, in MSI’s view, to launching a successful home remodeling program (MSI, Page 19)
- **Consumers want full-level information (similar to Consumer Reports)** regarding appliances, insulation, fixtures and HVAC systems, not just energy efficiency information. This includes repair records, pay back information and comparative gas-to-electric cost information, when relevant. (MSI, Page 19)
- **Those making space additions are strongly driven by cost versus efficiency** (MSI, Page 19)

Consumers-quantitative information on remodelers²⁸

- **The average amount spent on remodeling per household in the past two years is \$8,618.** (MSI, Page 22)
- **The principal reason cited for remodeling versus purchasing a new home is preference for the area they live in (47%),** followed by the expense trade-off of remodeling versus buying a new home (34%). Growing families comprise 12% of remodelers. (MSI, Page 23)

²⁸ Market Strategies, Inc., 1994.

- **Eighty percent of customers who have completed a remodeling project had no contact with PG&E during the process.** (MSI, Page 67)
- **Remodeling information sources** (see MSI, Page 68 for complete listing)
 - **Visited Showrooms/Retail Stores (23%)**
 - **Viewed Other Work of Architects/Contractors/Remodelers (16%)**
 - **Purchased Book/Video Library/Magazines (13%)**
 - **Visited a Friend's Remodel (11%)**
 - **Friend/Relative/Neighbor (5%)**
- **Nearly half (49%) of all remodelers hired or consulted with a general contractor**, while 41% did not hire or consult anyone. Other building or remodeling professionals hired or consulted include architects (9%), landscape architects (5%), and interior designers (5%). (MSI, Page 70)
- **Friends/acquaintances are the primary sources of information in finding building professionals (mentioned by 72% of remodelers).** Advertisements (mentioned by 8%) are the next most frequently mentioned source. (See MSI, Page 70 for a complete listing of sources of information on finding building professionals.)
- **Homeowners installing heating and air conditioning equipment are most influenced by friends, neighbors and family (27%), contractors (23%), and HVAC installers (17%).** Fifty percent of heating and cooling installers (i.e., customers) discussed energy savings comparisons with an HVAC installer. (MSI, Page 73). Also, see Table 9 on page 74.
- **In total, energy cost and efficiency is rated by 89% of home remodelers as important.** Product selection and availability is important to 84% of remodelers, while warranties (74%), service and maintenance availability after the product is finished (70%), and rebates and special discounts (49%) are important to relatively fewer home improvers. (See MSI, Page 76, Figure 35 for complete listing.)
- **Of the 89% who rate energy efficiency as a "somewhat" or "extremely" important factor that is taken into consideration during the remodeling process, 45% state that PG&E is the best source for this type of information.** Publications (15%) and "product labels or the manufacturer" (13%) each rate a distant second and third, respectively. (See MSI, Page 77, Figure 36 for complete listing)

- **A majority (55%) of remodelers would like information along with the PG&E bill in the form of inserts and newsletters.** Brochures are mentioned by 43% of home improvers, while 22% cite toll-free 800 numbers. (See MSI, Page 80, Figure 38 for complete listing)

Awareness of Title 24 energy efficiency requirements²⁹

- **As of 1994, 87 percent of remodelers knew nothing about Title 24 requirements.**

Important factors in program participation

The market evaluation of three MEC Programs—Energy Savings Plan (ESP), Residential Shell / Duct Repair, and Residential A/C Early Replacement (RACER)—provides information on program participants' characteristics.³⁰ Survey demographics of participants and nonparticipants provide the following comparisons:

- **Shell / Duct Repair participants' average income and home square footage are higher than those of ESP participants.**
- **ESP participants' average income and home square footage are higher than those of nonparticipants**
- **The average level of education and the average age of homes are significantly lower for nonparticipants and ESP participants than for Shell / Duct Repair and RACER participants.**
- **Results did not vary by average usage strata (at the 95 percent confidence level).**

The evaluation also asked participants what was the most important factor in their decision to participate in the program. Saving money on their electricity bills was the most important reason for all program participants. Many of the MEC ESP participants and statewide ESP participants also felt that helping conserve energy and helping protect the

²⁹ Market Strategies, Inc., 1994. Quantitative findings.

³⁰ PG&E, 1994b. VI-1 to VI-3.

environment were also very important. Interestingly, past PG&E program participation was not very important to many participants.³¹

Table 3: Most Important Factors in MEC - Delta Project Participation

Most Important Factors in Customers' Decision to participate in . . .	ESP—System-Wide	MEC—ESP	Shell / Duct Repair	RACER
Saving money on electric bills	86%	86%	59%	63%
Helping to conserve energy	75%	84%	13%	12%
Helping to protect the environment	47%	77%	3%	2%
Past participation in PG&E programs	23%	27%	0%	< 1%

Importance of home equity to household net worth³²

“Household net worth is defined as the sum of all assets minus liabilities such as mortgage debt, credit-card debt, and bank loans. In 1993, the median U.S. household’s net worth stood at \$38,000. Slightly more than 11 percent of American households had zero or negative net worth, while 4 percent had a net worth of \$500,000 or more.”

“The biggest portion of the typical American household’s net worth is found in home equity. The median family’s net worth is \$38,000, but it would drop to \$9,500 without home equity.”

³¹ PG&E, 1994b. pages VI-4 to VI-7 and Exhibits VI-4 and VI-5.

³² Kacapyr, 1998.

Contractors

Remodeling

Trade Allies - Qualitative³³

- **Trade allies perceive that energy efficiency is a secondary consideration to home remodelers, although it is almost always a consideration. (MSI, Page 3)**
- **Building professionals see room for an energy efficiency consulting role for PG&E during the remodeling process, and perhaps in financing home improvements. (MSI, Page 4)**
- **Building professionals say that the program rebate or future energy savings has to be significant for consumers (and themselves) to take much interest in efficiency programs. (MSI, Page 5)**

Need for training and certification

Throughout the PG&E Appliance Doctor Pilot Projects, technicians visiting locations to evaluate potential energy savings in residential air conditioners, heat pumps and gas forced air furnaces found significant problems.³⁴ Among the most prevalent were:

Mechanical and Distribution System Problems

- 1. Duct leakage problems were nearly universal, occurring in all three geographical areas and overwhelmingly present even in the largest sample, containing a high percentage of new construction;**
- 2. Airflow problems (low airflow) occurred close to half the time; and**
- 3. Incorrect charge was evident in over half the units.**

Problems with Existing HVAC Infrastructure

- 1. Failure to diagnose the true cause of the problem, sometimes resorting to “heat pumps / air conditioners just work that way.”**

³³ Market Strategies, Inc., 1994.

³⁴ Proctor, 1995. Page 1-3

2. **Failure to repair all significant problems while on site.** This includes, leaving the inside coil clogged, adding refrigerant without repairing the leak, leaving the unit with too much or too little charge, leaving major duct leaks, and numerous other oversights.
3. **Selling the homeowner unnecessary new equipment.** In the case of air conditioners, this can drive up peak demand substantially since replacement equipment is often oversized.

Homes more complex

“Along with these changes[in homes since the energy crisis of the 1970s] came a new level of complexity and sometimes new problems. Home buyers . . . are now able to judge that not all construction and retrofit work on homes is of equal quality. Most of the time, quality comes down to one thing: contractor skills. The contractors who understand the whole-house approach and know how to use and interpret diagnostic tools are the ones who are best able to deal with the high-performance homes that more and more buyers want.”³⁵

“Customers often want proof of ability before they sign a contract. And when the customer’s money is on the line—as for example, with an energy efficiency mortgage—it is essential that energy savings estimates be accurate.”³⁶

Example utility-sponsored contractor training program

Wisconsin Gas Company (WGC) . . . started 5 years ago to explore offering a formal whole-house program. “The complaints we got from customers—excessive moisture, cold rooms, drafts—were not being adequately addressed by the traditional conservation approach,” says Ken Sipes. The utility’s Whole-House Program was designed to better address these types of customer complaint and creating a network of independent, local contractors trained in whole-house diagnosis and treatment. The five years of contractor training that WGC has conducted is paying off, as more and more companies and individuals in the area offer blower door testing and other diagnostic testing.³⁷

³⁵ Weinreich and Neal, 1999. Page 29

³⁶ Weinreich and Neal, 1999. Page 30

³⁷ James, 1999. Page 14-15

Potential for contractors with trained, certified technicians

“Most heating and air conditioning contractors typically just go into a home’s HVAC system and install new parts. They have not yet recognized the potential for whole-house diagnostics. Instead of just installing a new part, they could be the first person to make that family *comfortable*.”³⁸

Financing and contractors³⁹

Eight focus groups held in four locations (Chicago, Los Angeles, Charlotte, Long Island and Dallas-among the leadership of the NAHB Remodelers Council).

- **Financing is something many respondents want to avoid entirely.** The prefer customers who can pay outright.
- **Contractors that are knowledgeable of financing options, take applications, etc. are also the ones that tend to belong to professional organizations,** go to meetings, attend trade show, surf the Internet to stay up-to-date on the industry and do other activities to continually increase their knowledge base.
- **Contractors who worked in “emergency / basic livability” areas (roofing / siding / air conditioning and heating, etc.) seemed to have the most experience in financing.** However, there were no clear boundaries for relevancy for different practice areas.
- **Contractors who deal with emergency / necessary renovations, such as HVAC, tend to accept credit cards** because they are simple to use and you get paid quickly (about 4 days).
- **Most respondents grasp that they can “sell up” or get more business by offering financing options.**
- **After discussion, respondents felt a real desire and need for information regarding financing.**
- **However, it will be difficult to reach this group, as there is very little organization among them and very few are active in local professional groups.**

³⁸ Weinreich and Neal, 1999. Page 31

³⁹ Fannie Mae, 1998.

- **Contractors all agree about one thing regarding financing—they want it simple.**
- **Contractors also have relationships with their preferred vendors.** These relationships are built on service, reliability and continuity (the ability of the contractor to deal with the same person all the time).
- **Overall, very few contractors are active in local professional organizations.** For perspective, there are 17,000 contractors on Long Island. Of the 17,000 some five hundred are members of NARI (National Association of Remodeling Industries), and only one hundred attend the monthly meetings.

Additional comments on financing programs⁴⁰

Successful promotion of high efficiency HVAC equipment benefits from:

- **Strong relationships with HVAC contractors are critical.** The importance of this point cannot be emphasized enough. In many programs the utility holds regular (quarterly) formal meetings with contractors. Some utilities require contractors to attend at least one meeting in order to participate. Some utilities also meet regularly on a one-to-one basis. The biggest (20% do 80% of the business) are met with more often.
- **Give contractors ample notice of program changes.** Contractors order equipment many months in advance.
- **Continuity in programs is important.** Virtually all successful programs started at least five years ago.
- **Utilities interested in peak demand savings need to carefully consider promotion of multi-speed equipment.** Multi-speed equipment can achieve high SEER ratings but when running at high speed (at times of system peaks) the EER may be lower than single-speed equipment.

⁴⁰ Neme, et. al., 1998

Barriers Affecting Market Actors

Barriers to communicating new ideas to contractors

- **Residential contracting firms tend to be small.** In a recent qualitative study of contractors in California, the vast majority of the 27 firms interviewed employed between 5 and 20 people.⁴¹ Furthermore, industry support is fragmented. Several interviewees belonged to no organizations at all. The remaining firms belonged to an assortment of organizations, but few of the groups were mentioned by more than one firm. Thus, there is no “natural” forum or organization to provide training, certification or marketing support.⁴²
- **Another study identified how few contractors are active in professional organizations.** The Fannie Mae study provides this example: “There are 17,000 contractors on Long Island. Of the 17,000 some 500 are members of the National Association of Remodeling Industries, and only 100 attend the monthly meetings.”⁴³

Distributors

Barriers affecting distributors

Lack of consistency between utility programs (barrier) —Utilities need to develop and implement common efficiency standards for rebates. To the extent possible, utilities will endeavor to make rebate levels consistent state-wide.

Lack of information (barrier) —Develop and implement a joint utility / trade ally marketing and education campaign on the benefits of efficiency and the components of efficiency (equipment, installation, ducts). Develop and distribute customer and HVAC contractor brochures which summarize the key elements of proper installation and provide recommendations on data contractors should provide customers to demonstrate that equipment has been properly installed.

⁴¹ Wirtshafter, et al, 1998. page 6

⁴² Wirtshafter, et al, 1998. Page 7

⁴³ Fannie Mae, 1998

Manufacturers

Barriers affecting manufacturers

Lack of consistency between utility programs (barrier) —Utilities need to develop and implement common efficiency standards for rebates. To the extent possible, utilities will endeavor to make rebate levels consistent state-wide.

Other Trade Allies

Remodeling⁴⁴

Retailers - Qualitative

- **There is a great deal of potential for a PG&E home remodeling program, especially delivered through the retail market, which has the greatest exposure to consumers, and the greatest interest in partnering with PG&E. (MSI, Page 3)**

Bankers/Lenders/Building Officials - Qualitative

- **They exert less influence on home energy decisions (e.g., bankers, lenders) or are too late in the decision process in many cases (city building permit officials and realtors). (MSI, Page 3)**

⁴⁴ Market Strategies, Inc., 1994.

Table 4: Barriers (from a Market Transformation Perspective)⁴⁵

Barrier / Issues	Program Strategies
<p>1. Higher first cost</p> <ul style="list-style-type: none"> • Efficient equipment, proper installation, duct repair cost more than standard equipment and installation practices • Customers have limited capital • The HVAC business is extremely competitive and contractors who bid quality equipment and installations may lose jobs 	<p>Utilities continue to offer rebates to offset incremental cost of efficiency. Rebates linked not only to nameplate efficiency but also to documentation of proper sizing and installation.</p>
<p>2. Lack of information</p> <ul style="list-style-type: none"> • Customers lack information on economic and comfort benefits • Customers do not recognize linkage between proper installation, duct system integrity, efficiency, comfort, maintenance costs, etc • Customers have a “bigger is better” mentality. A contractor trying to sell a properly sized system may lose to one selling a larger air conditioning system. • Contractors who try to sell customers on the benefits of efficiency may be considered biased sources of information. 	<p>Develop and implement a joint utility / trade ally marketing and education campaign on the benefits of efficiency and the components of efficiency (equipment , installation, ducts). Develop and distribute customer and HVAC contractor brochures which summarize the key elements of proper installation and provide recommendations on data contractors should provide customers to demonstrate that equipment has been properly installed.</p>
<p>3. Inadequate training</p> <ul style="list-style-type: none"> • Many contractor personnel do not have adequate training regarding energy efficiency practices • No training or licensing is required to operate an HVAC business in NJ • Only a few contractors are skilled in assessing or mitigating duct leakage or pressure imbalances 	<p>Utilities and trade allies design and offer high quality training on sizing, other elements of proper installation and duct sealing / repair.</p>

⁴⁵ Vermont Energy Investment Corporation, 1997.

Barrier / Issues	Program Strategies
<p>4. Difficulty in identifying quality installations</p> <ul style="list-style-type: none"> • HVAC systems are complex and not well understood by customers • Utilities have had limited requirements for placing contractors on “preferred” lists • Customers do not have any way to distinguish quality contractors • Although permits are required [in many places] for HVAC installations, housing inspectors do not adequately assess the quality of installations 	<p>Establishing “preferred contractor” program with strict standards for participation. Contractors who demonstrate knowledge of proper installation practices and agree to follow key standards would be provided customer referrals. Utilities would jointly market this program.</p>
<p>5. Lack of consistency between utility programs</p> <ul style="list-style-type: none"> • Different standards for qualifying for rebates creates confusion in the market as to the definition of “efficient” • Contractors who serve customers in more than one utility service territory have to order different types of equipment for customers in each territory 	<p>Utilities to develop and implement common efficiency standards for rebates. To the extent possible, utilities will endeavor to make rebate levels consistent state-wide.</p>
<p>6. Split incentives</p> <ul style="list-style-type: none"> • In new construction and rental housing the higher first cost is paid by the builder or landlord but they will not be paying the energy bills 	<p>Offer of rebates should help to overcome this barrier. Utilities to incorporate other HVAC strategy elements into their efforts to promote efficient new construction.</p>

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Residential Retrofit Market
Training Needs Assessment
Market Size & Training Opportunities

Prepared for
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August 31, 1999

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Executive Summary

This report focuses on the part of the housing construction market served by Pacific Gas and Electric Company's (PG&E's) Residential Retrofit and Renovation Program. It summarizes research meeting the California Board for Energy Efficiency (CBEE) milestone: "Estimate the size of the [Residential Retrofit and Renovation] market for building professionals, and identify opportunities for training."

The deliverables of this document, market size and training opportunities, can be found under their respective headings within each market actor section.

The information in this report was compiled from a variety of sources including:

- market research reports provided by PG&E,
- reactions of participants at the Retrofit and Renovation Year 2000 Planning Public Input Workshop,
- a focus group with general contractors specializing in renovation, and
- executive interviews with various parties involved in providing training to the actors in this market.

The following important conclusions can be drawn from this work:

1. There are significant opportunities to provide customized training for the estimated 37,000 general contractors (and their employees) in PG&E's service territory. General contractors will attend classes that are designed to acquaint them with “cutting edge” energy-efficient technologies and practices, and classes that cover the relationship between cost and comfort for different energy efficiency alternatives. General contractors see Energy Efficiency Mortgages (EEMs) as a potentially powerful marketing tool and are therefore very interested in learning how to help homeowners use them, especially with regards to refinancing to support remodeling. They are interested in learning more about the technical aspects of what their sub-contractors do, and are prepared to send their lead tradesmen to classes explaining how energy efficient technology should be incorporated into modern buildings. Finally, they are very interested in classes explaining the workings of Title 24 and the recent changes that have been adopted therein.
2. There are also significant opportunities to provide training to the 1,200 Heating, Ventilating and Air Conditioning (HVAC) contractors (and their employees) in PG&E's service territory. HVAC contractors are interested in receiving clear-cut information describing the benefits (e.g. comfort) and costs of energy-efficient equipment and practices. They want to know

exactly what equipment and practices are considered to be energy-efficient, and they want to be able to clearly explain the benefits customers will receive from the installation of energy-efficient equipment. On the technical side, HVAC contractors are interested in receiving training in duct sizing and duct sealing. They are also interested in classes on Title 24 requirements as they pertain to HVAC and are particularly interested in a class that specifically focuses on the recent Title 24 changes and the implications for HVAC contractors.

3. There are significant opportunities to provide training to the estimated 1,800 building code officials (i.e., plan checkers and building inspectors) working in Northern California concerning compliance with Title 24 requirements. Classes for these parties should focus on how to inspect for Title 24 compliance; how to ensure compliance with requirements established by recent changes to the code; and, proper installation practices for technologies covered by Title 24 (i.e., windows, insulation and HVAC system components).

4. Substantial numbers of the actors in the retrofit and renovation market pass through home centers (i.e., retail stores specializing in home improvement and construction materials) at some time during the course of their renovation projects. Consequently, these stores provide an excellent opportunity to communicate information about energy efficiency to decision makers before and during the selection of appliances and

equipment. Training should be offered to sales staffs in the estimated 120 home centers in Northern California regarding the comfort, performance and costs associated with energy-efficient building materials and equipment sold in their stores. Training could focus on windows, water heaters and other energy-efficient products and how they benefit the overall comfort of a home. It could also ensure that store personnel are well acquainted with the performance characteristics and benefits of EnergyStar® labeled products. There is also an opportunity to distribute instructional video tapes emphasizing the advantages of energy efficient equipment and installation practices for viewing the contractors and homeowners on store premises.

5. There are several opportunities to provide training to actors who are or will be offering products or services related to EEMs. These include:

- for home inspectors -- a class explaining how to provide an energy efficiency evaluation as part of the services they currently offer;
- for lenders -- a class explaining the requirements for qualifying for energy efficiency mortgages; the steps required to successfully fund an EEM and the roles and responsibilities of CHEERS raters and other inspectors who may be involved in the process;

- for "facilitators" -- a class explaining what it means to be a "facilitator". This class could deal with the specifics of lender requirements, the role of home inspectors and CHEERS raters in the process, and how to work with contractors once the work is decided upon. A class tailored to general contractors who expressed great interest in EEMs as a marketing tool might also be developed.

Based on the information gathered in this report, FSC recommends these follow-up actions:

1. additional research and focus groups to expand course content, target audience, delivery (i.e. STC vs. onsite/in-field), preferred schedule, and marketing approach, etc; and
2. an analysis of the 1999 training program, based on the level of attendance for different classes, test results, marketing approach used, feedback from trainees, etc., to help fine-tune next year's program.

Section 1: Introduction

Milestone

Market Transformation has emerged as a central policy objective of future publicly funded energy efficiency programs in California. In order to adapt to this policy change, PG&E has developed programs to transform the construction market by training market actors about energy efficiency. This report deals with the Residential Retrofit and Renovation Program part of the construction market.

This research was conducted to satisfy the California Board for Energy Efficiency (CBEE) milestone: “Estimate the size of the [Residential Retrofit and Renovation] market for building professionals, and identify opportunities for training.” The CBEE is an part of the California Public Utilities Commission (CPUC) that, among other things, monitors the efficacy and success of conservation programs in place throughout the state. This program “milestone” was set by the CBEE to target opportunities for training the market actors. It was also important to determine market size when developing training classes, seminars, workshops, etc.

This report meets the CBEE’s milestone. The information in this report was gathered from market research provided by PG&E, a public input workshop, a focus group, and executive interviews. Market size and training opportunities can be found under their respective headers in the section entitled “Findings”. A brief synopsis of each market actor’s role has also

been supplied under the “Role” section to help describe the opportunities suggested.

Background

Professionals in the building industry influence the eventual energy efficiency of residential buildings in various ways.

Contractors interpret and apply the construction codes (i.e., California’s Title 24) that establish minimum building and system performance standards. They can explain those codes to the homeowner, help them decide among the various technical choices available, and most importantly help them comply with those codes. They can also help consumers understand the comfort and operating cost implications of different building envelope, fenestration, lighting, and HVAC system design alternatives. In the end, the contractor is probably the most important source of information used by consumers to choose from among the various technical alternatives that best suit their desires and needs.

Building code inspectors have a different but equally important function in the retrofit and renovation marketplace. They check construction plans and work being carried out by contractors to ensure compliance with requirements set forth in the building codes. In doing so, they help ensure that minimum energy efficiency standards are met and that technically sophisticated engineering designs used to achieve energy savings are executed properly.

Yet another important function is provided by retailers/home centers in the retrofit and renovation marketplace. They provide literal storehouses of products and information consumers and contractors can use to learn about the costs and benefits of different products and technical design alternatives. They also provide an environment within which it is appropriate and easy to communicate information to consumers and contractors concerning the relative costs and benefits of different design alternatives. One of the key technical challenges in any communications program is to identify parties who are “in the market” at any point in time. Retail stores focused on various kinds of home improvements that literally attract parties who are “in the market” for the goods and services that determine the energy efficiency of remodeling projects.

The potential energy efficiency gains in the retrofit and renovation market place are limited by the training and experience of the above key actors. For example, while most general contractors understand how to comply with Title 24, relatively few understand it well enough to explain the rationale for these requirements to their clients. Even fewer understand the technical issues well enough to evaluate the costs and benefits of the various technical trade-offs described in the recent revisions to the code.

Deficiencies in the information available to market actors can be remedied by providing technical training to them. Identifying crucial training requirements for each of the market actors in the retrofit and renovation market was the central objective of this study.

Approach

The Residential Retrofit and Renovation marketplace consists of a number of different types of building professionals with different training needs.

These include:

General contractors	Building code inspectors
HVAC contractors	Home inspectors
Window contractors	CHEERS raters
Electrical contractors	Lenders
Retailers/Home centers	Energy Efficiency Mortgage “facilitators”
Retailers/Specialty shops	Real estate agents

In addition, within some of the above categories, there are multiple actors. For example, depending on the size of the firm, general contractors may employ foremen, framing carpenters, finish carpenters and other trades. Also, HVAC contractors usually have technicians and installers.

Those market actors that require future research to determine market size and training opportunities have been designated in the section entitled “Other Identified Market Actors”.

To identify the training needs of this diverse population of market actors, a three-step research process was carried out. In the first step, information on training needs identified during prior research was collected and analyzed. These reports included studies on segments of the market (such as windows,

HVAC, Energy Efficiency Mortgages), and an overall study of the entire Residential Retrofit and Renovation Market.

In the second step, the results of the literature review were summarized and presented at the PG&E Residential Retrofit and Renovation Program Year 2000 Planning Public Input Workshop. Participants in this workshop included general contractors, HVAC contractors, CHEERS Raters, PG&E program planners, representatives from various departments of the state and federal governments, and other California utilities. At the conclusion of the presentation, parties were asked to comment on the findings of the studies and provide additional suggestions for training for various market actors. A copy of the presentation made at the workshop is included in Appendix A.

At the conclusion of the second step, it was apparent that the planning process could be improved by collecting additional information from some of the key market actors. Therefore, in the third and final step of the project, additional information was collected from general contractors, retailers and building inspectors. Further information concerning the training needs of general contractors was collected by means of a focus group consisting of 7 general contractors meeting for a period of 3 hours. The focus group discussion guide is contained in Appendix B. Additional information concerning the needs of retailers and building inspectors was obtained by interviewing training specialists in those market areas.

Organization of Report

In addition to the introduction this report contains two other sections.

Section 2 describes the role, market size and training needs of each of the key market actors in the retrofit and renovation market. Section 3 contains a discussion of the research methods used in the study.

Section 2: Findings

General Contractors¹

Market Size

It is estimated that there are 37,000 active general contractor licenses in PG&E's service territory.²

Role

General contractors are involved in over 70 percent of all renovations to kitchens and baths or room additions.³ In addition to the trades that work directly under their supervision, general contractors usually supervise the work of one or more the measure-specific contractors who provide specialized work such as HVAC or electrical installations. Some general contractors also provide specialized retrofit services, such as window replacements, but this window service is generally not offered as a main line of business.

General contractors obtain new work in one or both of the following ways:

1. They bid on projects based on plans provided by the customer's architect or engineer. In this situation, the general contractor doesn't have much influence on the energy efficiency of the renovations: the

¹ Unless otherwise noted, the information gathered in the section on general contractors is based on a focus group held with 7 general contractors on August 13, 1999, in Walnut Creek, California.

² Market size was obtained by allocating the total number of active licenses in the State of California in proportion to the population in PG&E's service territory (estimated at 38 percent of the total state).

energy efficiency has already been defined in the plans based on Title 24 energy efficiency calculations. Usually the customer or their architect/engineer does not design beyond Title 24 requirements.

2. Some contractors exclusively obtain work through personal referrals, as opposed to through a formal bidding process. General contractors say that, about half the time, they become involved in renovation projects before the project has proceeded beyond the conceptual design phase. In such cases, the general contractors develop the project plans in consultation with the homeowner.

As with the first option, energy efficiency typically is incorporated into the design only as far as Title 24 requirements dictate. But at this stage the general contractors have an *excellent* opportunity to assist homeowners in selecting cost-effective energy-efficient technologies that will ensure their comfort and convenience.

General contractors often subcontract measure-specific installations to sub-contractors. When bidding is based on an architect's plan, general contractors usually solicit prices for specialized installations from sub-contractors with whom they normally work. One general contractor defined the relationship with his HVAC sub-contractor (as well as any subcontractor that he used on a regular basis) as similar to that of auto mechanic. "Once you find someone you can trust, you stick with him, and you bring all your work to him." The other general contractors echoed this sentiment. All the

³ 1994 – April, "Pacific Gas and Electric Home Remodelers Study Qualitative and Quantitative Results",

contractors in the focus group indicated they preferred sub-contractors that they used repeatedly. They also indicated that having these sub-contractors supply bids in competition with others would be highly unusual. Instead, the following process is used:

1. the general contractor gives their preferred sub-contractor the specifications based on the drawings;
2. the sub-contractor provides descriptive and pricing information based on the specifications; and
3. this information is incorporated into the contractor's bid package.

In bidding to specifications there is little room for enhancing energy efficiency above what has been specified, unless alternative options were included in the bid package.

However, when general contractors are involved in the design phase, they have much more flexibility in specifying the design and performance of the building envelope, fenestration and energy using systems. The general contractors in the focus group identified aesthetics and comfort as paramount concerns for their customers. Because energy efficiency and comfort are highly correlated, the contractors can offer cost-effective energy efficiency options to the customer. However, price is an important consideration. General contractors said that price was the biggest barrier to incorporating higher-end energy efficiency items with most of their

customers. As one general contractor put it, a customer would rather have a nicer looking fixture than a more energy-efficient one.

All of the general contractors in the focus group expressed interest in energy efficiency, and in fact said building with energy efficiency in mind was a given in the retrofit and renovation market. They said that while they do not often speak with customers specifically about energy efficiency, they believe that consumers expect them to build with energy efficiency in mind.

The general contractors cited Title 24 requirements as the area where energy efficiency considerations usually come into play. All 7 general contractors expressed strong interest in learning more about the basics of Title 24, as well as the recent changes that have been made to the code.

Contractors believe comfort and aesthetic interests drive the choices their customers are making. Energy efficiency comes into play when comfort is considered. The relatively low cost of energy and the moderate climate in a considerable portion of PG&E's service territory reduces the importance of long-term financial savings as a motivating factor. However, in some areas like the Central Valley, where air conditioning is necessary, it is more common to discuss energy efficiency in terms of financial savings, especially HVAC duct sizing and window quality. However, it should be kept in mind that general contractors said energy efficiency is a given in these situations, and that they would, as a matter of course, suggest the most reasonable and energy-efficient units as the best choice. In these situations, the issue becomes their degree of knowledge about energy efficiency.

One exception to this trend among general contractors is lighting. Even though energy-efficient lighting applies to all of the climate zones in PG&E's service territory, general contractors do not tend to specify energy-efficient lighting.

Training Opportunities

1. General contractors are very interested in learning about new energy efficient technology. They want to know what is in the works for the future, and what new energy efficiency options are available to them. All said they would attend classes on new and cutting-edge, energy-efficient products. There was a general consensus that lack of information regarding the specifics of energy-efficient technology limits their ability to suggest alternatives. Also, they believe that keeping abreast of new and upcoming changes in the industry can give them the upper hand with their competitors. It is important, when developing training for general contractors, to keep in mind that their customers are more motivated by comfort than long-term financial savings when going above Title 24 requirements. So education on new energy-efficient technology should emphasize the relationship between cost and comfort.
2. To the extent that Energy Efficiency Mortgages (EEMs) can be employed in refinancing for retrofit or renovation, the general contractors were interested in learning about how to become "facilitators" of these products. None of the contractors in the focus group had heard of EEMs. However, on the basis of the rudimentary information provided in the

focus group setting, most said this mechanism offered a promising way to support business development. They were also interested in promoting and working on whole-house approach⁴ as considered under the EEM. They felt this offered a strong opportunity to increase the scope of their work, and therefore increase their profits. Without the EEM, they felt homeowners would be unlikely to choose the whole-house approach.

3. The general contractors were interested in learning more about the technical aspects of what their sub-contractors do. For example, they expressed an interest in obtaining more general knowledge about HVAC energy-efficient items such as duct sealing and load sizing. This would help general contractors answer their customers' questions, and give them more information when working with their sub-contractors.
4. In addition to classes designed to meet their individual needs, general contractors also expressed interest in classes that could be offered to their lead tradesmen (i.e., foremen and site managers), explaining energy-efficient technology, such as lighting fixtures, and practices that are being incorporated into building designs.
5. General contractors are interested in training related to Title 24.⁵ They have limited knowledge of Title 24 requirements, especially regarding recent changes, and are interested in attending classes that will help them develop their knowledge in this area. They are looking for in-depth information on how Title 24 calculations work, what the technical

⁴ PG&E defines the whole-house approach as follows: "A house is a system made of appliances, equipment, and building materials whose characteristics and how they are used, impact each other and the house environment. The whole house approach to retrofitting and renovating takes into account how each interrelated house component impacts others. For example, if a renovation will include both upgrading insulation and a new air conditioner - the improved thermal shell should be factored into the new air conditioners sizing calculation - allowing for a smaller, less energy consuming unit."

⁵ All of the training opportunities identified for general contractors were identified during the focus group identified in footnote (1).

specifics are, and how they can better explain to their customers the rationale behind the requirements. Contractors say that their customers are often surprised and annoyed by the restrictions placed on them by Title 24. Contractors believe that if they had a better understanding of these requirements, they would appear more knowledgeable to their customers. It would also help them to train their personnel and persuade customers that energy efficiency requirements are in their interest.

6. There was interest in a class explaining how to market energy-efficient technology, such as lighting or bathroom fixtures, and practices for different market situations.
7. General contractors were not enthusiastic about attending basic energy efficiency classes. Most felt that energy efficiency training was useful to them as professionals only when applied to specific aspects of their role as general contractor.
8. They were not interested in information about how to market themselves as energy efficiency specialists since they considered this to be an elemental part of their job description. In other words, they do not see it as something that can be used to distinguish themselves from others.

HVAC Contractors⁶

Market Size

It is estimated that there are 1,200 HVAC contractors in PG&E's service territory.⁷

Role

Unlike general contractors, HVAC contractors offer a specialized service in the retrofit and renovation market. Most retrofits of HVAC units are precipitated by the breakdown of a unit, requiring an upgrade or unit replacement. Over one-third (38 percent) of residential HVAC activity involves the "replacement of existing equipment."⁸ In these situations, the HVAC contractor is hired directly by the homeowner and has a direct opportunity to offer energy efficiency as an option to consider in developing a new system. HVAC contractors generally cited increased (or incremental) cost of energy-efficient HVAC equipment as a major barrier to adoption.⁹

Over one-half of customers simply call a single HVAC contractor and have them do the work, requesting no bids or only one bid.¹⁰ This means that

⁶ Unless otherwise noted, all information in this section is based on HVAC contractor input during PG&E Residential Retrofit and Renovation Program Year 2000 Planning Public Input Workshop held at the San Ramon Learning Center on July 27, 1999.

⁷ 1999 – July, PowerPoint presentation entitled "Residential HVAC Program Market Characterization and Baseline Study", prepared for PG&E by Opinion Dynamics Corp., page 5 of presentation.

⁸ 1999 – May, "Residential HVAC Market Transformation Market Characterization and Baseline Study", prepared for PG&E by Opinion Dynamics Corp., section VII, page 9.

⁹ Ibid., section V, page 21.

¹⁰ Ibid., section V, page 32.

HVAC contractors, from a competitive standpoint, are well placed to suggest higher-end, energy-efficient HVAC units to their customers. While energy efficiency is a topic commonly mentioned, this discussion with the customer is limited by the HVAC contractor's interest in and knowledge of energy-efficient units, duct sizing and load calculations.

HVAC contractors are also hired by general contractors to make the necessary changes to HVAC systems that correspond with building improvements. This happens when the HVAC retrofit or replacement is discretionary or brought on by the renovation itself. In about half of all renovations, additions to conditioned floor area or other changes to the building envelope cause significant changes to the building energy load. At a minimum this change requires installation of additional supply and return ducts to support the new load and may require upgrading or replacement of the existing HVAC system.¹¹

As indicated above, FSC presented preliminary findings from its review of the literature at the Year 2000 Public Workshop and discussed the results with those in attendance. The HVAC contractors present said that trying to "up-sell" energy efficient equipment during renovations was difficult and unlikely when they were sub-contracting to general contractors.

As the renovation market currently stands, HVAC energy efficiency is determined by minimum compliance, based on Title 24 requirements, and derived from the plans of the architect or general contractor. The HVAC

contractors said there is little opportunity for them to advocate designs that exceed Title 24 compliance. HVAC contractors also stated that general contractors have little knowledge of the details of Title 24 compliance, and therefore are reluctant to deviate from what has been specified in the Title 24 document.

Currently there is more work than can be handled by the available trained, well-qualified HVAC technicians and installers.¹² Because of this shortage, there is only a small incentive for technicians and contractors to improve their skill level. Any training programs PG&E provides should take this into account, and should coordinate with industry-accepted organizations (including technical schools) to bring more skilled workers into this labor force.

Training Opportunities

1. Training should be provided to HVAC contractors on effective sales methods.¹³ It was revealed that HVAC contractors have a misconception regarding their consumers' needs when replacing or upgrading their HVAC unit. HVAC contractors believe they do not have the time and latitude to up-sell, when in fact customers are receptive to energy efficiency options.¹⁴ This, coupled with the contractors' lack of effective sales approach to explain the benefits of energy-efficient HVAC systems,

¹¹ 1999 - March, "PG&E Energy Efficiency Training Survey: Final Report", prepared for PG&E by Quantum Consulting Inc., page 4-13.

¹² Op. Cit. (8), section IX, page 39.

¹³ 1999 - June, "Residential Heating and Cooling Systems Program - Three Year Market Transformation Plan", pages 21-22.

¹⁴ Op. Cit. (8), section VI, pages 62-63.

limits the options HVAC contractors offer to consumers.¹⁵ Thus, consumers have limited access to comprehensive information sources (and fail to take advantage of what resources there are) to help them make energy efficiency decisions. In training on sales techniques, the topic of upselling, where warranted, should also be incorporated. A class like this would provide valuable sales skills and tools to promote energy-efficient HVAC options.

2. On the technical side of HVAC energy efficiency, the contractors in this market suggested that training in duct sizing and duct sealing would be valuable and attract their interest. Many contractors rely on rules of thumb and past experience in sizing and installing equipment. In many cases, duct sizing/layout is done without calculations and without sufficient customer input regarding comfort issues. Some specific areas of weakness identified include: checking refrigerants and coil airflow; checking and repairing ducts as part of replacing or adding HVAC equipment; and performance uncertainty regarding installations of high efficiency equipment.¹⁶
3. The average HVAC contractor's company tends to be a small operation with little time and resources available to become informed and/or trained on new technologies and practices. All training classes should be developed with this information in mind.
4. HVAC contractors are interested in receiving clear-cut information describing the benefits (comfort and cost) of energy-efficient equipment and practices. They want to know what equipment and practices are classified as energy-efficient and what exactly the benefits are that

¹⁵ Op. Cit. (8), section VI, pages 62-63.

customers will receive from energy-efficient equipment. The HVAC contractors feel that providing information on how energy efficiency affects comfort levels, more so than long-term financial savings, would be a useful emphasis. This would equip them with the information needed to advocate energy-efficient solutions to their customers.

5. It is recommended that PG&E coordinate classes with industry organizations such as the Consortium for Energy Efficiency (specifically their program on HVAC Quality Installation Practice), Air Conditioning Contractors of America (ACCA), and the Refrigerator Service Engineers Society (RSES)¹⁷ so that training is given more visibility with contractors. It is also recommended that PG&E work with these organizations to encourage the development of an independent industry certification infrastructure, including the development of installation standards and installer certification programs. These programs could be developed with the goal of reducing costs associated with callbacks, improving the number of installers and the level of their competency, and improvement of the overall quality of installations of energy-efficient products.
6. Any training about the technical side of HVAC should include variations according to climate zones. This is especially true for HVAC. PG&E's service territory is unique in that it covers a variety of climate zones with considerably different attributes and energy efficiency concerns. For example, HVAC contractors working in the San Joaquin Valley would have a strong interest in air conditioning training, but those

¹⁶ Op. Cit. (8), section V, page 38, and section IX, page 33.

¹⁷ Ibid., section IX, page 30.

in the coastal area would be interested in a class with a different emphasis.

7. Performance testing, though not frequently provided by HVAC contractors, may offer another avenue for training. Performance testing takes place when the contractor, using diagnostic tools (i.e., airflow measurement devices, duct leakage testers) shows the customer that the work has been done properly. These tools may also be used to show the direct benefits the homeowner's choice is now having on the home. PG&E might want to offer training on performance evaluation, or promote more economically viable ways to show to the customer the direct benefits of the newly installed, energy-efficient HVAC system.
8. HVAC contractors expressed a strong interest in augmenting training with mailings to keep them up to date about emerging energy-efficient technologies. One reason for the lack of well-qualified contractors in the market has to do with the rapid changes in what is considered energy-efficient technology and how the changes affect their work. Mailing updates, perhaps organized with an existing newsletter, would be of great use, they said. These updates could also be an excellent marketing tool for offering future training classes, as they become available.
9. Classes on the Title 24 requirements as they pertain to HVAC would be useful to the HVAC contractors. They may also be interested in a class that specifically focuses on the recent Title 24 changes and the implications for HVAC contractors. They were specifically interested in how to deal with building inspectors and meeting inspection requirements for Title 24.

10. HVAC contractors were also interested in instruction that would allow them to get more face time with the customer in situations where they were sub-contracting. HVAC contractors were interested in obtaining information that would give them more access to the customer to explain the energy efficiency options available. This would best be treated as a marketing issue, and the class could perhaps include a summary of various marketing training, treating this problem as one aspect of the class or workshop.

Window Contractors

Market Size

It is estimated that there are 830 window contractors in PG&E's service territory.¹⁸

Role

Window contractors replace windows in existing homes (when no other work is being done), or install new windows during broader remodeling projects. Window replacement is the most frequent single discretionary retrofit event.¹⁹ Homeowners frequently replace their existing windows without undertaking any other retrofits or renovations. While some general contractors offer window replacement services, there are large numbers of contractors who specialize in windows.²⁰ Correspondingly, a large amount of the retrofit and renovation work including windows is not channeled through general contractors.

Knowledge about energy efficiency is fairly common among window contractors. As with the other market actors, window contractors do not see energy efficiency as a chief concern of their customers. Style, reliability, and price are the prime motivating factors for customers.²¹ As with HVAC contractors, specialized window contractors have a better understanding of

¹⁸ Op. Cit. (2).

¹⁹ Op. Cit. (11), page 3-2.

²⁰ Ibid., page 3-16.

²¹ Ibid., page 3-15.

energy efficiency than general contractors and are more likely to discuss it with their customers when they are dealing with them directly.

Training Opportunities

1. A class designed to train contractors to present the benefits of energy-efficient windows should be offered. Trade magazines were also cited as an effective way to get information to window contractors.²² Comfort is often overlooked when homeowners are shopping for new windows. Consumers normally consider aesthetics and price before comfort. If window contractors were better equipped to communicate the impacts of window performance on comfort, deterioration of products in their home and long-term economic savings, they could relay this information to homeowners and offer more energy-efficient options during the decision making process. Classes should emphasize comfort and quality of life issues, such as reduced UV light and ability to incorporate more windows in a home when using energy-efficient products. Long-term financial savings to the customer and marketing tools for the window contractor could also be incorporated into this class.
2. As with HVAC contractors, it is recommended that PG&E coordinate classes with industry-accepted window organizations, including trade magazines, to increase the visibility of any training programs offered. Working with organizations such as the American Architectural Manufacturers Association (AAMA) to develop industry accepted installation standards and installer certification programs would improve

energy-efficient window installation. This coordination should be done with the goal of reducing costs associated with callbacks, improve the number of installers and the level of their competency and improve the overall quality of installations of energy-efficient products.²³

3. Training should be tailored to climate zones--window contractors on the coast vs. in the mountains have different needs and their customers have different concerns. This is pertinent for window contractors because the energy loss from their windows based on climate zone can vary greatly.²⁴
4. Training should be tailored to small companies since a large majority of window contractor companies have fewer than 5 employees.²⁵
5. There is a shortage of well-qualified window installers in the market, and classes to train on energy-efficient installation methods would prove useful.²⁶

²² 1998 - January, "Market Transformation: Residential Windows", prepared for PG&E by Opinion Dynamics Corp. Page 42.

²³ Ibid., page 52.

²⁴ Ibid., page 53.

²⁵ Op. Cit. (11), page 3-14.

²⁶ Op. Cit. (6).

Electrical (Lighting) Contractors

Market Size

It is estimated that there are 7,750 electrical contractors in PG&E's service territory.²⁷

Role

General contractors usually sub-contract to electrical contractors when lighting changes are made. The literature indicates that electrical contractors generally are not concerned with energy efficiency when it comes to lighting. They do not believe it is an important consideration for customers, and are not inclined to discuss it with them.²⁸

Training Opportunities

1. Training for these contractors should emphasize explaining energy-efficient products, such as those designated under the EnergyStar label, and encouraging electrical contractors to select and recommend these to their customers.

²⁷ Op. Cit. (2).

²⁸ Op. Cit. (11), page 6-14.

Retailers/Home Centers

Size

Of the major players in the retail home center market (i.e., Home Depot, Orchard Supply Hardware, Yardbirds, 84 Lumber and Meeks Lumber), there are approximately 120 home centers in PG&E's service territory.²⁹

Role

Home centers are very large retail stores offering wide selections of building materials and remodeling and home maintenance tools. They are frequented by the major decision making parties involved in remodeling projects prior to and during remodeling projects. In addition to supplying basic materials used in construction, they are used by contractors to give homeowners a chance to view or shop for materials before purchase. Often, decisions about what equipment to purchase and therefore the extent to which energy efficiency will be incorporated into their home are made in these home centers. For the part of the market that does retrofit and renovations themselves -- the do-it-yourselfers -- this may be the only area where they can be informed about the energy efficiency of the equipment they are purchasing.

Home centers stock a considerable portion of the products used in the retrofit and renovation market under one roof. They have lumber, bolts, concrete, drywall, fixtures, flashing, building paper, windows, water heaters,

²⁹ Based on PG&E provided numbers.

insulation and other necessary equipment. Consequently, most of the decision-makers involved in a remodeling project will visit one of these stores at least once during the project. Therefore, these stores potentially provide an almost ideal opportunity to communicate information about energy efficiency to critical parties in the investment decision making process before and during the remodeling effort.

Sales personnel in home centers see energy efficiency as a limited concern for their customers. Instead, they say their customers view price, reliability, style, and product reputation as more important.³⁰ Presently, home center retailers don't market or push energy-efficient products because they don't perceive much customer interest. The one product exception appears to be windows.³¹ Some home centers, like Home Depot, have enthusiastically participated in window training programs for their employees and customers. Based on the responses of customers and employees to this training program there may be opportunities for other product training classes -- specifically water heaters.³²

Unlike the other market actors, who sell up at the risk of losing a project or appearing to unnecessarily inflate costs, retailers make profits based on selling high value and high margin products. They have a natural strong economic incentive to sell up.

³⁰ Op. Cit. (11), page 5-8.

³¹ Based on an interview with training specialist James O'Bannon.

³² Ibid.

Although it appears home centers also are uniquely qualified to promote the whole-house approach to remodeling, they appear to be unlikely to do so.³³ Home centers are heavily departmentalized, and there is a general lack of cross-departmental sales expertise. One area expert believes that the lack of cross-departmental training among sales staff members would result in constant shuffling from sales person to sales person and thus produce significant frustration for homeowners trying to use the whole-house approach in a home center environment. It also is unlikely that the home centers would cross-train sales staff in the whole-house approach because it would present a restructuring problem which they have no incentive to solve.³⁴

Training Opportunities

1. Retail sales staffs in home centers should be trained about energy-efficient options and equipment, especially windows (which PG&E already has been working on), and water heaters. Home centers are open to bringing in energy efficiency specialists to keep their staff up-to-date on industry changes and specifics. Currently, PG&E has consultants involved as guest lecturers during in-store training for windows. This training has been successful and should be continued and broadened. Stores like Home Depot, in fact, pride themselves on equipment knowledge and seem receptive to working with PG&E on training. These classes dealing with energy efficiency technologies and alternatives might best be offered on-site at various home centers, so that

³³ Op. Cit. (31).

customers could also be brought into the process. The windows training that PG&E has already been involved with Home Depot has actually influenced the types (i.e. more energy-efficient) of products they stock on their shelves. In this instance, PG&E's training has significantly impacted this part of the market, and should continue to do so.³⁵ Training should include a detailed explanation of the EnergyStar® labeling system emphasizing the products in the store that are so labeled.³⁶

2. "Roadshow" demonstrations can be offered to demonstrate new energy-efficient technologies to sales staff, homeowners, and contractors. This has already been very successful with windows. More of these events in PG&E's service territory are recommended. These demonstrations included vendor, customer, and contractor participation, and were comprised of seminars and demonstrations. These shows also represent marketing opportunities for energy efficiency and future training events. Water heaters were suggested as a candidate for future demonstrations.³⁷
3. There is an opportunity to provide videotapes on energy-efficient technologies to be made available on the floor to staff and customers. These videotapes should explain how various energy-efficient technologies work, and what their various benefits are. This product should be developed with the do-it-yourselfers in mind, since they are most likely to find this appealing.³⁸

³⁴ Op. Cit. (31).

³⁵ Ibid.

³⁶ Op. Cit. (11), page 5-8.

³⁷ Op. Cit. (31).

³⁸ Op. Cit. (11), page A-12.

Retailers/Specialty Shops

Market Size

There are an estimated 450 window and kitchen and bath specialty shops in PG&E's service territory.³⁹

Role

Specialty retailers offer a more comprehensive selection of specific products or related products in the retrofit and renovation market than home centers. The majority of these specialty shops provide windows or kitchen and bath products and design services. Specialty window retailers reported discussing energy efficiency in most or all of their sales situations.⁴⁰ However, they also reported that energy efficiency wasn't of primary concern to their customers. Instead, price, style and reliability ranked highest. Kitchen and bath retailers cited the EnergyStar® label as a guide to energy efficiency.⁴¹ These market actors are mostly interested in learning more about the products they are trying to sell, and how energy efficiency plays into their performance. A training format similar to the California Windows Initiative (CWI)⁴² was recommended which includes attendance by, and therefore simultaneous training of, window contractors and customers.⁴³

³⁹ Based on Standard Industrial Classification code numbers for retailers in kitchens, baths and windows.

⁴⁰ Op. Cit. (11), page 3-13.

⁴¹ Ibid., page 5-18.

⁴² The California Window Initiative (CWI) is a collaborative of window and building energy technology experts, administered by Richard Heath and Associates, Inc. The purpose of CWI is to transform the California window market to high-performance products through on-site specialized training. CWI is a result of a third party 1998 contract.

⁴³ Op. Cit (11), page A-12.

Training Opportunities

1. Classes could be offered on explaining the benefits and costs of energy efficient windows, and kitchen and bath products and design services.⁴⁴ Up selling means higher profits for their business. This class could also deal with new technologies and what is in the works, then sales staff could inform and give well-reasoned suggestions to their customers, which include homeowners and contractors. There should also be a component in this training to address those specialty retailers who install the windows they sell.
2. It is recommended that PG&E coordinate classes with industry-accepted organizations (i.e., Energy Efficiency Consortium, American Architectural Manufacturers Association) to increase the visibility of any training programs offered. This is especially true for window specialty shops. Working with organizations to develop industry accepted installation standards and installer certification programs would improve energy-efficient window installation. This coordination should be done with the goal of reducing costs associated with callbacks, improve the number of installers and the level of their competency and improve the overall quality of installations of energy-efficient products.⁴⁵
3. “Roadshow” demonstrations can be offered to demonstrate new energy-efficient technologies to sales staff, homeowners, and contractors. This has already been done with windows with great success. More of these events in PG&E’s service territory are recommended. These demonstrations included vendor, customer, and contractor participation,

⁴⁴ Op. Cit. (11), page A-12.

and were comprised of seminars and demonstrations. These shows also represent marketing opportunities for energy efficiency and future training events.⁴⁶

4. There is an opportunity to provide videotapes on energy-efficient technologies to be made available on the floor to staff and customers. These videotapes should explain how various energy-efficient technologies work, and what their various benefits are. This should be developed with the do-it-yourselfers in mind, since they are most likely to find this appealing.⁴⁷
5. Training should be offered on the EnergyStar label directed toward small business retailers, such as kitchen and bath specialty shops.⁴⁸

⁴⁵ Op. Cit. (22), page 52.

⁴⁶ Op. Cit. (31).

⁴⁷ Op. Cit. (11), page A-12.

⁴⁸ Ibid., page 5-8.

Building Code Inspectors

Market Size

It is estimated that there are 1,800 building code inspectors in PG&E's service area.⁴⁹

Role

Not all retrofits and renovations require a Title 24 inspection. For those that do, building code inspectors play an important role in energy efficiency.⁵⁰

Building code inspectors ensure that the plans and installations comply with Title 24 -- the section of California's building codes concerned with energy efficiency and proper installation practices. Title 24 contains specific recommendations for achieving the minimum energy efficiency requirements in homes. Building code inspectors are responsible for checking construction plans to ensure compliance with Title 24 and for inspecting additions or renovations to ensure that the Title 24 requirements and specifications in the construction plans were correctly followed.

Recent changes to the requirements in Title 24 have increased the level of technical expertise required to properly evaluate plans and installations.⁵¹

These changes provide substantial incentive for jurisdictions and their

⁴⁹ Based on executive interviews with industry specialists Charles Segerstrom and Doug Beaman.

⁵⁰ Ibid.

⁵¹ Ibid.

building code inspectors to receive additional training regarding the interpretation of Title 24 compliance.

Building code inspectors are also concerned with issues of health and safety. When reviewing a retrofit or renovation, they are likely to check for any health or safety hazards created as a result of the work completed.⁵²

Training Opportunities

1. Training classes should be offered for plan checkers and building inspectors, coordinated with their local agencies, on Title 24 compliance.

Classes should focus on:

- how to inspect for Title 24 compliance,
 - how to ensure compliance with requirements established by recent changes to the code, and
 - proper installation practices for technologies covered by Title 24 (i.e., windows, insulation, HVAC system components).⁵³
2. Building code inspectors are also interested in training on issues of health and safety. They would find a class about proper installation practices and techniques from the perspective health and safety to be useful.⁵⁴

⁵² Op. Cit. (49).

⁵³ Ibid.

⁵⁴ Ibid.

Energy Efficiency Mortgages (EEMs)

Introduction

EEMs bring together some specific market actors usually not involved in the Residential Retrofit and Renovation market. EEMs provide buyers with financing for the installation of energy efficiency measures at the time of a home sale, or in the event of refinancing. The measure costs are financed through the buyer's mortgage, and are paid off over the term of the loan. EEMs offer a motivation and method for financing the whole-house approach to retrofit and renovation. Currently, EEMs account for only a small part of the market. However, in the long run, they may become a more persuasive and influential force in the market. EEMs present a unique opportunity to finance the whole-house approach rather than just a single measure replacement. Once the potential homebuyer has decided to seek an EEM, they must then have a home energy rating done, which is often performed by a California Home Energy Efficiency Rating System (CHEERS) rater. As EEMs have become more common, "facilitators" have emerged as a new market actor. "Facilitators" coordinate the EEM with the various market actors.⁵⁵ The actors included in the EEM market are:

- Home Inspectors
- CHEERS Raters
- Lenders
- EEM "facilitators"
- Real Estate Agents

⁵⁵ 1998 – December, "Energy Aware Housing Agent Program: A Market Effects Study", prepared for PG&E by Schiller Associates.

EEM Market Actors

Home Inspectors

Market Size

It is estimated that there are over 750 home inspectors, including independent operators who do not belong to an association, in PG&E's service territory.⁵⁶

Role

Home inspectors are involved in the time of sale part of the market, and are an advocate of the homebuyer. They evaluate the state of the home and make recommendations to the homebuyer regarding repairs and problems. Usually home inspectors do their inspection after it's too late to recommend an EEM. Home inspectors currently do not specifically offer energy efficiency services, and since there are no licensing requirements, there is no common system for training. Home inspectors will identify problems such as inadequate insulation or old equipment, but they currently do not offer comprehensive suggestions on how to increase energy efficiency.⁵⁷

⁵⁶ Op. Cit. (49).

⁵⁷ Op. Cit. (11), page A-1.

Training Opportunities

1. Classes should be coordinated with California Real Estate Inspectors Association (CREIA) on both technical and business aspects of home inspection as it pertains to energy efficiency. This training should address some of the following areas: natural gas heating systems; combustion air and venting requirements, accessibility, installation, and maintenance; and electrical service equipment, such as AC, (particularly requirements for clearances and grounding).⁵⁸
2. Considering the increase of home inspectors in the market, which stems from the lack of licensing requirements, home inspectors may be interested in offering services their competitors lack. PG&E could offer a course for home inspectors on how to provide an energy efficiency evaluation as a complementary, add-on service.⁵⁹ This course should include ways to market their services so that they are involved in the “sale” early enough to effect an EEM. If PG&E were to develop an energy efficiency evaluation training program, this could allow home inspectors to provide another service during their inspection, and give them a visible niche in the market. This training could be coordinated with some of the other actors in the EEM market so that they were recognized as energy efficiency specialists in the field.

⁵⁸ 1999 – July, “The Home Inspection Industry in the PG&E Service Area”, prepared for PG&E by Richard Heath & Associates, pages 2, 3-4.

⁵⁹ Op. Cit. (11), page A-3.

CHEERS Raters

Market Size

There are over 60 CHEERS raters in PG&E's service territory.⁶⁰

Role

State-certified California Home Energy Efficiency Rating System (CHEERS) raters offer the energy audit that is required by lenders in the process of getting an EEM. CHEERS raters perform a detailed analysis of the home checking for the energy efficiency level of insulation, windows, HVAC, water heater, and lighting. This information is then fed into a computer program that calculates the energy rating of the home, and provides recommendations for improvement and examples of the related costs and savings. CHEERS raters give detailed recommendations for increasing the energy efficiency of the home, often based on the homeowner's preferences and requirements.⁶¹ However, CHEERS raters are prohibited from recommending brands or services to the homeowner since they must maintain an objective perspective. Several of the CHEERS raters expressed an interest in becoming EEM "facilitators". They feel they can provide better services and prices than the current "facilitators" can.⁶²

⁶⁰ Op. Cit. (49).

⁶¹ Ibid.

⁶² Op. Cit. (11), pages 7-6 through 7-9.

Training Opportunities

1. CHEERS does all their rater's certification training in-house.⁶³

CHEERS raters can be a valuable tool in designing and implementing training classes for the other market actors. It would be especially useful to work with them to try and get general contractors on board as EEM "facilitators". They could also give valuable insight into the EEM process as a whole, and how to work toward the whole-house approach in the long run. PG&E could work with the CHEERS organization to develop additional cooperative training, or could extend PG&E training opportunities to CHEERS raters.

⁶³ Op. Cit. (6).

Lenders

Market Size

There are an estimated 760 lenders in PG&E's service territory.⁶⁴ It is important to note, however, that currently only a few regularly participate in the EEMs.⁶⁵

Role

Lenders provide financing for EEMs. According to general contractors, the homeowners finance most non-EEM retrofit or renovations themselves, often through refinancing.⁶⁶ Lenders are interested in energy efficiency only as it pertains to the EEMs. They do not see financing the whole-house approach as a viable option without EEMs.⁶⁷ They cited high information/search cost barriers as the primary concern. They also experience a high turnover rate among loan officers, which is a factor to consider when developing training programs.⁶⁸ According to CHEERS raters and "facilitators", a few lenders account for most of the EEMs being written.⁶⁹ "Facilitators", if they become more of a factor in the EEM market, can make the process easier on the lender, and therefore increase the interest and participation of this market actor. From the material presented, it was unclear if lenders were interested in becoming EEM "facilitators".

⁶⁴ Op. Cit. (2).

⁶⁵ Op. Cit., (11), page 7-11.

⁶⁶ Op. Cit. (1).

⁶⁷ Op. Cit. (11), page 7-11.

⁶⁸ Ibid.

⁶⁹ Ibid.

Training Opportunities

1. Loan officer training on EEMs is the chief training opportunity for this market actor.⁷⁰ This class should deal with the specifics of how to determine whether applicants are qualified for an EEM, the role of the CHEERS rater, and how to work effectively and in a timely manner with any “facilitators” in the process. There may also be room in this course to give training on the paperwork involved, and steps a prospective homeowner must go through in the EEM process.
2. PG&E could also provide training on marketing EEMs to potential customers.⁷¹ As it stands, there are only a small number of EEMs getting written, and an even smaller number of lenders participating. This is due to lack of awareness of the long-term benefits of EEMs. Classes that offered lenders EEM marketing strategies to pull in more customers would prove useful to lenders.

⁷⁰ Op. Cit. (11), page A-11.

⁷¹ Ibid.

EEM “facilitators”

Market Size

There are very few EEM “facilitators” officially in operation because this market actor is just emerging. PG&E estimates there are probably no more than 5 companies providing this service in their territory.⁷²

Role

“Facilitators” generally handle the paperwork and coordinate the installation of energy-efficient measures. They can also hire and supervise contractors that do the recommended work, as well as oversee any other aspects of the process that may come up. Currently these “facilitators” are loosely defined in the market, and are not necessarily highly regarded by the other market actors working with EEMs. There are some concerns among market actors and contractors that EEM “facilitators” are less than candid about their profits and fees, and this has led to additional concerns about the appropriateness of recommendations made to customers and the costs of work done.⁷³

⁷² Op. Cit. (49).

⁷³ Ibid.

Training Opportunities

1. Since this is an emerging market actor, there is significant opportunity for training. A training class in what it means to be a “facilitator” and how to do it without damaging the EEM process is essential to the health and credibility of the EEM. This class could deal with sales training, the specifics of lender requirements, the role of home inspectors and CHEERS raters in the process, and how to work with contractors once the work is decided upon.⁷⁴
2. General contractors expressed an interest in learning more about what is entailed in becoming an EEM “facilitators”. A class addressed specifically to general contractors dealing with the process from their perspective could meet this need.⁷⁵ The general contractors in the focus group expressed a strong interest in learning more about EEMs, especially if there was an emphasis on the refinancing options available.⁷⁶ General contractors are also positioned to pursue and benefit from the whole-house approach using the EEM, and they expressed a serious interest in this whole-house approach. Training on the long term benefits, savings and comfort issues that a whole-house retrofit or renovation can mean for the homeowner will prove attractive to general contractors.

⁷⁴ Op. Cit. (49).

⁷⁵ Ibid.

⁷⁶ Op. Cit. (1).

Real Estate Agents

Market Size

It has been estimated that there are approximately 76,000 active real estate licenses in PG&E's service territory.⁷⁷

Role

Real estate agents are involved in marketing homes for sale and representing buyers in search of homes. According to some of the EEM market actors, real estate agents see EEMs as a threat to the way they do business. Real estate agents are anxious to close deals and are concerned about anything that might derail them. One "facilitator" noted that real estate agents "hate the EEM program because they are afraid that if it is found that the home needs improvements, the customers will not be as willing to buy."⁷⁸ A further impediment to real estate interest is the booming real estate market which offers no incentive to find other ways to market homes. Some real estate agents have gone so far as to stop referring customers to lenders, and try to convince homebuyers *not* to use EEMs. Usually, real estate agents will bring up EEMs only in the event that it seems like it might help sell the home, for example if the homebuyer will purchase the home only if it has a new HVAC unit.⁷⁹

⁷⁷ Op. Cit. (2).

⁷⁸ Op. Cit. (11), page 7-12.

⁷⁹ Ibid.

Training Opportunities

1. Until EEMs become a more powerful force in the market, real estate agents show only some interest in training. Informing real estate agents about the benefits of EEMs, and the importance of knowing about them in the event that the EEM might close a sale, seems to be the best opportunity for training. This training could be oriented toward the value-added aspects of selling energy-efficient homes.⁸⁰

⁸⁰ Op. Cit. (11), page A-12.

Other Identified Market Actors

The following market actors have been identified as having opportunities for training, but are in need of further detailed research before these opportunities can be properly determined.

- Distributors
- Manufacturers
- Architects

Methods of Delivery

Many methods of delivery for training were suggested in the various reports, interviews and workshops conducted.

1. The most common training method considered was the standard classroom or seminar setting similar to what is currently offered at PG&E's training facilities in Stockton, Sonoma, San Ramon and San Francisco. These settings offer all the benefits of classroom instruction. Concerning the classes, there was a general consensus that PG&E should:
 - coordinate its class with industry-accepted organizations and trade publications as much as possible;
 - coordinate classes with manufacturers and distributors who already have training programs in progress;
 - coordinate with technical schools and junior colleges; and
 - tailor the classes with climate zone considerations in mind.
2. The second most common method suggested was on-site training or seminars. This option was especially popular with the home centers, as they already have an in-house training program set up. Most of the market actors claimed a high volume of work based on the robust nature of the industry, so training that did not significantly cut into their work time proved attractive.
3. Another recommendation was that PG&E provide education on energy efficiency through videos that market actors can view at their own leisure. Several actors expressed an interest in this method of delivery to deal with constraints on their time. There was some skepticism with

other market actors, saying that video did not appeal to them because it didn't allow for specific questions to be asked and answered.

4. Several of the market actors, especially the contractors, were interested in keeping informed of changes in the market through direct mailings. This method could also keep them up-to-date on upcoming training classes or functions. There is a strong incentive in the market to remain competitive by keeping informed of the newest technologies. Information on the EnergyStar label should also be incorporated into these efforts.
5. Some market actors were interested in training classes and information resources offered through the Internet. This option was appealing due to time constraints and heavy workloads. The market actors felt that if they could learn at their own leisure, or during a time that worked best with their schedule, they would be more likely to participate in training.
6. There was some interest on the part of contractors to receive training on software applications that would allow them to demonstrate the comparative, long-term value of energy efficiency to their customers.

Section 3: Methodology

This report was developed by first reviewing the following literature provided by PG&E:

1999 – July, “The Home Inspection Industry in the PG&E Service Area”, prepared for PG&E by Richard Heath & Associates

1999 - June, "Residential Discretionary Retrofit and Time of Sale Renovation Market Characterization", prepared for PG&E by Quantum Consulting Inc.

1999 – June, "PG&E Comfort Home Program Market Baseline and Market Effects Study", prepared for PG&E by RER

1999 – June, “Residential Heating and Cooling Systems Program – Three Year Market Transformation Plan”, prepared by PG&E

1999 – May, Residential HVAC Market Transformation Market Characterization and Baseline Study", prepared for PG&E by Opinion Dynamics Corp.

1999 – April, "R&R Financing Options", prepared for PG&E by Applied Marketing Science

1999 – March, "PG&E Energy Efficiency Training Survey: Final Report", prepared for PG&E by Quantum Consulting Inc.

1998 – December, "Energy-Aware Housing Agent Program: A Market Effects Study", prepared for PG&E by Schiller Associates

1998 – June, "PG&E Residential Energy Management Services Program: Market Baseline and Market Effects", prepared for PG&E by PHB Hagler Bailly, Inc.

1998 - January, "Market Transformation: Residential Windows", prepared for PG&E by Opinion Dynamics Corp.

1994 – April, "Pacific Gas and Electric Home Remodelers Study", prepared for PG&E by Market Strategies Inc.

During the review of these documents, the major market actors (building professionals) were identified; training opportunities were extracted and, market size was identified for each actor.

At the conclusion of the review, a presentation was prepared for PG&E's "Residential Retrofit and Renovation Program Year 2000 Planning Public Input Workshop". In this presentation, included as Appendix 2, findings concerning training opportunities and market size were given to the various market actors in attendance. Parties at the workshop included: general contractors, HVAC contractors, CHEERS Raters, PG&E program planners,

representatives from various departments of the state and federal governments and other California utilities. During the workshop, more detailed training suggestions were obtained from those present.

At the conclusion of the workshop, the findings of the study were summarized and important missing information identified. During this analysis, it became apparent that significant additional information was required concerning the information needs of general contractors, building inspectors and retailers.

To collect needed information from general contractors, a focus group was conducted in Walnut Creek on August 13, 1999 with 7 contractors representing companies of various size, specialty and location. The smallest contractor present had no other full-time employees, while the largest contractor employed at least 30. The moderator's discussion guide for this focus group, included as Appendix 4, solicited input from the general contractors on energy efficiency and their current perception of the market. Using the topical outline in the guide contractors were asked to discuss the training needs within specific subject matter areas. There was an enthusiastic, dynamic dialogue during this discussion, and several promising opportunities for training were identified.

Additional information about building code inspectors and retailers was obtained through executive interviews with industry specialists Charles Segerstrom and Doug Beaman to further explore training opportunities for home inspectors, building code inspectors, and issues of Title 24

compliance. An interview was also conducted with training specialist James O'Bannon on the retail sector of the market. FSC specifically asked what training had been done, or was currently being done, and how successful these programs were. Suggestions of other training options were also gathered.

Section 4: Appendices

- Appendix 1: Bibliography of reports
- Appendix 2: Presentation made to San Ramon Learning Center
- Appendix 3: Table of training opportunities made for discussion
- Appendix 4: Discussion guide for general contractor's focus group held in Walnut Creek, California

Appendix 1

Bibliography

1999 – July, “The Home Inspection Industry in the PG&E Service Area”, prepared for PG&E by Richard Heath & Associates

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1999 – May, Residential HVAC Market Transformation Market Characterization and Baseline Study", prepared for PG&E by Opinion Dynamics Corp.

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1994 – April, "Pacific Gas and Electric Home Remodelers Study", prepared for PG&E by Market Strategies Inc.

Appendix 2

Presentation made at PG&E's San Ramon Learning Center on July, 27, 1999
for the Residential Retrofit and Renovation Program Year 2000 Planning
Public Input Workshop.

Appendix 3

Matrix of training opportunities extracted from studies provided by PG&E.
This matrix was used for preliminary discussions with PG&E program coordinators and evaluators.

Appendix 4

Discussion guide for a focus group held with 7 general contractors in Walnut Creek on August 13, 1999.

Residential Retrofit Market Training Needs Assessment

Market Size and Training Opportunities



Objectives

- ◆ **Milestone: Estimate the size of market for building professionals and identify opportunities for training.**
- ◆ **Based on reports given to PG&E, we will:**
 - Define role played by each market actor
 - Estimate size
 - Review training opportunities and suggestions

Overview - The Market

- ◆ **The Homeowner is the key market actor.**
- ◆ **Homeowners usually don't retrofit their homes with energy efficiency in mind.**
 - The climate and relative low cost offer little incentive.
 - There is more interest in expanding space or upgrading equipment.
- ◆ **Homeowners usually don't retrofit their home using a whole-house approach.**
- ◆ **Homeowners usually pay cash or already raised financing for specific expansions or upgrades.**

Overview - DR vs. TOS Renovations

- ◆ **Discretionary Retrofitting (DR) is retrofitting done by a homeowner.**
- ◆ **Do-it-yourselfers account for about 27 percent of the market.**
- ◆ **General or measure-specific contractors handle the rest.**
- ◆ **Time of Sale (TOS) renovations are made by the homeowner/homebuyer upon purchase.**

Structure of Training Opportunities

- ◆ **To understand the best opportunities for training, the market has been divided up into:**
 - Contractors (general & measure-specific)
 - Retailers (home centers & specialty shops)
 - EEM “facilitators”(small part of the market)
 - Home Inspectors
- ◆ **Both contractors and retailers directly influence EE decision-making.**

Contractors

◆ General Contractors

Window Contractors

HVAC Contractors

Electrical Contractors

General Contractors/ Role & Size

- ◆ GCs do multi-faceted retrofitting like kitchen or bathroom remodeling.
- ◆ They often subcontract aspects of this, such as HVAC or electrical, to measure-specific contractors.
- ◆ There are around 98,240 general contractors in California.
- ◆ GCs don't see energy efficiency as important to remodeling customers.

General Contractors/ Role & Size

- ◆ **GCs account for about one-third of the kitchen appliances ultimately sold to consumers in the remodeling market.**
- ◆ **An average of 46 percent of their jobs in existing homes include replacement of HVAC equipment.**
- ◆ **GCs have a less accurate understanding of energy-efficient characteristics of HVAC and windows than do measure-specific contractors.**
- ◆ **There is a limited awareness of energy efficiency among kitchen remodeling contractors.**

General Contractors Training Opportunities

- ◆ **GCs believe their customers see energy efficiency as only “somewhat important”.**
- ◆ **Some training suggestions included:**
 - Offer information packets
 - Offer training seminars/classes
 - On-site training
 - Workshops
 - Certification program for contractors and subcontractors

Contractors

General Contractors

◆ **Window Contractors**

HVAC Contractors

Electrical Contractors

Window Contractors Role & Size

- ◆ **Window contractors can be hired directly by the homeowner, or subcontracted by general contractor.**
- ◆ **There are around 2,194 contractors state-wide who specialize in windows.**
- ◆ **Most window installation contractors give customers the choice of various window brands' efficiency level.**
- ◆ **Most window installation and remodeling contractors said that the type of windows they install is principally driven by the customer's budget.**

Window Contractors Role & Size

- ◆ **Window retailers report selling to both contractors and homeowners.**
- ◆ **Price, reliability, style, and warranty were cited as most important purchase criteria by all contractors.**
- ◆ **There appears to be a shortage of qualified, well-training window contractors in the market.**

Window Contractors Training Opportunities

- ◆ **Window contractors are generally knowledgeable about EE, but they feel there is still a general lack of information in the market.**
- ◆ **Contractors suggested using direct mailings or trade magazines to get out more information.**
- ◆ **Due to the small size of window contracting businesses, many window contractors will not send employees to training seminars.**

Windows Contractors Training Opportunities

- ◆ **Contractors said any direct training of windows contractors should emphasize:**
 - Added value and increased profit margins of high performance windows
 - Installation of high performance windows will reduce household energy use
 - Customers can incorporate more windows into a home
 - Use increased comfort and reduced ultra-violet degradation as selling points

Contractors

General Contractors

Window Contractors

◆ HVAC Contractors

Electrical Contractors

HVAC Contractors Role & Size

- ◆ HVAC systems are often subcontracted by GCs.
- ◆ Most HVAC contractors mention “low operating costs/lower utility bills” when talking with customers about high-efficiency equipment.
- ◆ There are around 9,421 HVAC contractors in California.
- ◆ HVAC contractors are wary of trying to upsell.
- ◆ There is a shortage of qualified, well-trained HVAC contractors in the market.

HVAC Contractors Role & Size

- ◆ **Customers frequently take the contractor's advice on what HVAC equipment to have installed.**
- ◆ **HVAC contractor's education and recommendations have the largest impact on this component of the DR market.**
- ◆ **Contractors indicate that "equipment reliability" and "contractor reputation" are the most important factors for customers making an HVAC purchase.**
- ◆ **EE is ranked as the sixth most important factor in customers' equipment purchase.**

HVAC Contractors Training Opportunities

- ◆ HVAC Certification would provide recognition of EE qualifications.
- ◆ Technical training regarding system sizing.
- ◆ There was high interest in central air conditioning efficiency improvement.
- ◆ There was more participation in the Home Energy Savings Loan Program than any of the other PG&E programs mentioned.

Contractors

General Contractors

Window Contractors

HVAC Contractors

◆ Electrical Contractors

Electrical (Lighting) Contractors Role & Size

- ◆ **Electrical contractors account for the majority of the retrofit lighting installations.**
- ◆ **There are around 20,373 electrical contractors in California.**
- ◆ **Electrical contractors are a small part of the market.**
- ◆ **Electrical contractors don't promote efficient lighting technologies because customers do not have much interest in EE.**

Electrical (Lighting) Contractors Training Opportunities

- ◆ **In the reports provided, electrical contractors were not asked to give training suggestions.**
- ◆ **Evidence suggests electrical contractors influence only a small part of the market.**

Retailers

Retailers/Role & Size

- ◆ **Retailers are the primary conduit through which the DR or TOS renovation equipment passes.**
- ◆ **The input of the sales person and their knowledge of EE is essential.**
- ◆ **Unlike the other market actors, retailers have a strong incentive to sell up.**
- ◆ **Retailers are divided up into large home centers and specialty shops.**

Retailers/Role & Size

◆ Home Centers

- There are around 120 home center retailers in PG&E's service territory.
- Home centers don't see EE as a large concern for their customers.
- Home centers see integrated solutions as playing to their strength.
- They've been receptive to training and information-based interventions.
- Retailers see higher profit margins as an incentive to sell EE equipment.

Retailers/Role & Size

◆ Specialty Shops

- Specialty shops allow customers to come in and look at various products in the market.
 - Kitchens and Baths
 - Windows
- These shops are becoming more popular.

Retailers/Training Opportunities

- ◆ **Provide video tapes to home centers so that their customers can watch EE demonstrations.**
- ◆ **These video monitors are often already in place for do-it-yourselfers.**
- ◆ **A specialty window retailer suggested a training format similar to the California Windows Initiative program.**
- ◆ **Self-education provided over the Internet would be helpful.**
- ◆ **Offer on-site training.**

EEM “Facilitators”

Energy Efficiency Mortgages (EEMs)

- ◆ EEMs offer a unique incentive to renovate a home at the time of sale.
- ◆ They are still a relatively small portion of the market.
- ◆ Quantum Consulting estimates that there about 2,000 EEMs written annually in PG&E's service territory.
- ◆ EEMs remain low for TOS customers.
- ◆ The cost of the prerequisite CHEERS analysis may discourage customers.

CHEERS Raters

- ◆ **California Home Energy Efficiency Rating Program (CHEERS) offer specific recommendations on how to increase EE in the home.**
- ◆ **EEMs require a rating like this to be done prior to the financing process.**
- ◆ **Adding insulation or replacing windows is a common recommendation.**
- ◆ **Some CHEERS raters are considering becoming facilitators.**
- ◆ **There are 42 CHEERS raters in California.**

Lenders

- ◆ **Lenders are primarily used when getting an EEM.**
- ◆ **Lenders say it is difficult to provide loans outside the EEM framework.**
- ◆ **There are about 2,000 lenders in California.**

Realtors

- ◆ **“Realtors hate the EEM program because they are afraid if it is found that the home needs improvements, the customers will not be as willing to buy.”**
- ◆ **Realtors are anxious to close a deal and more suspicious of anything that might derail it.**
- ◆ **The booming California real estate market doesn't offer much of an economic incentive to push EEMs.**
- ◆ **There are around 200,000 realtors in California.**

EEM “Facilitators” Training Opportunities

- ◆ **Provide loan officer training on how to promote EEMs.**
- ◆ **Offer guidelines to determine qualified applicants.**
- ◆ **Better explanation of the incentives for EE equipment.**

Home Inspectors/ Role & Size

- ◆ Home inspectors appear to have good general knowledge of EE issues.
- ◆ There are about 782 home inspectors in California.
- ◆ Not all inspectors know how to conduct a complete Title 24 review.
- ◆ Not all of them can keep up with changes in the codes.

Home Inspectors Training Opportunities

- ◆ **Training on how to offer energy audits as an add-on service.**
- ◆ **Offer certification process.**
- ◆ **Classes on how to develop new lines of business.**

Best Training Opportunities

- ◆ **Getting GCs more involved in EE.**
- ◆ **Retailers have incentive to sell up.**
- ◆ **Retailers are a common point of contact in the market**

Best Training Opportunities

- ◆ **Measure-specific contractors are the most knowledgeable.**
- ◆ **Access to information is a main concern of all market actors.**
- ◆ **EEMs are not yet a significant market actor.**

Audience Input

- ◆ **Contractors, retailers, EEM facilitators, and home inspectors.**
- ◆ **Suggestions given:**
 - **On-site training/workshops**
 - **Certification**
 - **Access to information**
 - **School training**
- ◆ ***What are some specific training suggestions?***

Market Actor	Size	Training Opportunities	Classes Offered at Stockton Training Ctr.
General Contractors	37,000	<ul style="list-style-type: none"> • Communicate the potential market advantages of positioning themselves as experts in energy efficiency to GCs. Can be an important selling point. Benefits that can be obtained from incorporating optional EE upgrades in proposals. • Classes on the Title 24 changes and the implications for businesses. • Classes on the benefits of becoming EEM facilitators. • Educate GCs about HVAC contractors and the contribution they can make to improve EE in a home -- other benefits of using a qualified HVAC installer. • Offer correspondence courses; this could be coupled with above renewal requirements. • Offer training classes that directly lead to certification; incorporate EE in the classes. • Offer regional training classes emphasizing EE opportunities in different applications and climates. • Provide training in Title 24 compliance -- what the requirements are, how EE is involved and how going beyond Title 24 can benefit them and their customers. • Deliver education on EE through videos contractors can view at home at their own leisure. • Provide information on the benefits (economics, comfort, health and safety) of building with EE in mind. • Provide information and aids in how to market EE in different bidding situations. • Implement mailing lists to keep interested contractors up to date on availability of training. • Provide software to be used on laptop computers to demonstrate the comparative, long-term value of EE to customers. • Inform GCs using direct mailing or other marketing of the meaning and importance of the EnergyStar label. • Offer training classes, certification tests over the Internet. • Classes on the Title 24 changes and the implications for businesses. 	<ul style="list-style-type: none"> • RCP – Duct overview • RCP –CAS overview • RCP – Windows overview • RCP – Walls overview • RCP – Duct/CAS Challenge exam • EE Water Measures • RCP for CIP

Market Actor	Size	Training Opportunities	Classes Offered at Stockton Training Ctr.
HVAC Contractors	1,200	<ul style="list-style-type: none"> • Provide information on the benefits (economics, comfort, health and safety) of EE in HVAC applications. • Provide information and aids in how to market EE in different bidding situations. • Implement mailing lists to keep interested contractors up to date on the availability of training. • Provide software to be used on laptop computers to demonstrate the comparative, long-term value of EE to customers. • Inform HVAC contractors using direct mailing or other marketing of the meaning and importance of the EnergyStar label. • Offer training classes, certification tests on the Internet. • Offer training classes in duct sizing and duct sealing. • Provide regional training in HVAC topics -- air conditioning is big issue in the Central Valley, not in Monterey. • Coordinate training with manufacturers and distributors who already have training programs in progress. • Training should be tailored to small companies. • Provide on-site training whenever possible. • Coordinate training in energy efficiency with technical schools where possible. • Provide education on EE through videos that contractors can view at home at their own leisure. • Provide instruction in the use of performance testing, so contractors can show their customer that the work has been done correctly. • Coordinate with schools to bring more contractors into the labor force. • Classes on the Title 24 changes and the implications for businesses. 	<ul style="list-style-type: none"> • T-24 Equipment sizing & selection. • T-24 Installation standards.

Market Actor	Size	Training Opportunities	Classes Offered at Stockton Training Ctr.
Window Contractors	830	<ul style="list-style-type: none"> • Provide information on the benefits (economics, comfort, ability to incorporate more windows reduced UV light). • Provide regional training --window contractors on the coast vs. in the Sierras have different needs and their customers different concerns. • Implement mailing lists to keep window contractors informed of available training. • Inform Window contractors using direct mailing or other marketing of the meaning and importance of the EnergyStar label. • Coordinate with schools to bring more contractors into the labor force. • Offer training classes, certification tests over the Internet. 	<ul style="list-style-type: none"> • RCP – Windows overview
Electrical Contractors	7,750	<ul style="list-style-type: none"> • Inform contractors using direct mailing or other marketing of the meaning and importance of the EnergyStar label. 	

Market Actor	Size	Training Opportunities	Classes Offered at Stockton Training Ctr.
Retailers - Home Centers	120	<ul style="list-style-type: none"> • Provide videos to be made available on the floor explaining how various EE technologies work and how they benefit consumers. • Inform retail staff of the EnergyStar technologies and the reasons/advantages of the label. • Train retail staff on EE alternatives and technologies. • Train retail staff on whole-house approach to remodeling. • Provide self-education classes in EE over the Internet. 	
Retailers - Specialty Shops		<ul style="list-style-type: none"> • Provide training classes for specific technologies on how to upsell customers to EE technologies, and the advantages of these items to their home. 	
EEM “Facilitators”	5	<ul style="list-style-type: none"> • Offer classes on what an EEM facilitator does. • Marketing EEMs. 	
Home Inspectors	450	<ul style="list-style-type: none"> • Offer a course on how to provide energy audits as an add-on service. • Value-added service, with EEMs, offering a niche in the market. • Provide training concerning how to provide a Title 24 review, and the new changes. • Provide information on on code changes and energy efficiency by direct mailings. • Coordinate classes with CREIA on both technical and business aspects of the field. This training should be in the form of seminars and workshops and could address some of the following areas: natural gas heating systems; combustion air and venting requirements, accessibility, installation, and maintenance; and electrical service equipment, such as AC, (particularly requirements for clearances and grounding). 	<ul style="list-style-type: none"> • T-24 Air Distribution Diagnostic Training • Home Inspector Training
CHEERS Raters	42	<ul style="list-style-type: none"> • They have their own training programs and when asked they responded that their training needs were met. 	<ul style="list-style-type: none"> • CHEERS
Realtors	76,000	<ul style="list-style-type: none"> • Provide general information about the economic and social benefits of EE renovations. 	
Lenders	760	<ul style="list-style-type: none"> • Provide loan officer training specifically geared toward EEMs. • Provide a class in how to market EEMs to their customers. 	
Customers		<ul style="list-style-type: none"> • Public Service Announcements directed toward children: “Don’t be an energy hog”. 	

General Contractor Focus Group

*Residential Retrofit
& Renovation Market*

Breakfast, Introductions and Explanation of Objectives

Energy Efficiency and the Market

- What do your customers think about energy efficiency?
 - Do they care about it?
 - Are they willing to pay for it?
 - Do they look to you for advice?
 - What do you say?
- Do you have strategic alliances with vendors and sub-contractors?
 - what areas
 - what do they provide?

Energy Efficiency and the Market

When Bidding to specifications

- Is there a market advantage to positioning yourselves as experts in energy efficiency?
- Can this can be an important selling point?
- What is the feasibility of incorporating optional EE upgrades in proposals?

When doing Design and Build

- How is energy efficiency of design determined?

Subcontractors

- How often do you use sub-contractors
 - HVAC
 - Windows
 - Electrical
 - Plumbing
- How do you select sub-contractors?
 - sole source v. bidding to specifications
 - is there an opportunity for them to sell-up to you?
- How can they communicate the specific advantages/disadvantages of the equipment they are installing?

Title 24 Issues

- How knowledgeable are you on Title 24 and the recent changes?
- What is your strategy for dealing with Title 24 compliance?
- What are the implications of Title 24 changes for your business?
- Are you interested in training dealing with
 - Title 24 basics
 - how you can use alternative approaches to Title 24 to benefit you and your customers?
- What's the best way?

Possible Areas of Training

- Title 24 compliance
 - explaining recent changes to Title 24
 - emphasizing Title 24 issues that will occur in different climate zones?
 - explaining alternative approaches to achieving compliance?
- The benefits of building with energy efficiency in mind?
 - comfort
 - operating cost
 - health and safety
- Using Energy Efficiency Competitively?

Other Possible Training Issues

- Energy Star Marketing Program
- Whole House Approach To Energy Efficiency
- Energy Efficient Mortgages
- What else?

What's the best way to get information to you?

- Articles in trades
- Video tapes
- Internet
- Books on tape
- Correspondence courses
- Classroom courses