

Market Baseline Evaluation Report
**Performance - Tested Comfort
Systems, No. 2**

prepared by
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**VOLUME I:
PTCS VENTURE MARKET
BASELINE REPORT**

FINAL

Prepared for

**Northwest Energy Efficiency Alliance
Portland, Oregon**

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This report presents the results of the baseline market research that was conducted for the Northwest Energy Efficiency Alliance (Alliance) for the purpose of supporting the evaluation of the Performance Tested Comfort Systems (PTCS) Venture. The purpose of this study is to develop baseline data on consumers and contractors in the Pacific Northwest Region on issues pertaining to HVAC, duct, and weatherization services. This baseline research will serve as the foundation for future research on the market effects of the PTCS Venture.

The PTCS Venture evolved from the Residential Energy Efficient Air Distribution Systems (ADS) Program that was jointly funded by the Northwest Energy Efficiency Alliance and EPRI and began in late 1997. On April 29, 1999, the Alliance Board approved its staff's recommendation to change the name of the venture to Performance Tested Comfort Systems and to set up an independently run PTCS organization. The approval also endorsed an expanded scope of services, which includes electric and gas heating system diagnostics and repair, air conditioning diagnostics and repair, duct testing and repair, and weatherization improvement services. The market includes all existing single-family and manufactured homes, with the potential extension to new homes in the future. The core concepts of the PTCS Venture include:

- System diagnostics, tune-ups and performance testing
- Independent third-party certification of contractors
- Regional coordinated quality assurance and quality control
- Market supported PTCS organization
- Independent delivery of services by contractors.

The PTCS Venture relies exclusively on contractors to deliver efficiency services to the residential end-users. Contractors will be trained and certified to deliver system tune-ups and performance testing, routine maintenance, duct efficiency improvements, and weatherization services.

Market transformation and building a self-sustaining PTCS organization are core goals of the PTCS Venture. Thus, it is critical that contractors are aware and knowledgeable about the PTCS services, perceive these services as being profitable, and routinely promote and specify these services in their business interactions with end-users. It is equally critical that end-users are aware and knowledgeable about the PTCS services and are able to justify their purchases based on some level of analysis or judgment that demonstrates that the incremental costs, if any, are justified.

1.1 HIGHLIGHTS OF BASELINE FINDINGS

A baseline survey of 503 residential homeowners in Idaho, Montana, Oregon, and Washington was conducted by telephone in late June and early July of 2000. Additionally, a contractor survey was administered to 104 non-participating contractors and to 23 participating contractors. Sections 5 through 7 provide a detailed analysis of the baseline results. Highlights of the baseline findings are presented below.

1.1.1 Consumer Survey Results

Home Characteristics

Table 1-1 summarizes the household characteristics of the survey respondents. Characteristics are also provided by dwelling type and housing age. As displayed, site-built homes account for 84 percent of the homes surveyed, while manufactured homes make up the remaining 16 percent.

More than 80 percent of the surveyed homes have a central heating system or a heat pump. Natural gas central systems are most prevalent, followed closely by central electric systems. Electric heating systems dominate in the manufactured home segment (83 percent). The saturation of electric heating systems is higher for homes built in the last 20 years, compared to homes that are more than 20 years old (52 vs. 35 percent).¹

About one-fourth of the surveyed homes have some form of a central air conditioning system. As expected, newer homes are nearly 50 percent more likely to have a central cooling systems than older homes. There is an unexpected discrepancy between the reported heat pump systems for heating and cooling in the manufactured home segment.

As expected, the site-built homes tend to be larger and have more residents than the manufactured homes on average. Interestingly, the reported average monthly energy bills tend to be very similar across the two dwelling segments and the two housing age segments.

¹ Respondents were screened out if they had wood or pellet heating. Approximately 4.9% of the respondents (prior to screening) reported that they had wood or pellet heating.

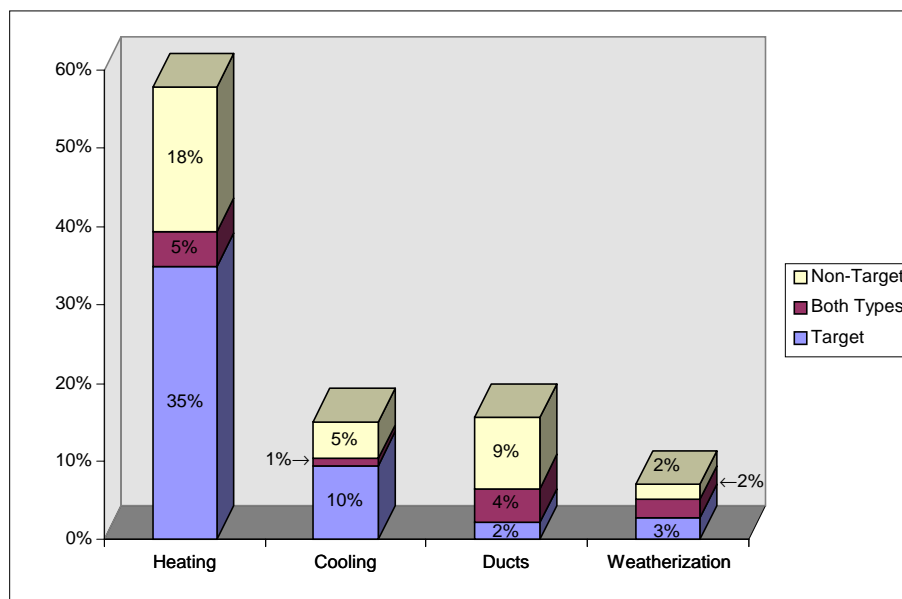
**Table 1-1
Summary of Home Characteristics**

	All Homes	Home Type		Home Age	
		Site Built Homes	Manufactured Homes	≤20 years old	>20 years old
Heating Systems					
Central Heating System	70%	69%	72%	71%	69%
Natural Gas	42%	49%	6%	39%	45%
Electric	18%	10%	60%	25%	12%
Oil	6%	8%	0%	1%	11%
Propane	4%	4%	6%	6%	2%
Heat Pump Heating	11%	9%	17%	13%	8%
Non-Central Heating System	20%	21%	11%	16%	23%
Natural Gas	3%	3%	4%	1%	5%
Electric	15%	16%	6%	14%	15%
Propane or Oil	2%	2%	1%	1%	2%
Cooling Systems					
Central Air Conditioning	15%	16%	10%	17%	13%
Heat Pump Cooling System	9%	10%	8%	12%	7%
Non-Central Cooling System	11%	10%	18%	8%	14%
State					
Oregon	30%	28%	41%	28%	31%
Washington	52%	55%	38%	56%	49%
Idaho	10%	11%	9%	11%	10%
Montana	8%	7%	13%	5%	10%
Home Type					
Site Built Home- Single Family	78%	93%	0%	66%	88%
Site Built Home- Other	5%	6%	0%	8%	3%
Manufactured Home	16%	0%	100%	26%	7%
Average home age, years	31	34	15	10	48
Average number of people in the home	3.1	3.1	2.8	3.4	2.8
Average size of home	2,219	2,364	1,395	2,160	2,270
Average typical monthly energy bill					
Last summer	\$74	\$75	\$74	\$73	\$75
Last winter	\$120	\$120	\$116	\$121	\$119
Number in sample	503	424	79	227	276
Percent in sample	100%	84%	16%	45%	55%

HVAC Service History

More than half of the surveyed homeowners have performed some service on their heating system in the last four years, with general maintenance being the most common service performed. Figure 1-1 displays the percentage of homes that had a service performed during the last four years for each of the four service categories. The services have been categorized into target and non-target services, where the target services comprise PTCS-promoted activities, such as system performance testing, routine maintenance, duct efficiency improvements, and weatherization services.

Figure 1-1
Respondents Receiving Services Within Four Years



Safety and Performance Testing

Safety and performance testing are an important aspect of the PTCS Venture. About 10 percent of the consumers stated that they had a safety or efficiency test performed on either their heating, cooling, or duct system during the last four years. Approximately 3 percent of surveyed homeowners stated that they had their duct system tested.

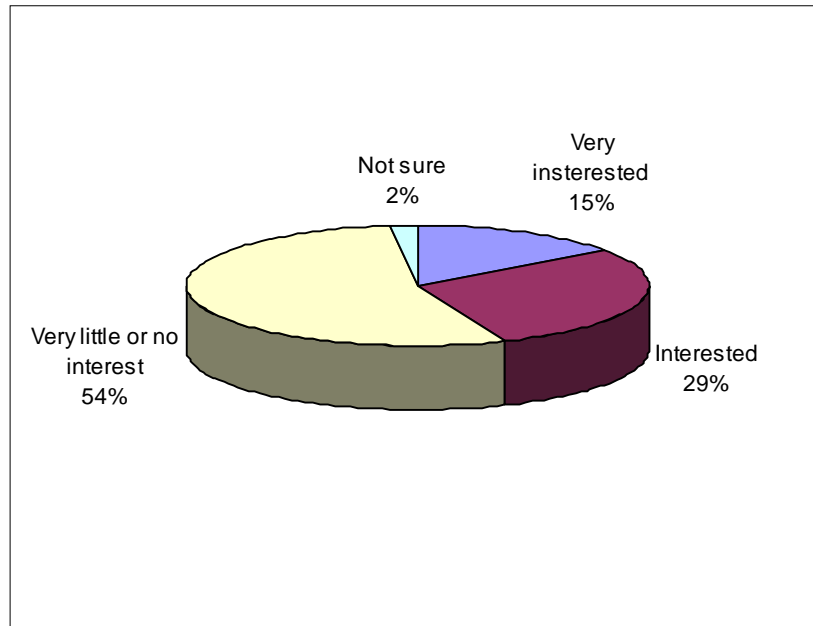
Contractor Training and Certification

Contractor training and certification is another important component of the PTCS Venture. The interest in contractor certification is fairly high among consumers, with more than half of the respondents giving the highest possible rating on the usefulness of certification when selecting a contractor. However, only 15 percent of the respondents stated that knowing their contractor was certified would have a strong influence on whether they purchased a service.

Consumer Interest in HVAC System Check and Certification

Consumers were also asked to rate their level of interest in having their home's HVAC system checked and certified for safety and efficiency. As displayed in Figure 1-2, current interest in HVAC system testing and certification is somewhat mixed. In addition, only 18 percent of interested respondents stated that they would be willing to pay more than \$100 to have their HVAC system certified.

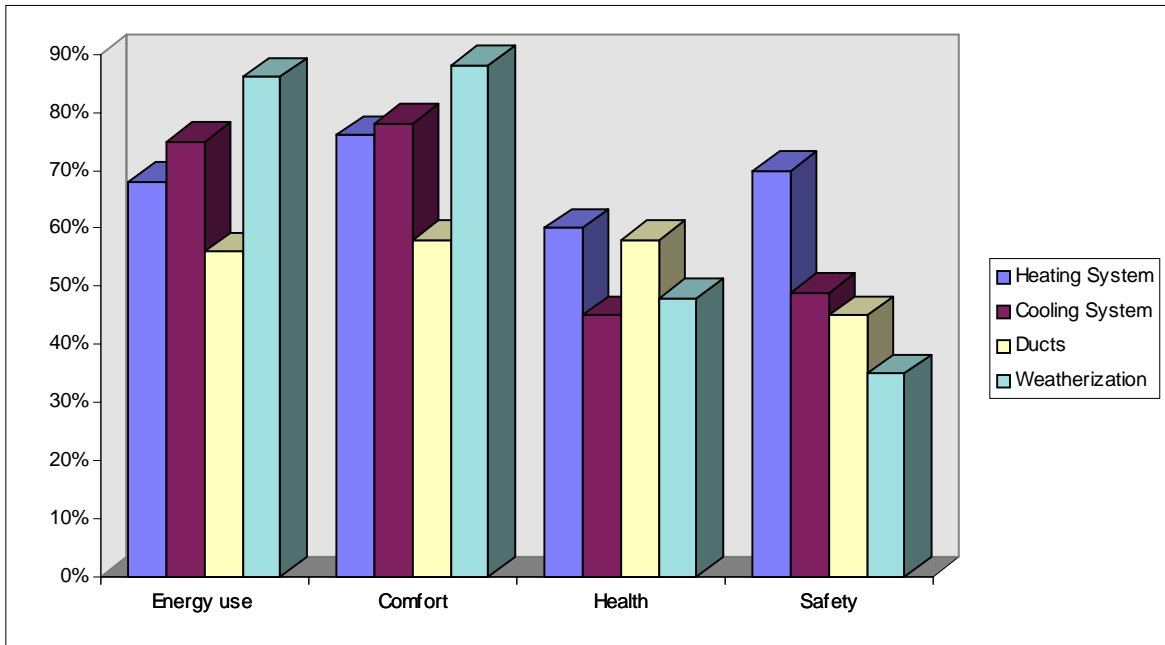
Figure 1-2
Consumer Interest in HVAC System Check and Certification



HVAC System Maintenance

Survey respondents were asked to give their perceptions of what effect maintaining each system (heating, cooling, ducts, and weatherization) has on four issues: energy use, comfort, health, and safety. Figure 1-3 displays the percentage of respondents who felt that maintaining a particular system would have a very large effect on each issue.

Figure 1-3
Percentage of Respondents that Perceive a Strong Effect from Maintaining System

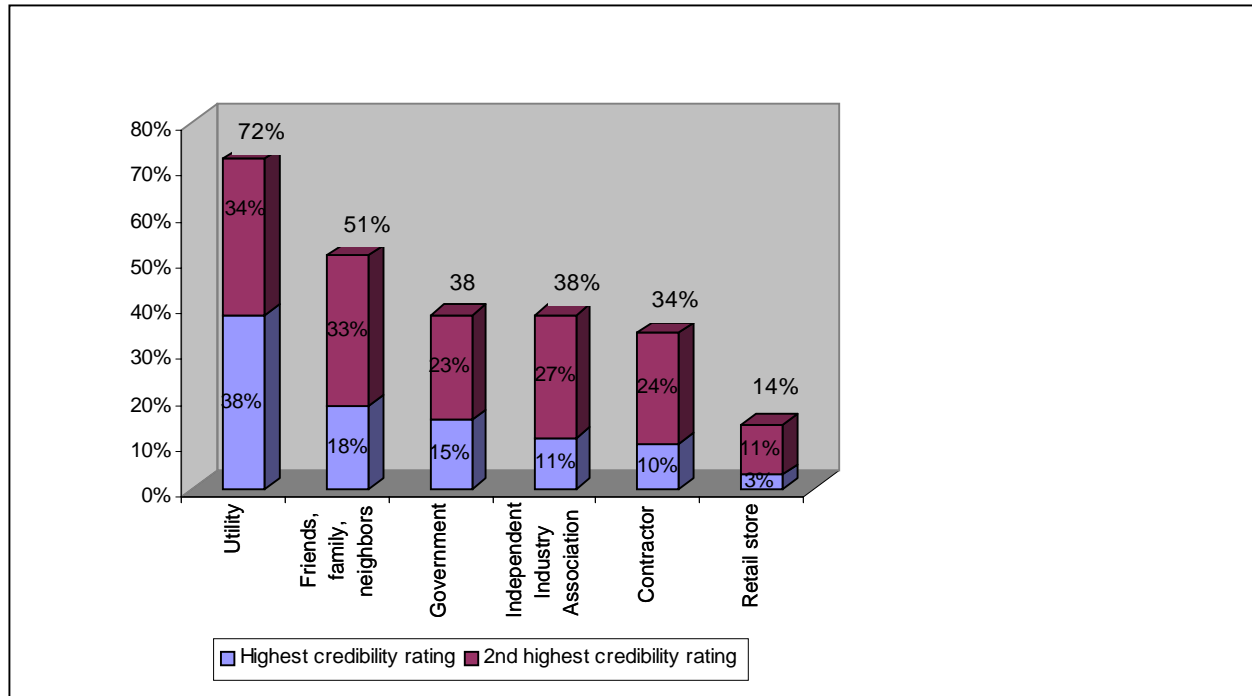


In general, fewer respondents felt that the maintenance of ducts would have a very large effect on energy usage and comfort relative to the other three service categories. Other than that, the perceptions of the respondents appear to be relatively in line with actual effects. Safety is viewed primarily as a heating system issue.

Credibility of Information Sources

Consumers were also asked to rate the credibility of several potential information providers, including their utility, a contractor, government, independent industry association, retail stores, and family-friends-neighbors. As Figure 1-4 shows, utilities are seen as a credible information source on HVAC services by 72 percent of respondents. The response of friends, family, and neighbors was the only other source that was given a high credibility rating by more than half of the respondents. The government, industry association, and contractors all received similar amounts of high credibility ratings (about 35 percent) with retail stores getting the lowest amount of high ratings. Government had the highest percentage of respondents (18 percent) that gave it the “not at all credible” rating.

Figure 1-4
Credibility of Information Sources



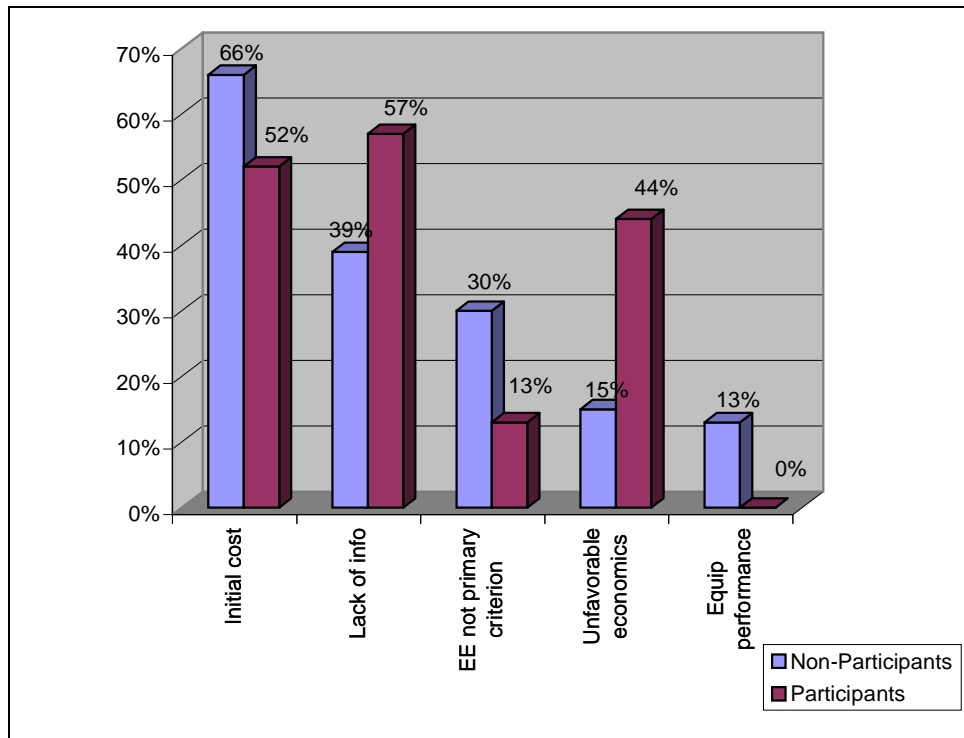
1.1.2 Contractor Survey Results

The baseline data on contractors in the Pacific Northwest region provide the foundation for future research on the market effects of the PTCS Venture. Key findings of the contractor research will also be extremely useful in helping to design marketing strategies for the PTCS Venture.

Barriers

Figure 1-5 presents the results of the survey when contractors were asked to rate the primary reasons that prevent consumers from choosing energy-efficient products and services. The majority of the contractors surveyed felt that initial cost was a primary obstacle or barrier that prevents consumers from choosing energy-efficient products and services. Notably, many more participants felt that lack of information was a primary reason why consumers don't buy energy-efficient products and services.

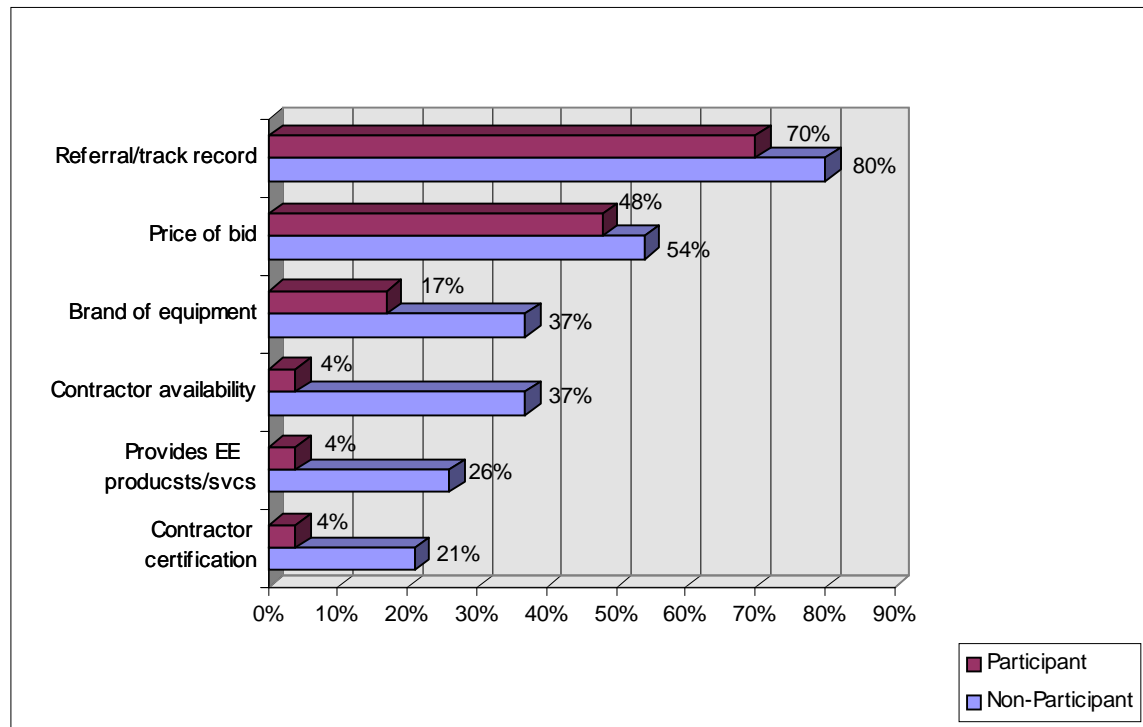
Figure 1-5
Contractor Opinions of Barriers Affecting
Energy-Efficient Products and Services Sales



Contractor Selection Process - Important Factors

As displayed in Figure 1-6, 80 percent of non-participating contractors and 70 percent of participants felt the contractor's track record or a referral are the most important factors consumers consider when selecting a contractor. Whereas consumers were very interested in contractor certification, most contractors do not believe that consumers care about contractor certification. Hence, there is a gap between consumers' and contractors' perception of the importance of certification.

Figure 1-6
Contractors' Opinions on Factors Consumers Consider when Selecting a Contractor



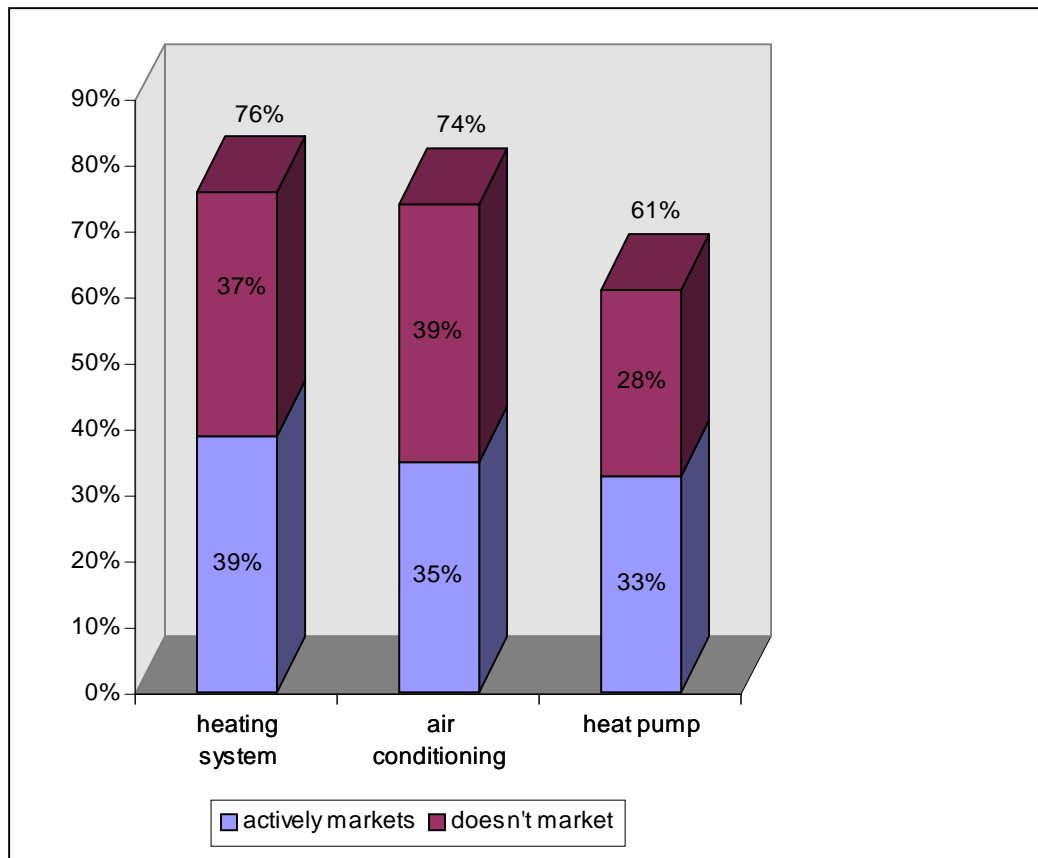
The differences in perceived importance of track record and contractor certification suggests that contractors do not believe that consumers view contractor certification as a means of establishing a track record. If contractor certification is promoted to consumers as a strong indicator of quality and reliability, then contractors will be more likely to get certified.

System Tune-up and Performance Testing

Well over half of non-participating contractors in the region perform system tune-ups and testing. Contractors are more likely to perform these services for heating and cooling systems than heat pump systems. This is partly due to the fact that contractors are less likely to install or service heat pumps than other systems because this is a more specialized trade. Seventy-four percent of the non-participating contractors install or service heat pumps as compared to 83 percent and 79 percent of contractors who install or service heating and cooling systems, respectively.² Some contractors actively market their services and others do not. Figure 1-7 shows the percentage of contractors who provide system tune-ups and performance testing, and of those, the percent that actively markets these services. Approximately half of the contractors stated that they actively market their services for the three service categories displayed.

² Participants are also less likely to service heating, cooling, and heat pump systems: 70% service heating, 61% service cooling, and 51% service heat pumps. But of those, almost all offer tune-ups and testing. Thus, the overall percentage of participants who offer tune-ups and testing is very close to the overall percentages for non-participants.

Figure 1-7
Contractors Who Provide System Tune-up and Safety and Performance Testing and Who Actively Market Services

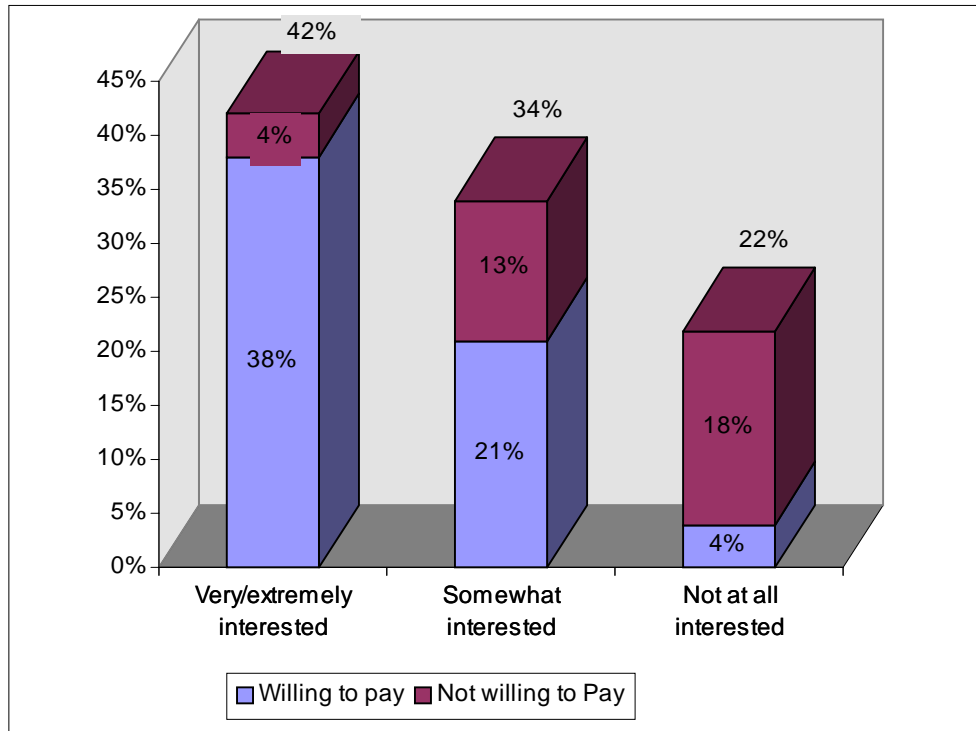


The majority of contractors report charging consumers less than \$100 for system tune-up and performance testing. Participant contractors are more likely to perform tune-ups and testing at their jobs. System tune-ups and performance testing is performed, on average, at 77 percent of participating contractors jobs, as compared to 67 percent for non-participants. Sixty-two percent of the participants stated that they perform tune-up services at all of their jobs versus approximately half of the non-participant contractors.

Interest in Training and Certification Programs

As Figure 1-8 displays, 42 percent of non-participant contractors are either extremely or very interested in participating in training and certification programs. Thirty-four percent are somewhat interested and 22 percent are not at all interested in training and certification programs. Overall, 60 percent stated that they would be willing to pay for training and certification.

Figure 1-8
Contractor Interest/Willingness to Pay for Certification Program



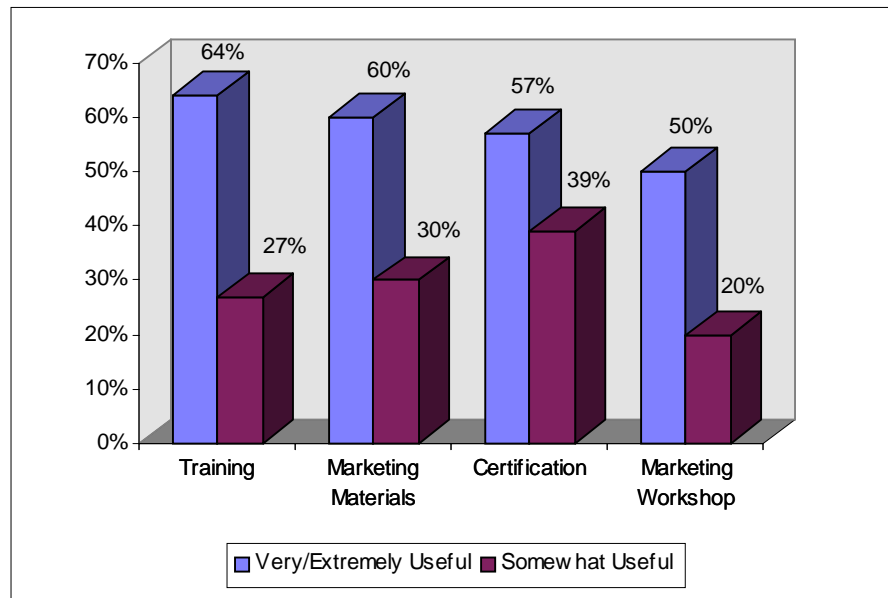
Participant Feedback

The majority of participants found the training, certification, and marketing components very or extremely useful, as shown in Figure 1-9.

Participants were asked for suggestions on how to get more contractors to participate in the PTCS training program. About one-quarter felt that marketing the program would attract more contractors, and 17 percent felt that consumer education would be an effective method for getting higher participation rates.

Consumer education and increasing program marketing were also mentioned by participants as ways to improve the program. Other interesting suggestions were to add energy-efficient practices to the building codes and to make duct requirements and rebate programs broader and more consistent across the Pacific Northwest.

Figure 1-9
Usefulness and Effectiveness of Program Components



1.2 IMPLICATIONS FOR PROGRAM DESIGN

PTCS marketing material should emphasize to consumers the importance of performance testing and the benefits of having this service performed. Consumer survey results indicate that there currently is a low penetration of safety and performance testing services. Additionally, only 15 percent of consumers stated that they are very interested in HVAC system testing and certification. Therefore, marketing to consumers should emphasize the various benefits of performance testing.

PTCS marketing strategies directed at consumers should leverage the credible sources of information identified by the consumers. Consumer data indicates that the importance placed on the type of information is highly correlated with the perceived credibility of the source of information. Marketing strategies should leverage the high perceived credibility of the utilities as well as friends, family, and neighbors through case studies and testimonials.

The consumer data also indicates that many consumers do not fully appreciate the relationship between duct maintenance and energy usage or comfort. Consumers tend to be very aware of the importance of weatherization on their energy use and comfort. However, somewhat fewer consumers believe that maintaining their HVAC system has a strong effect on energy use, and only about half of consumers believe that maintaining their duct system has a large impact on their energy usage and comfort. Consumer advertising should state that routine maintenance of their heating systems and ducts is just as important for their energy use and comfort as insulating their homes.

Finally, contractors believe that consumers consider the contractor's track record to be most important when selecting a contractor. However, contractors do not believe that most consumers will consider contractor certification when making a selection. A consumer marketing program that associates contractor certification as the best indicator of a contractor's track record will go a long way in encouraging contractors to get certified.

This report presents the results of the baseline market research that was conducted in the Pacific Northwest Region for the Northwest Energy Efficiency Alliance (Alliance). The baseline research was conducted on issues pertaining to HVAC, duct, and weatherization services for the purpose of supporting the evaluation of the Performance Tested Comfort Systems (PTCS) Program. XENERGY is performing the evaluation of this program and therefore conducted the baseline research and prepared this report.

2.1 THEORY-BASED EVALUATION

XENERGY is using a theory-based evaluation approach for the baseline and market effects portions of this study. Theory-based evaluation is a broad descriptor of an evaluation approach that has been used in a number of policy fields for some time. Theory-based evaluation provides a critical framework to evaluate programs that seek to cause lasting structural changes in social or economic systems. The first lesson of theory-based evaluation is that a useful evaluation must be fully informed by the causal theory that underlies the program intervention.

One of the first tasks of this study was to develop initial program theories and hypotheses that could be used to form the basis of our evaluation, given the new scope of services under the PTCS venture. As a result, a detailed exploration of program theories and hypotheses was necessary to inform the development of data collection instruments, to establish appropriate baseline benchmarks, and to provide a framework for assessing both short- and long-term market effects.

2.2 BASELINE SURVEY OBJECTIVES

The purpose of the PTCS Market Baseline Study is to develop baseline data on end-users (residential consumers) and supply-side actors (contractors) that will serve as the foundation for future research on the market effects of the PTCS Program. The PTCS Program includes market interventions pertaining to the following:

- Gas heating systems
- Air conditioning systems
- Heat pumps
- Duct systems
- Weatherization services.

Therefore, the baseline survey instruments included questions pertaining to the above services and were designed to help identify the barriers to market transformation of energy-efficient services in the HVAC, duct, and weatherization market.

2.2.1 Consumer Survey

A baseline survey of 503 residential homeowners in Idaho, Montana, Oregon, and Washington was conducted by telephone in late June and early July of 2000. The key objectives of the consumer survey were to develop baseline data on:

- Housing characteristics and demographics
- Consumer behavior and practices
- Cost of services
- Consumer knowledge of energy-efficiency measures
- Consumer awareness of and participation in energy-efficiency programs (including performance testing programs)
- Consumers' willingness to pay for services such as safety and efficiency testing and certification
- Consumer attitudes about the perceived value of contractor certification programs and equipment labeling
- Barriers to and consumer interest in the PTCS Venture.

2.2.2 Contractor Survey

A contractor survey was administered to 104 non-participating contractors and to 23 participating contractors. The objective of the survey was to collect baseline data on the following:

- Contractor attitudes and awareness
- Contractor practices
- Contractor scoring model
- Contractor interest in PTCS Venture
- Program feedback from participants.

Contractors that participated in the PTCS Venture were interviewed to get feedback on their experiences with the program. Participants were also administered the baseline survey, allowing comparison between non-participants and participants.

2.3 REPORT ORGANIZATION

Volume I of this report presents highlights and an analysis of the baseline survey results. The report identifies indicators that can be tracked over time to determine the market effects of the PTCS Venture. Volumes II and III provide the full set of tables summarizing basic frequencies and cross-tabulations of all the consumer and contractor survey responses, respectively. This report is organized in the following manner:

2.3.1 Volume I: PTCS Venture Market Baseline Report

- **Section 1: Executive Summary**
- **Section 2: Introduction**
- **Section 3: PTCS Overview**

This section presents an overview of the PTCS Venture. It provides an historical background of the project evolution as well as a discussion of the program accomplishments.

- **Section 4: Program Theories and Hypotheses**

This section presents an overview of the initial program theories and hypotheses that are used to form the basis of our evaluation, given the new scope of services under the PTCS venture.

- **Section 5: Consumer Survey Results**

Section 4 summarizes highlights of the consumer survey results. Analysis of the data is presented for consumer purchasing behavior, average cost of service, willingness to pay for safety and efficiency certification, purchase decision factors, and the importance of contractor certification. In addition, a scoring model is provided to help identify the characteristics of those consumers who are likely to be high-value candidates for receiving the downstream services of the PTCS market interventions.

- **Section 6: Contractor Survey Results**

This section presents the results of contractor baseline surveys. Two distinct groups of contractors were sampled, “participants” and “non-participants.” An indexing or scoring system was created to provide a numeric method for assessing the practices currently employed by contractors. The distribution of scores over contractors in the region can be tracked over time to assess improvements in desired practices and effects of the program.

- **Section 7: PTCS Participant Survey Results**

This section summarizes the results of the participant survey. Specifically, this section discusses the effect of the program on contractor practices, the value of the program to contractors, opinions on PTCS diagnostic protocols, and suggested improvements to the program.

- **Section 8: Survey Methods**

Section 8 presents a summary of the survey methods and documents the sampling strategy and weighting methods.

- **Section 9: Key Findings**

This section summarizes key baseline findings specifically pertaining to the PTCS Venture and the market for HVAC, duct, and weatherization services in the Pacific Northwest.

- *Appendix A: PTCS Certified Contractor and Licensed Firm Lists*
- *Appendix B: Consumer Survey Instrument*
- *Appendix C: Contractor Survey Instrument*

2.3.2 Volume II: Consumer Survey Responses

- *Section 1: Consumer Overall Frequencies*
- *Section 2: Consumer Cross-Tabulated Frequencies by State*
- *Section 3: Consumer Cross-Tabulated Frequencies by Heating System*
- *Section 4: Consumer Cross-Tabulated Frequencies by Home Type*
- *Section 5: Consumer Cross-Tabulated Frequencies by Home Age*
- *Section 6: Consumer Cross-Tabulated Frequencies by Relative Value of Likely Services*
- *Appendix A: Consumer Survey Instrument*

2.3.3 Volume III: Contractor Survey Responses

- *Section 1: Contractor Overall Frequencies*
- *Section 2: Participant Contractors Overall Frequencies*
- *Section 3: Contractor Cross-Tabulated Frequencies by Participation*
- *Section 4: Contractor Cross-Tabulated Frequencies by Contractor Type & Size*
- *Section 5: Participant Cross-Tabulated Frequencies by Contractor Type*
- *Appendix A: Contractor Survey Instruments*

This section presents an overview of the PTCS Venture. The following topics are discussed:

- Historical overview
- PTCS Venture overview
 - ⇒ Core concepts
 - ⇒ PTCS mission statement
 - ⇒ PTCS Venture goals with the Alliance
 - ⇒ PTCS business plan
 - ⇒ PTCS organization
- Alliance extension of PTCS Venture contract
- PTCS Venture's accomplishments.

3.1 HISTORICAL OVERVIEW

The PTCS Venture evolved from the Residential Energy Efficient Air Distribution Systems (ADS) Program that was jointly funded by the Northwest Energy Efficiency Alliance and EPRI and began in late 1997. The Oregon State University Energy Extension Service, Oregon Office of Energy, Washington State University Energy Extension Service, and the Idaho Department of Water Resources all served as project team members on the ADS Program.

The goal of the initial phase of this venture was to assess whether the testing, retrofitting, and certifying of residential air distribution systems (ducts) for heating and cooling systems could be established as a viable, ongoing business in the Pacific Northwest.¹ As a result of the field experience and cost-effectiveness research that took place in 1999, the following was determined:

- As a stand-alone program, the Residential ADS Program was not cost-effective at the program or utility level.²
- Bundling ADS services with other HVAC services enhances potential cost-effectiveness.
- HVAC contractors have a greater incentive to provide energy-efficiency retrofit services when they're part of a broader service portfolio.

¹ Northwest Energy Efficiency Alliance Staff Recommendation Memo, April 2, 2000.

² Residential Duct Sealing Cost/Benefit Analysis Report. D. Baylon and B. Davis. December, 1999.

- Consumers are better served when more attention is paid to the system-wide effects of air distribution system changes on energy efficiency, health, and safety.
- The Oregon tax credit program revealed that contractors that retrofit ducts are successfully bundling other complementary HVAC and weatherization services.

Thus, the Residential ADS Program was redesigned to expand the scope of services to include all heating, cooling, and ventilation system improvements, as well as weatherization services. As opposed to focusing only on electrically heated homes, the services became fuel neutral with the expanded scope of services.

3.2 PTCS VENTURE OVERVIEW

On April 29, 1999, the Alliance Board approved its staff's recommendation to change the name of the venture to Performance Tested Comfort Systems and to set up an independently run PTCS organization. The approval also endorsed an expanded scope of services, which includes electric and gas heating system diagnostics and repair, air conditioning diagnostics and repair, duct testing and repair, and weatherization improvement services. Thus, duct system services are one of a range of energy-efficiency services that can be "certified" under the PTCS Venture. The services are fuel neutral and the market includes all existing single-family and manufactured homes, with the potential extension to new homes in the future.

3.2.1 Core Concepts of PTCS Venture

The core concepts of the PTCS Venture include the following:

- Performance testing
- Independent third-party certification of systems and contractors
- Trained and certified contractors
- Regional coordinated quality assurance and quality control (QA/QC)
- Market-supported organization
- Independent delivery by contractors
- Broad range of services to enhance business viability for contractors.

As noted under core concepts, the PTCS Venture relies on contractors to deliver efficiency services to the residential end-users. Contractors will be trained and certified to deliver the following services:

- Check-ups and performance testing
 - ⇒ Safety
 - ⇒ Efficiency
- Efficiency services

- ⇒ Duct sealing
- ⇒ Gas heating system maintenance
- ⇒ Heat pump and cooling system diagnostics and repair
- ⇒ New equipment sales (replacement)
- ⇒ Weatherization.

3.2.2 PTCS Mission Statement

The mission statement for the PTCS Venture is as follows:

The Performance Tested Comfort Systems Venture will fill an important void in the current residential and light commercial HVAC, duct systems and weatherization marketplace. The venture's mission is to be the indispensable source for state-of-the-art information related to safe, cost-effective, and healthy home heating, air conditioning, duct systems, and weatherization that consumers will turn to when purchasing decisions are required. This should provide consumers of Performance Tested Comfort Systems services tangible benefits in terms of reliability, energy and equipment cost savings, durability, health and safety. In order to accomplish this mission, the Performance Tested Comfort Systems organization has two primary business objectives: to create market transformation and to build a self-sustaining venture.³

3.2.3 PTCS Venture Targets

The PTCS Venture targets for the year 2010 are as follows:

- Train and certify 400 contractors
- Provide 152,600 homes with PTCS services.

3.2.4 PTCS Business Plan

The PTCS business plan was finalized in March, 2000.⁴ The business plan was completely revised to incorporate the expanded scope of services of the PTCS Venture. The primary activities of the PTCS Venture are technical standards definitions, technician training and certification, QA/QC and inspection, sales and marketing, and consumer information. Residential HVAC, duct, and weatherization components that meet the PTCS standards, as determined by a PTCS certified technician, will receive system component certification. PTCS certification labels will be placed on all certified systems.

³ Performance Tested Comfort Systems - Creating a Business Model for Northwest HVAC/Weatherization Contractor Training and Certification, Thomas Hewes and Tom Dowling.

⁴ PTCS Business Plan, T. Dowling Consulting Services Inc., March 8, 2000.

The following subsections describe the PTCS product and service offerings to residential consumers, utilities, and contractors. In addition, information on marketing support, QA, and the contractor referral service is also provided.

Residential Consumer Services

As stated above, the PTCS Venture relies on contractors to deliver efficiency services to the residential end-users. However, the objective of the PTCS Venture is to become the premiere source of information to residential consumers regarding HVAC, ducts, and weatherization services. The PTCS business plan summarizes this objective in the following manner:

By establishing brand equity for the PTCS program, the venture will create a long-term market opportunity to become the primary source in the four-state region for state-of-the-art information related to safe, cost-effective, and healthy home heating, air conditioning, duct systems, and weatherization that consumers will turn to when purchasing decisions are required.

The perceived quality of the technical information, certification and training services, and customer support provided by the PTCS Organization will become a reason for residential homeowners to seek out venture information prior to making major HVAC/weatherization investments. These consumers will also seek out PTCS-certified technicians and PTCS-licensed firms employing them when choosing HVAC, duct, and weatherization contractors. Additionally, as these consumers are notified about routine maintenance requirements of their HVAC system through the use of the venture's database tracking program, a long-term relationship with the PTCS Organization will be established.⁵

Utility Services

The PTCS organization will establish partnerships with utilities to provide custom program development and implementation. The PTCS business plan states the following:

The PTCS Venture will provide training, certification services, marketing materials, and program information to utilities on a fee-for-service basis that allows the utility to maintain direct downstream contact with its customer base while providing a higher degree of available services.

The PTCS Venture plans to rely on utilities to assist in marketing to both residential consumers and contractors.

⁵ PTCS Business Plan, et. al

Contractor Services

The PTCS organization will provide training and certification to contractors on gas heating systems, heat pumps/air conditioning systems, ducts, and weatherization services. The training activities are designed to increase energy-efficiency service availability and break down some of the customs and conventions that keep contractors from offering efficiency services. Contractors will pay for the training and for the certification labels. Table 3-1 displays the current status of the training certification offerings available to contractors from the PTCS Venture.⁶

**Table 3-1
PTCS Training and Certification Program Offerings (As of July 30, 2000)**

System Certification Category	Standards Completion Date	Training Curricula Completion Date	Training Available Date	Service Initiation Date
Original Offering				
Duct Certification	Done	Done	Currently Available	1/1998
Expanded Offerings				
AC/Heat Pump Diagnostics & Maintenance (requires EPA License)	To be developed under contract from Procter Engineering	7/20/2000	9/1/2000 Regional Tech Training 9/20/00 (Training for regional trainers)	10/1/2000
Gas Furnace Maintenance	To be developed under contract from Ecotope Inc.	7/20/2000	9/1/00	10/1/00
Weatherization	Draft completed 3/1/00; estimated completion date 9/2000	1/1/2000 ¹	3/1/2001	9/1/2001
Light Commercial ⁷	3/1/2001	6/1/2001	8/1/2001	12/1/2001

Marketing Support

The PTCS organization provides marketing support to licensed contractors and utilities through marketing workshops and the distribution of marketing materials and limited print ads. Once licensed, contractors and utilities may use the PTCS “ready-to-use” marketing materials for their own marketing endeavors. The PTCS business plan anticipates that every marketing dollar that is spent by the PTCS organization will be matched at least dollar for dollar by contractors and utilities.

The PTCS business plan calls for significant expenditures on PTCS marketing and promotion. The use of the PTCS certification logo, along with associated advertising materials, will serve to

⁶ Performance Tested Comfort Systems - Creating a Business Model for Northwest HVAC/Weatherization Contractor Training and Certification, et. al.

⁷ This study scope did not include baseline data collection for the light commercial market.

increase consumer awareness of PTCS efficiency services, add credibility, and reduce performance uncertainty. Marketing expenditures are higher in the first three years of the venture to increase consumer awareness of the PTCS services and establish brand awareness. The PTCS Venture marketing budget includes expenditures for the following:

- Retaining professional marketing and advertising professionals to assist in developing marketing plans, promotional materials, and advertising programs
- Printing and distributing marketing materials
- Purchasing media.

In addition to the above expenditures, the PTCS business plan assigns staff time for marketing support and funds for the development and maintenance of a PTCS web site.

Regional Referral Service

The business plan calls for the establishment of a region-wide referral service for certified and licensed contracting firms. This service will be available to residential consumers, builders, real estate agents, property managers, lenders, utilities, and others.

Quality Assurance and Control

The PTCS organization is responsible for establishing a third-party certification and QC system. QA and QC, including limited inspections, is required as part of the certification and recertification process for contractors.

3.2.5 PTCS Organization

In December, 1999, PTCS became incorporated as a nonprofit entity. The PTCS Board of Directors includes members from Oregon, Washington, Idaho, and Montana. The Board of Directors includes utility representatives, contractors and representatives from the state energy offices that support the training and certification activities of the PTCS Venture. The PTCS organization will develop and coordinate all of the PTCS services that were listed above under the PTCS business plan.

According to the business plan, there are two key sources of revenue for the first three years of operations for the PTCS organization.⁸ These primary sources of revenue will come from the Alliance and revenue from the sales of PTCS products and services. The revenue sources from the PTCS products and services include the following:

- Technician certification fees
- Contractor firm and utility company licensing fees for use of the PTCS program and marketing materials
- Certification label fee for each certified system

⁸ PTCS Business Plan, et. al.

- Custom program development and delivery to utilities.

The long-term sustainability of the PTCS Venture is dependent on the ability of contractors to profit from consumer demand for PTCS performance-tested and certified systems.

3.3 ALLIANCE EXTENSION OF PTCS VENTURE CONTRACT

In April, 2000, the Alliance staff recommended that the PTCS Venture contract period be extended to December 31, 2002 and that additional funding be provided for marketing purposes. The marketing funds will be targeted at assisting the contractors and utilities in their marketing efforts aimed at consumers. This marketing strategy is consistent with the market transformation goals of the PTCS Venture.

3.4 PTCS VENTURE'S ACCOMPLISHMENTS

As evidenced by the above discussion, the Venture has made tremendous progress towards laying the foundation for market transformation of energy efficiency HVAC, duct, and weatherization contractor services. The main accomplishments of the PTCS Venture or related programs are listed below:

- Training of trainers on the gas heating and heat pump/AC training modules in July, 2000
- James Mattil was hired in June, 2000 as the Manager of the PTCS organization
- The Northwest Public Power Association (NWPPA) was selected by the PTCS Executive Committee to provide a variety of administrative services to the PTCS organization
- PTCS Board of Directors legally constituted on May 1, 2000
- The PTCS business plan was completed in March, 2000 by Dowling Consulting Services Inc.
- The PTCS trademark established and protected
- PTCS organization incorporated as a nonprofit entity in December, 1999
- The Residential Duct Sealing Cost/Benefit Analysis Report was completed by Ecotope in December, 1999
- PTCS Venture officially expanded scope of services in May, 1999
- The Market Baseline Evaluation Report on Northwest Residential Ducts was completed by XENERGY in January, 1999
- A total of 113 technicians, representing 47 firms, have been trained and certified to the current PTCS standards on duct efficiency (Appendix A)
- A total of 23 firms have signed licensing agreements with the PTCS organization
- The complete set of PTCS consumer marketing brochures and sales aids have been developed and distributed to contractors and utilities

- Training in marketing/sales of PTCS services has been hosted by 9 different utilities and delivered to 48 contractors
- A total of 2,400 homes throughout the region have completed duct sealing improvements⁹
- The Alliance staff has developed additional cost/benefit analyses that may be helpful to utilities
- A report by OSU Extension Service was completed in February, 1998, that summarizes available literature and other resources on the impact of air leakage in residential duct systems.

Appendix A includes the list of contractors that have been trained and certified on duct efficiency. In addition, it provides a list of firms that have signed a licensing agreement with the PTCS organization.

⁹ Alliance staff presentation regarding PTCS Venture, April, 2000. Based on Oregon state tax credit data, utility and PTCS internal reporting.

4

PROGRAM THEORIES AND HYPOTHESES

4.1 INITIAL PROGRAM THEORIES AND HYPOTHESES WITHIN THE EVALUATION OF THE PERFORMANCE TESTED COMFORT SYSTEMS (PTCS) PROGRAM

One of the first tasks of this study was to develop initial program theories and hypotheses that could be used to form the basis of our evaluation, given the new scope of services under the PTCS Venture. As a result, a detailed exploration of program theories and hypotheses was necessary to inform the development of data collection instruments, to establish appropriate baseline benchmarks, and to provide a framework for assessing both short- and long-term market effects. Specifically, our goal in this section is to explore the ways in which the PTCS Venture might lead to causal changes in the marketplace that ultimately result in long-term *market effects*.¹

4.1.1 Northwest Energy Efficiency Alliance Background

It is important to acknowledge that the public-policy arena has changed with respect to interventions to promote energy efficiency in the Pacific Northwest region. With the formation of the Northwest Energy Efficiency Alliance (Alliance), electric utilities, public interest groups and industry representatives joined together for the first time to promote energy efficiency and market transformation on a region-wide basis.² The Alliance has adopted market transformation as their prominent approach to help sustain energy-efficiency initiatives in an electric industry that is being reshaped by market forces and competition.

4.2 THEORY-BASED EVALUATION

XENERGY is using a theory-based evaluation (TBE) approach for the baseline and market effects portions of this study. TBE is a broad descriptor of an evaluation approach that has been used in a number of policy fields for some time. According to Weiss,³ the idea behind TBE is that:

¹ The above policy rules define a “market effect” as: A change in the structure or functioning of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficient products, services, or practices and is causally related to Market Interventions.

² Market transformation means reducing barriers in ways that “allow” customers to “obtain” all or a portion of cost-effective products and services in a self-sustaining fashion.

³ Weiss, Carol H., “How Can Theory-Based Evaluation Make Greater Headway?,” *Evaluation Review*, Vol. 21, No.4, August, 1997, 501-524.

...the beliefs and assumptions underlying an intervention can be expressed in terms of a phased sequence of causes and effects (i.e., a program theory). The evaluation is expected to collect data to see how well each step of the sequence is in fact borne out. This approach to evaluation offers a way in which evaluation can tell not only how much change has occurred but also, if the sequence of steps appears as expected, how the change occurred. If the posited sequence breaks down along the way, the evaluation can tell at what point the breakdown occurred.

TBE provides a critical framework to evaluate programs that seek to cause lasting structural changes in social or economic systems. The first lesson of TBE is that a useful evaluation must be fully informed by the causal theory that underlies the program intervention.

As the evaluation team, one of our first tasks is to collect and summarize information on program theories that have been articulated to date, and to add to these through our own analyses. This is a multi-phase process that will occur throughout the evaluation period. The first stage of the TBE involved conducting extensive background research to help construct as much of a working theory and set of hypotheses as possible to guide our research plan and the design of our residential consumer and contractor survey instruments.

The remainder of this section presents our initial program theories and hypotheses on how the PTCS Venture might induce lasting market effects. As such, this information was a critical *input* into finalizing our research plan and developing our survey instruments. The primary intent of this document is to develop a comprehensive foundation for the evaluation of the PTCS Venture.

In developing the initial theories and hypotheses that follow, we used the *Market Transformation Scoping Study*⁴ as a source of information and analytical frameworks, particularly with respect to definitions of market barriers.

4.3 INITIAL DISCUSSION OF THEORIES AND HYPOTHESES

A few caveats to the remainder of this section are warranted:

1. Our theory development is focused on the long-term effects of the PTCS Venture. Therefore, we do not assume that if market effects do not appear in the first years that they will not appear eventually.
2. We recognize that the PTCS Venture is continually evolving and changing and that the hypothesized effects may need to be changed as the program evolves.
3. Some effects can be expected to occur earlier than others.
4. We hope to assess each effect as best we can in this study, but in some cases we will need to rely on proximate indicators.

⁴ Eto, J., Prael, R., and Schlegel, J. (1996) *A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs*. Berkeley, CA: Lawrence Berkeley National Laboratory.

In order for energy-efficient HVAC, duct, and weatherization services to be self-sustaining in the marketplace, both supply-side and demand-side interests must become aligned with respect to the value of these services. On the supply side, it is critical that contractors are aware and knowledgeable about the PTCS suite of services, perceive these services as being profitable, and routinely promote and specify these services in their business interactions with end-users. On the demand side, it is equally critical that end-users are aware and knowledgeable about the PTCS services. In addition, most end-users must be able to justify their purchases based on some level of analysis or judgment that demonstrates that the incremental costs, if any, are justified based on the monetary value of the energy savings obtained, plus the value of any other non-energy benefits such as comfort, safety, and health affects. If the large majority of end-users' investment criteria are not met (which could be because a measure is genuinely uneconomic or because the end-users' investment criteria are inappropriate or nonexistent), then it is unlikely that enough demand for the products and services will occur to create significant self-sustaining markets.

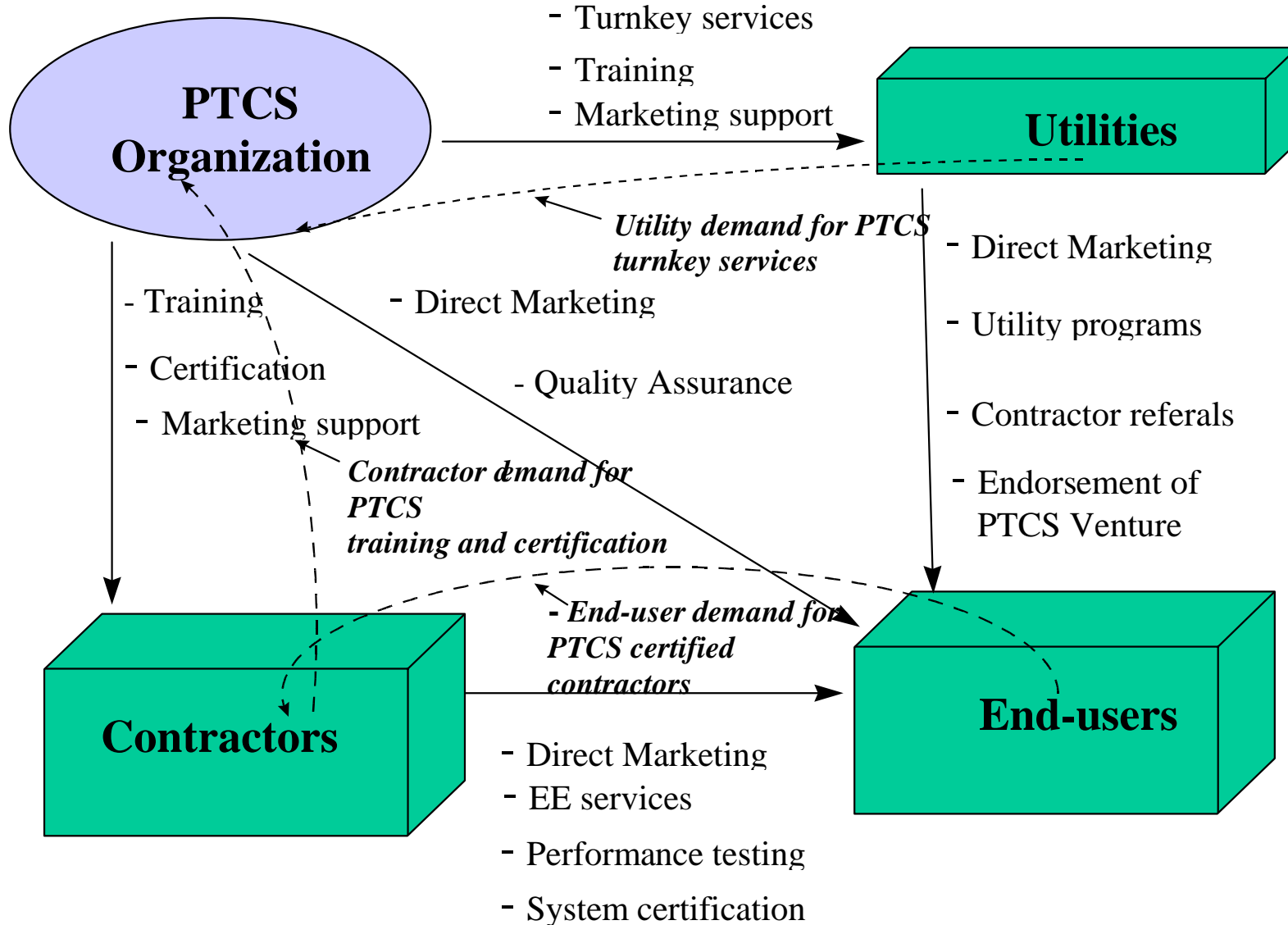
As first steps in our process of further developing the theories and hypotheses necessary for evaluating the PTCS, we drafted a number of diagrams that graphically present the interplay between the variety of market forces, market actors, and interventions relevant to the program. Figure 4-1 focuses on the big-picture relationships between the market actors and administrators. Key aspects of this diagram of which to take note include the following:

- The program interventions are managed by the PTCS organization. Responsibility for program administration recently transferred from the Oregon Office of Energy, who served as the program administrator from 1997 to 1999, to the PTCS organization which was formed in December, 1999.
- One of the effects postulated is that the venture leads end-users to prefer contractors who have been trained and certified under the PTCS Venture; thereby making certification a key driver in the choice calculus of contractors.
- Another effect postulated is that the program leads end-users to value HVAC, duct, and weatherization system performance testing and system certification services.
- On both the demand side and supply side, it is postulated that the program will increase general awareness and knowledge of potential benefits (comfort, safety, health, energy usage) of the energy-efficiency services promoted by the PTCS Venture.
- A related hypothesis is that customers respond positively to program-induced changes in private sector energy-efficiency offers, which simply initiates a positively reinforcing cycle of supply and demand for such services. Two important indicators of such a positive feedback mechanism would be increases in the number of certified contractors and the size of the market for their services.
- Another hypothesis is that contractors have lower credibility than the utilities and that they value the utility link to generate new customers.

- The program interventions themselves are focused on utilities, contractors, and end-users. Note that we do not show any *direct* program interventions at the builder or manufacturer level of the supply chain (see following bullet).
- Primary market effects are those that involve the demand for training and certification services by the contractors (supply-side actors). Additionally, primary effects involve demand for the downstream efficiency services that occurs between end-users and the trained and certified contractors (supply-side actors). Secondary effects involve the utilities that may purchase PTCS turnkey services or promote individual incentive programs at the local level.
- We do not recognize any significant hypothesized effects between upstream supply-side actors (i.e., manufacturers, builders or real estate agents) and downstream supply-side actors or end-users due to the following:
 - ⇒ The current program design does not explicitly involve or target manufacturers.
 - ⇒ The current program design does not explicitly include the new home market, and therefore there are no hypothesized effects with builders or real estate agents.

At the macro-level presented in Figure 4-1, the primary hypothesized effect of the program is to stimulate and reinforce a positive feedback relationship between contractors and end-users who demand energy-efficiency services pertaining to home heating, air conditioning, duct, and weatherization services. An implicit goal of the PTCS Venture is to encourage customers to obtain and procure efficiency services directly from private sector actors without reliance on utility incentives as a market intervention. Increased consumer demand for private sector efficiency services may then more fully support trained and certified contractors and encourage new entrants into the market—contractors who are trained and certified by the PTCS Venture. Eventually, increased consumer demand will lead to greater competition among service providers, reductions in the cost of services, and improved contractor marketing and sales practices. The long-term goal of the PTCS Venture is to create a *self-sustaining market* for energy-efficiency HVAC, duct, and weatherization products and services that captures *all, or a portion of*, the cost-effective opportunities for residential end-users.

Figure 4-1. PTCS Market Interventions and Feedback Mechanisms



PTCS Market Transformation Criteria

Market transformation and building a self-sustaining PTCS organization are core goals of the PTCS business plan. According to the PTCS business plan, market transformation will be measured against the following criteria:⁵

1. High-performance tested and certified HVAC, duct, and weatherization products and services, as represented by the important home characteristics to current and potential owners of residential homes, HVAC and weatherization contractors, utilities, lenders, and other key market participants.
2. A total of 27,232 site-built and manufactured homes in the four-state project region will have been certified for at least 1 major system component based on the PTCS standards for HVAC, ducts, and weatherization, by January 1, 2005. Additionally, 212 light commercial certifications will be issued by January 1, 2005.
3. HVAC and weatherization contractors include duct testing and sealing as a routine service offering. This implies that duct inspection and remediation services in accordance with PTCS standards are a profitable business opportunity with demonstrated and sustained market demand.
4. Fifteen percent of all HVAC contractors and 5 percent of all weatherization contractors within the venture region have PTCS certified technicians by 2004. Most importantly, there will be an adequate supply of trained and certified PTCS technicians in all venture geographic areas to meet consumer demand.
5. Residential energy rating systems include testing to meet PTCS standards.
6. Combination HVAC safety inspections and duct testing become a routine part of the mortgage and home inspection process.

Regarding the market transformation criteria, the PTCS business plan states, “these are very aggressive objectives for this venture. Yet for the PTCS organization to be successful in the long term, this degree of market transformation is required.”⁶

Figure 4-2, is a market influence diagram for the PTCS program. This diagram is based on the prototypes and examples presented in the *Market Transformation Scoping Study*. In this diagram, we provide additional detail on the program’s market interventions, the barriers targeted, and the hypothesized market effects that may result from the intervention. The market influence diagrams are designed to illustrate the following:⁷

⁵ Performance Tested Comfort Systems Business Plan, Dowling Consulting Services Inc., March 8, 2000.

⁶ PTCS Business Plan, et. al.

⁷ Eto, J., Prah, R., and Schlegel, J. (1996) *A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs*. Berkeley, CA: Lawrence Berkeley National Laboratory.

- The causal chain of specific market effects that are hypothesized to result from the program, showing, for each link in the chain, which market actors are posited as changing their market-oriented behavior, why they do so, and in what order
- Which market effects appear to be only temporary and which may have the potential to last after the program is withdrawn
- The specific relationship between the hypothesized market effects and any lasting reductions in the market barriers the program is believed to have the potential to achieve.

Figure 4-2 consists of the following elements:

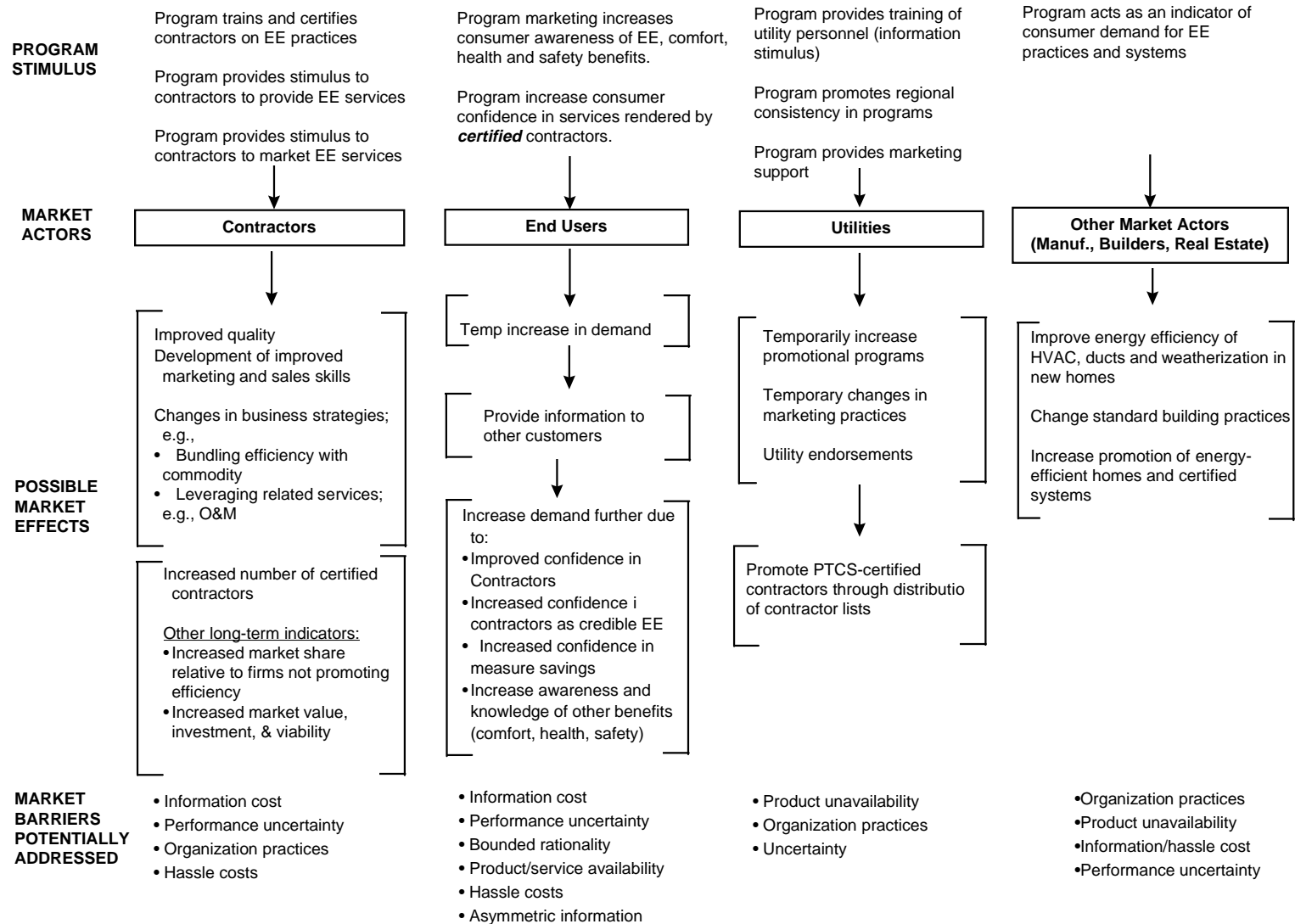
- At the top of the figure, a series of vertical arrows with captions denote the initial impact of the program on various market actors.
- Below these arrows, a row of boxes indicates the major categories of market actors believed to play a role in the series of behavioral changes that constitute the overall market effect. In this case there are four boxes, representing manufacturers, builders and real estate agents; utilities; contractors; and end-users.
- Below the boxes, indicating the major categories of market actors involved, a series of hypothesized market effects are categorized according to the set of market actors whose behavior is posited as changing.
- Finally, the market barriers these effects may be listed in the last row in the figure.

4.3.2 Program Interventions

The first horizontal section of Figure 4-2 presents the PTCS Venture program stimulus. The principal interventions of the PTCS Venture are shown in the third column and are focused on training and certifying contractors on energy-efficient practices pertaining to home heating, air conditioning, duct systems, and weatherization. The PTCS Venture provides the stimulus to contractors to apply their knowledge in the field by providing energy-efficient services to end-users. The PTCS program also offers marketing support to contractors, which in turn provides the stimulus to contractors to market energy-efficient services.

The fourth column of the diagram pertains to the end-users and displays additional market interventions of the PTCS program. It is important to note that the PTCS Venture encourages consumers to work directly with the contractor without the involvement, other than referral services, of the PTCS organization or local utilities. However, the PTCS organization will

Figure 4-2. PTCS Market Influence Diagram



provide direct marketing to end-users, which is likely to increase consumer awareness of the energy efficiency, comfort, health, and safety benefits of obtaining one or several of the services provided under the PTCS suite of services. Another program stimulus is that consumer confidence in the services rendered by *certified* contractors may increase. Consumers are likely to be reassured by the requirement that contractors must demonstrate technical ability in order to become a PTCS certified technician and by the quality assurance activities of the PTCS organization.

Program stimuli for other market actors are more indirect and are listed in the first two columns of the diagram. The PTCS Venture offers training to utility personnel and marketing support to utilities. As a result, the utilities may implement related energy-efficiency programs (incentive and or educational) to compliment the PTCS Venture and to further leverage the trained and certified contractors. Program stimuli at the equipment manufacturer, builder, and real estate level are limited to the indirect effect of increased end-user demand for energy-efficient equipment, performance testing, and labeling. An important question is whether the end-user demand will produce enough specific demand signals for PTCS related services and labeling to capture the attention the equipment manufacturers, home builders, and real estate agents.

The next major section of the influence diagram addresses the possible market effects of the PTCS Venture.

4.3.3 Possible Market Effects—Contractors

The principal effects of the program hypothesized to date are related to the training and certification of contractors and the resulting changes in contractor practices that may occur. All of the other hypothesized market effects are largely contingent on contractors changing their practices and marketing activities in lasting ways. To identify success indicators for this evaluation, we have hypothesized some of the specific ways in which contractor business practices might be effected by the PTCS Venture.

Training and certification improves quality of energy-efficiency services offered. Q&A adds credibility and consumer confidence. The training and certification programs serve to increase contractor awareness of energy-efficiency issues and practices. Contractors are trained how to provide technically sound efficiency services in a cost-effective manner. The quality assurance provisions of the PTCS Venture lend credibility to contractor services and may have the effect of increasing consumer confidence in the services rendered by a certified contractor. Additionally, the Q&A protocols may improve the knowledge and capability of some certified contractors by requiring that minimum standards be met and providing the appropriate feedback if they are not. This, in effect, raises the benchmark for service quality throughout the region. Consumers will be encouraged to seek out certified contractors who, by virtue of their certification, can demonstrate performance.

Development of improved marketing and sales skills. By providing marketing support, the PTCS Venture may enable or encourage contractors to make changes in their marketing and sales

practices. Such changes could include shifts in marketing strategies, branding and advertising to highlight energy-efficiency and performance testing capabilities and services. Related improvements in target marketing techniques may occur that could reduce customer acquisition costs. By leveraging the backing and credibility of their PTCS certification, contractors may also find it easier to promote energy-efficiency services and close sales. Another result could be new organizational structures and alliances between contractors and other market actors. For example, a contractor might team with a builder to offer new energy-efficient and certified homes.

Changes in business strategies and new market entrants. Changes in a variety of energy-efficiency services can be hypothesized based on the PTCS interventions. By training and certifying contractors, the program may provide the foundation for a new group of contractors who specialize in energy efficiency and performance testing services. The PTCS program has evolved to offer a broad range of services that enhances the potential business viability to contractors. Contractors may choose to bundle energy-efficiency services with more traditional commodity or O&M services, thereby increasing the profit-earning potential per consumer.

Changes in number of certified contractors and increased market share of these firms relative to firms not promoting energy efficiency. Increases in market valuation, investment, and improved financing terms. Consistent with the specific changes in business practices and service offerings described above, changes in the size and characteristics of the HVAC contracting industry itself are important potential market effects. The program may lead, in the short term, to new market entrants and changes in the types of entities providing HVAC energy-efficiency services. This may also lead to increases in the relative market share of certified contractors in comparison with competing firms that do not actively promote energy-efficient products and services. If certified contractors are successful in the marketplace, it is likely that their market value will also increase. A related effect could be that certified contractors are able to attract greater investment and lower-cost financing, which could lead to further business expansion and product and service improvements. In addition, for energy-efficiency products and services to be offered cost-effectively to the marketplace, the industry itself will need to be sufficiently competitive (e.g., it must be free of barriers associated with imperfect competition and imperfect regulation). If these short-term, supply-side changes contribute to the stimulation of supporting long-term demand-side effects, then both sets of effects are more likely to sustain (by reinforcing each other) when the program interventions are withdrawn.

4.3.4 Possible Market Effects—End Users

When evaluating the market effects of the PTCS Venture on end-users, it is important to recognize that ***end-users are the demand engine upon which all self-sustaining changes in the marketplace are dependent.*** With the increased funding for PTCS marketing activities, the venture is now addressing one of the most important market barriers that affects end-users—information or search costs. While the marketing activities of contractors have the potential to mitigate this barrier, the likelihood of significant marketing by contractors without moderate consumer demand is low. Therefore, direct marketing by the PTCS organization to end-users is

an important component of the program. The Venture’s mission is to be “the indispensable source for state-of-the-art information related to safe, cost-effective, and healthy home heating, air conditioning, duct systems, and weatherization that consumers will turn to when purchasing decisions are required.” The consumer-related market effects for which we have developed hypotheses are provided below.

Increased awareness and knowledge of the benefits of services including comfort, health, and safety. The PTCS Venture has sought to address the information barrier pertaining to the health, comfort, and safety barriers. This may lead to a program-induced, short-term increase in awareness and knowledge of the benefits of these PTCS efficiency solutions. It is less clear whether this increase in awareness and knowledge would be sustainable in the long term without the reduction of a number of other market barriers. This process is most likely to reinforce and become sustainable if customers go on to make investments in the measures for which they have become aware and knowledgeable (which may require concomitant reductions in other barriers), and then are satisfied with the results that they achieve.

Increased demand for contractor services, performance testing and system certification(s). As a result of the marketing activities of the PTCS organization, contractors and utilities, consumer awareness of the potential benefits of the PTCS suite of services increases in the short term. Hence, consumer demand for contractors to provide energy-efficiency, performance testing, and system certification services also increases in the short-term. This increase in consumer demand serves to encourage more contractors to pursue training and certification.

Improved confidence in contractors as service provider. One of the hypothesized market effects of the PTCS Venture is to increase consumer confidence in contractor services. By training and certifying contractors, the PTCS Venture lends credibility to the energy-efficiency services that are being promoted by the certified contractors.

Some of the reluctance on the consumers’ part to purchase energy-efficiency services from contractors may be related to the fact that, in the Pacific Northwest, residential consumers have been able to obtain a variety of energy-efficiency services rather easily from utilities for many years.⁸ The PTCS Venture strongly encourages the consumers to deal directly with the contractors, thus increasing the likelihood for market transformation and self-sustainability.

Increased confidence in measure savings. Performance uncertainty is a frequently cited barrier associated with customers’ reluctance to invest in cost-effective, energy-efficiency opportunities. The PTCS organization provides quality assurance and promotes some reassurance that the proposed measure(s) have been installed properly.

⁸ Many customers were no doubt accustomed to obtaining such service seemingly free of charge, although, of course, their costs have always been spread among ratepayers.

4.3.5 Possible Market Effects—Utilities

The hypothesized market effects on utilities are discussed below.

Utility endorsement of PTCS Venture and temporary increases in utility-related programs and marketing activities. The PTCS organization’s objective is to win the endorsement of the local utilities in the Pacific Northwest Region. The PTCS Venture provides training and marketing support to utilities. The training is the same as that provided to the contractors and thus provides the utility personnel with information on HVAC, duct, and weatherization practices and protocols. After completing the training program, utility personnel are more likely to design and implement similar complimentary energy-efficiency programs. For instance, the utilities may choose to design programs, such as low-income weatherization programs, which leverage the benefits of the trained cadre of contractors. The PTCS Venture also provides marketing support to utilities. These market interventions are likely to result at the local level in utility endorsements of the PTCS Venture, which adds credibility to the venture, and temporary increases in related utility energy-efficiency program and marketing activities.

Utilities to promote PTCS-certified contractors through distribution of list. The utilities may decide to promote the PTCS Venture by publishing a list of certified contractors that could be distributed to their customers. This will serve to further stimulate increased consumer confidence in the PTCS-certified contractors and reduce hassle costs of acquiring a contractor.

4.3.6 Possible Market Effects—Manufacturers, Builders, Real Estate Agents

Most of the hypothesized market effects of the PTCS Venture are indirect program effects that result from these market actors’ responses to increases in the demand for energy-efficient products and services.

Manufacturers respond to increased market demand. One of the hypothesized market effects, although indirect and weak, is consumer demand for energy-efficient products services may increase to a level that is recognized by the manufacturers of energy-efficient HVAC, duct, and weatherization products. Increased consumer demand may lead to increased manufacturer production and may then lead to economies of scale and production rationalizations that result in decreases in the product’s production cost. These production cost decreases may then be passed along to end-users by distributors, builders, and contractors. These reduced prices to end-users may then stimulate even more demand for the product and set about another cycle of the positive feedback loop.

New home builders improve energy efficiency. As a result of the successful market interventions of the PTCS Venture, consumers may begin to request PTCS energy-efficiency labels on the HVAC and duct systems in the new homes that they are purchasing. In response to end-user demand, home builders may need to improve energy efficiency to secure premium prices. This may result in builders changing their standard building practices in the new home market.

Real estate agents market home's energy-efficiency attributes in sales transactions. PTCS certification labels on the home's heating, cooling, or duct systems and overall energy efficiency may eventually become attributes that consumers look for when purchasing a new home. As consumer awareness of the PTCS certification labels increases, real estate agents may choose to include the PTCS certification status in their sales strategies to prospective home buyers.

The market barriers addressed by the program are discussed in the next section. Our focus is on end-user and contractor market barriers since this is the main focus of the PTCS Venture.

4.3.7 Market Barriers Potentially Addressed—End Users

Our focus in this section is on end-user level barriers (contractor barriers are presented in the following subsection). In Table 4-1, we present short summaries of the market barrier definitions from the *Market Transformation Scoping Study* as a reference to this discussion. In Table 4-2, we present a summary of our assessments of the extent to which the PTCS Venture and contractors address the end-user market barriers. We believe that the end-user barriers with the greatest relative likelihood of being reduced by the PTCS Venture include the following:

- Information or search costs
- Performance uncertainty
- Bounded rationality
- Product/service unavailability
- Asymmetric information and opportunism
- Hassle or transaction costs.

We offer the following observations on the barriers in addition to Table 4-2:

- It is important to note that the contractors have faced all of these end-user barriers for many years. It is also true that traditional utility demand-side management programs provided a double-edged intervention into efficiency markets from the perspective of contractors. On the one hand, many contractors were able to use utility rebate programs to support projects that they initiated with end-users; while, on the other hand, utility programs served as an easily accessible, virtually free alternative source of energy-efficiency information and services that competed directly with contractors for customers' business and attention. The extent to which these programs might have inhibited contractors' ability to reduce end-use level barriers is unknown.
- As shown in the list of six barriers listed above, the PTCS Venture appears to address a small but important subset of end-user barriers. However, many of the other barriers shown in Table 4-1 are hypothesized to be mitigated indirectly by the PTCS Venture program interventions. The strength of these linkages is uncertain and is likely contingent upon significant changes in the role of contractors as barrier "mitigators."

Table 4-1. Summary of Market Barrier Definitions

Barrier	Description
Information or Search Costs	The costs of identifying energy-efficient products or services or of learning about energy-efficient practices, including the value of time spent finding out about or locating a product or service or hiring someone else to do so.
Performance Uncertainties	The difficulties consumers face in evaluating claims about future benefits. Closely related to high search costs, in that acquiring the information needed to evaluate claims regarding future performance is rarely costless.
Asymmetric Information and Opportunism	The tendency of sellers of energy-efficient products or services to have more and better information about their offerings than do consumers, which, combined with potential incentives to mislead, can lead to sub-optimal purchasing behavior.
Hassle or Transaction Costs	The indirect costs of acquiring energy efficiency, including the time, materials and labor involved in obtaining or contracting for an energy-efficient product or service. (Distinct from search costs in that it refers to what happens once a product has been located.)
Hidden Costs	Unexpected costs associated with reliance on or operation of energy-efficient products or services - for example, extra operating and maintenance costs.
Access to Financing	The difficulties associated with the lending industry's historic inability to account for the unique features of loans for energy savings products (i.e., that future reductions in utility bills increase the borrower's ability to repay a loan) in underwriting procedures.
Bounded Rationality	The behavior of an individual during the decision-making process that either seems or actually is inconsistent with the individual's goals.
Organization Practices or Customs	Organizational behavior or systems of practice that discourage or inhibit cost-effective energy-efficiency decisions - for example, procurement rules that make it difficult to act on energy-efficiency decisions based on economic merit.
Misplaced or split incentives	Cases in which the incentives of an agent charged with purchasing energy efficiency are not aligned with those of the persons who would benefit from the purchase.
Product or service Unavailability	The failure of manufacturers, distributors or vendors to make a product or service available in a given area or market. May result from collusion, bounded rationality, or supply constraints.
Externalities	Costs that are associated with transactions, but which are not reflected in the price paid in the transaction.
Non-externality Pricing	Factors other than externalities that move prices away from marginal cost. An example arises when utility commodity prices are set using ratemaking practices based on average (rather than marginal) costs.
Inseparability of Product Features	The difficulties consumers sometimes face in acquiring desirable energy-efficiency features in products without also acquiring (and paying for) additional undesired features that increase the total cost of the product beyond what the consumer is willing to pay.
Irreversibility	The difficulty of reversing a purchase decision in light of new information that may become available, which may deter the initial purchase - for example, if energy prices decline, one cannot resell insulation that has been blown into a wall.

Table 4-2. Contractors, the PTCS Venture, and End-User Market Barriers

Market Barrier	Role/Action of Contractor (Prior to PTCS Venture)	How Program Might Mitigate Barrier
Information or Search Costs	Part of contractor's value is to reduce information or search costs to the consumer. But some consumers may be uncomfortable relying on contractors for this if the customer distrusts the asymmetric information difference between themselves and the contractor.	A direct effect could occur to the extent that program raises end-users' trust of contractors as sources for reducing information costs and customers begin to use contractors in this capacity. See also Asymmetric Information.
Performance Uncertainties	Contractors have a difficult time alleviating consumer concerns regarding estimated savings and payback resulting from energy efficiency practices. All uncertainties cannot be eliminated because of non-constant factors (thermostat settings, occupancy, etc.) and their potential impact on savings.	The training and certification of contractors by the PTCS Venture lends credibility to certified contractors. Additionally, the Q&A provisions and utility endorsements add a third-party credibility effect. Still, not all uncertainties are likely to be eliminated.
Bounded Rationality	Contractors are challenged by consumers who do not make decisions that would appear to be rational. An historic marketing and communications challenge that contractors overcome or don't to varying degrees.	An indirect effect could arise via the program's reduction of other market barriers. For example, if more projects are undertaken because of reduced performance uncertainty, good experiences with these projects could change the consumers broader practices and policies towards efficiency investments.
Product or Service Unavailability	Contractors may be able to address short-term availability of existing products or services. Individual contractors less able to effect new product development.	Indirect effect possible in that increased consumer demand can stimulate EE product and service development and sales.
Asymmetric Information and Opportunism	Contractors historically must convince customers that their asymmetric advantage, i.e. more and better information, will be used to the customer's benefit. Customers are not always convinced.	End users experience with certified contractors may increase their knowledge and, concurrently, confidence in negotiating with certified contractors in the future. In addition, as stated above, third party endorsement by utilities and support from the PTCS organization could lead to more comfort with information provided by certified contractors.
Hassle or Transaction Costs	Contractor may eliminate some or all of these, but may also add new costs with respect to their own service contracts.	Utility supplied lists of certified contractors may reduce hassle costs of obtaining qualified and reputable contractors.

This section presents findings from a survey of homeowners in the four northwestern states¹. Approximately 500 homeowners with a primary heating system using either natural gas, electricity, heating oil, or propane were surveyed. Renters and homeowners that use wood as their primary heating fuel were excluded from the survey. This section provides key findings on the following topics:

- Summary of home characteristics
- Consumer purchasing behavior
- Cost of services
- Consumer interest in HVAC safety/efficiency certification
- Purchase decision factors
- Importance of contractor certification
- High-value market segment results.

A full discussion of the sample design for the residential survey is provided in the Survey Methods Section of this report. Volume II of this report provides the survey statistics for the complete set of survey questions and cross-tabulations on various market segments such as dwelling type, state, housing age, and primary heating system type.

5.1 SUMMARY OF HOME CHARACTERISTICS

Table 5-1 summarizes the household characteristics of the survey respondents. Characteristics are also provided by dwelling type and housing age. Site-built homes account for 84 percent of the homes surveyed, while manufactured homes make up the remaining 16 percent.

More than 80 percent of the surveyed homes have a central heating system or a heat pump. Natural gas central systems are most prevalent, followed closely by central electric systems. Electric heating systems dominate in the manufactured home segment (83 percent). The saturation of electric heating systems is higher for homes built in the last 20 years compared to homes that are more than 20 years old (52 percent vs. 35 percent).²

¹ Oregon, Washington, Idaho, and Montana

² Respondents were screened out if they had wood or pellet heating. Approximately 4.9% of the respondents (prior to screening) reported that they had wood or pellet heating.

About one-fourth of the surveyed homes have some form of a central air conditioning system. As expected, newer homes are nearly 50 percent more likely to have a central cooling systems than older homes. There is an unexpected discrepancy between the reported heat pump systems for heating and cooling in the manufactured home segment.

As expected, the site-built homes tend to be quite a bit larger and have more residents than the manufactured homes on average. Interestingly, the reported average monthly energy bills tend to be very similar across the two dwelling segments and the two housing age segments.

**Table 5-1
Summary of Home Characteristics**

	All Homes	Home Type		Home Age	
		Site Built Homes	Manufactured Homes	≤20 years old	>20 years old
Heating Systems					
Central Heating System	70%	69%	72%	71%	69%
Natural Gas	42%	49%	6%	39%	45%
Electric	18%	10%	60%	25%	12%
Oil	6%	8%	0%	1%	11%
Propane	4%	4%	6%	6%	2%
Heat Pump Heating	11%	9%	17%	13%	8%
Non-Central Heating System					
Natural Gas	3%	3%	4%	1%	5%
Electric	15%	16%	6%	14%	15%
Propane or Oil	2%	2%	1%	1%	2%
Cooling Systems					
Central Air Conditioning	15%	16%	10%	17%	13%
Heat Pump Cooling System	9%	10%	8%	12%	7%
Non-Central Cooling System	11%	10%	18%	8%	14%
State					
Oregon	30%	28%	41%	28%	31%
Washington	52%	55%	38%	56%	49%
Idaho	10%	11%	9%	11%	10%
Montana	8%	7%	13%	5%	10%
Home Type					
Site Built Home- Single Family	78%	93%	0%	66%	88%
Site Built Home- Other	5%	6%	0%	8%	3%
Manufactured Home	16%	0%	100%	26%	7%
Average home age, years	31	34	15	10	48
Average number of people in the home	3.1	3.1	2.8	3.4	2.8
Average size of home	2,219	2,364	1,395	2,160	2,270
Average typical monthly energy bill					
Last summer	\$74	\$75	\$74	\$73	\$75
Last winter	\$120	\$120	\$116	\$121	\$119
Number in sample	503	424	79	227	276
Percent in sample	100%	84%	16%	45%	55%

5.2 CONSUMER PURCHASING BEHAVIOR

Consumers were asked about their purchasing behavior pertaining to heating, cooling, duct, and weatherization services. Table 5-2 shows the types of purchases that customers were asked about on the survey. The services have been categorized into target and non-target services, where the target services comprise the types of activities that tend to be promoted through this venture.

Table 5-2
Definition of Target versus Non-Target Services

Service Categories	Target Services	Non Target Services
Heating	<ul style="list-style-type: none"> • Safety/Efficiency Testing • General Maintenance 	<ul style="list-style-type: none"> • Equipment Repair/ • Upgrading or Replacing Equipment
Cooling	<ul style="list-style-type: none"> • Safety/Efficiency Testing • General Maintenance 	<ul style="list-style-type: none"> • Equipment Repair • Upgrading or Replacing Equipment
Ducts	<ul style="list-style-type: none"> • Testing, Sealing • Insulation, Repair 	<ul style="list-style-type: none"> • Duct Cleaning
Weatherization	<ul style="list-style-type: none"> • Weatherstripping • Insulation 	<ul style="list-style-type: none"> • Window Treatments • Miscellaneous Weatherization

Figure 5-1 provides the portion of respondents that stated they had purchased at least one of the services. More than two-thirds of the homes (69 percent) had purchased at least one service, while 61 percent made a purchase in the last four years.

Figure 5-1
Percentage of Consumers who Purchase a Service

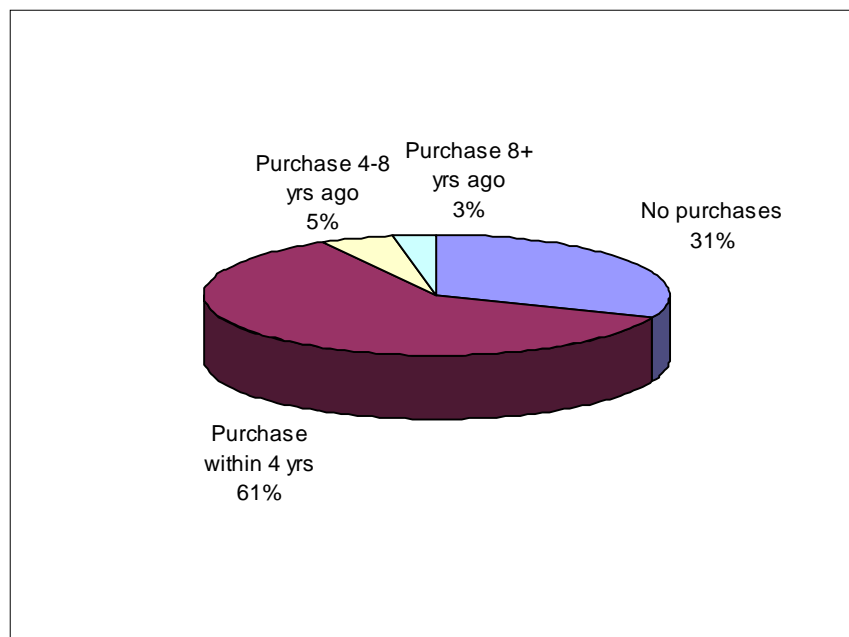


Figure 5-2 shows the portion of homes that purchased at least one target service. Slightly more than half of the respondents (54 percent) stated that they had purchased one target service. Nearly two-thirds of the respondents that purchased their last target service more than four years ago also purchased a non-target service in the last four years.

Figure 5-2
Percentage of Consumers who Purchase a Target Service

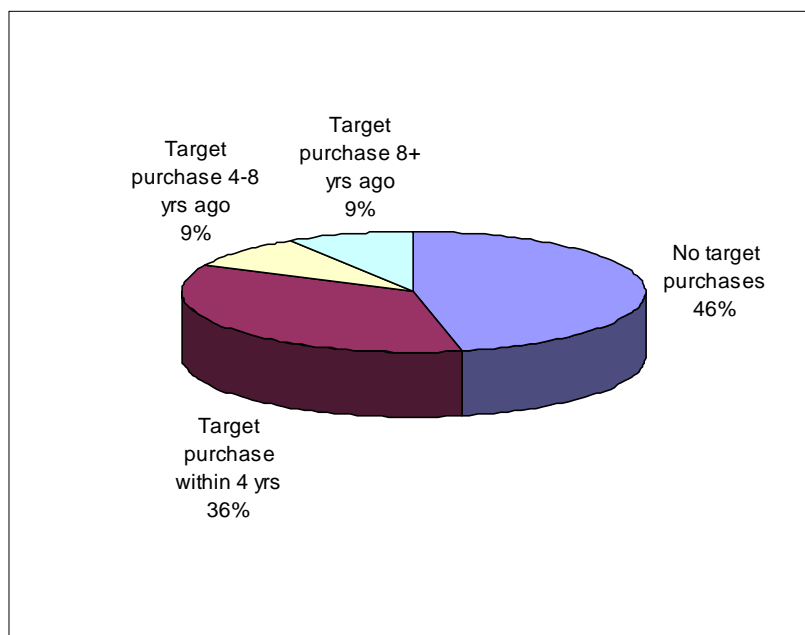


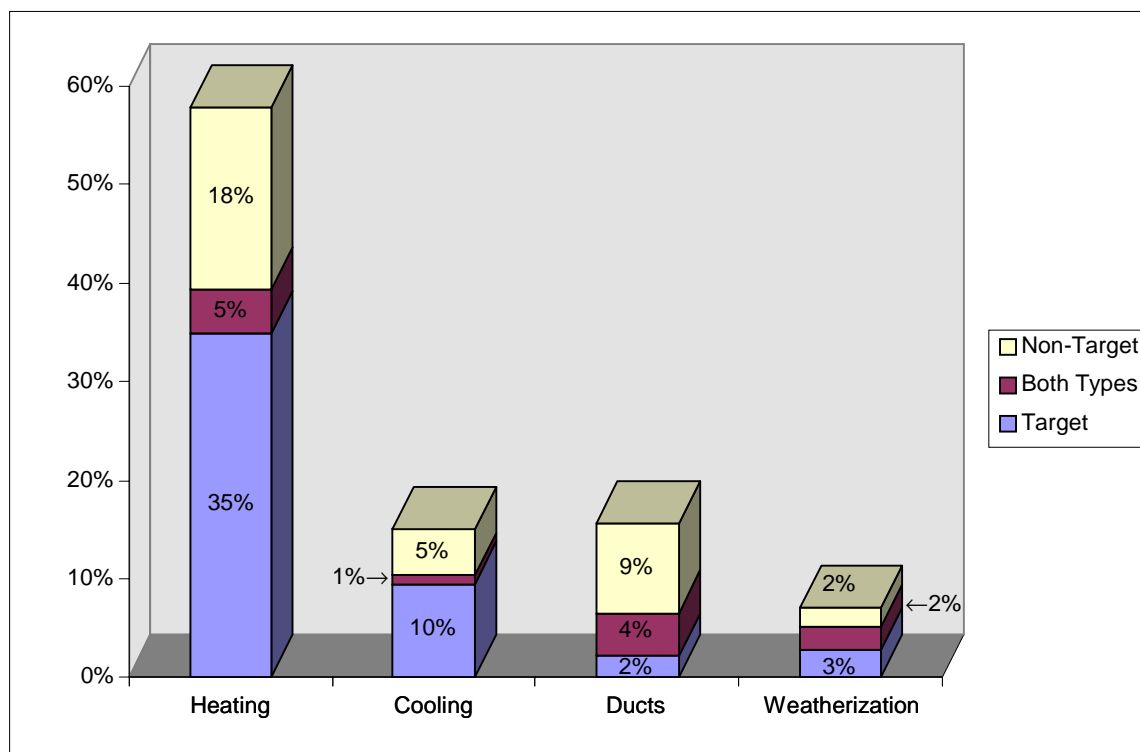
Figure 5-3 provides the percentage of homes that had a service performed during the last four years for each of the four service categories.

More than 90 percent of the homes that received one or more service in the last four years had at least one service performed on their heating system. General maintenance accounts for the vast majority of the target services, while system replacement and repairs provided fairly equal shares of the non-target heating system services.

Services were performed on more than half of the existing central cooling systems, given that 24 percent of the homes have a central cooling system (including heat pumps). General maintenance was reported by 10 percent of the homes, while 3 percent had their cooling system replaced. Nearly all of the homes that reported receiving a cooling system service also reported that services were performed on their heating system.

Duct cleaning was the by far the most common activity in the duct service category. As with cooling, the vast majority of respondents that had a duct service performed also had their heating system serviced in some fashion. Weatherization activity was evenly split between adding insulation, weatherstripping, and window treatments at about 3 percent each.

Figure 5-3
Respondents Receiving Services Within Four Years



All survey respondents were also asked if they had replaced or added any windows or glass doors in their homes during the last 12 months. Fifteen percent of the respondents stated that they had replaced at least one window or glass door. About half of these respondents had a major replacement project that involved replacing at least four windows or doors.

The penetration of safety and efficiency testing services for heating system, cooling system, and duct systems are of particular interest to this venture. Table 5-3 shows the portion of respondents that had one of these testing services performed during the last four years. About 10 percent of homes had one or more of these services performed.

Table 5-3
Testing Service Penetration during Last Four Years

System Tested	Percent of Homes Receiving Test
Heating	8%
Cooling	1%
Ducts	3%

Nearly half of the heating and cooling tests were provided as a standalone service. Nearly all of the duct tests were done in conjunction with a duct cleaning and sealing/repair.

Table 5-4 illustrates the relationship between consumers' target service purchases and heating/cooling system type. Respondents with gas central forced-air furnaces are more likely than those with an electric system and other non-central system to have purchased one or more services during the last four years. Respondents with heat pumps and those with central air conditioning systems were the most likely to have services performed in two or more categories. However, this is largely due to the fact that general maintenance and testing are typically performed on both the heating and cooling system together thus resulting in a service being performed in both categories.

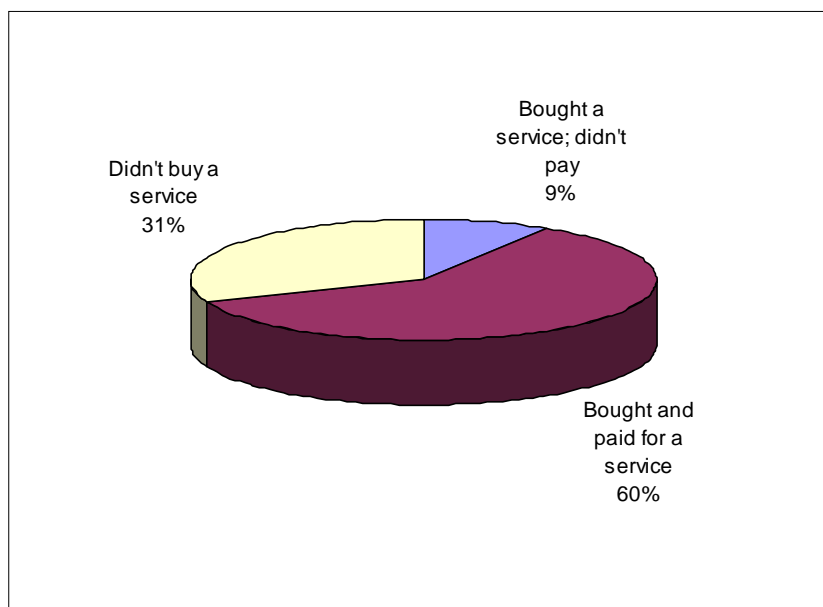
Table 5-4
Number of Target Services Purchased by Heating and Cooling System Type

Heating System Type	Number of Categories where Target Services were Received	
	1	2+
Gas Central FAU	39%	17%
Electric Heat Pump	19%	28%
Electric Central FAU	28%	8%
Other	29%	2%
Central Cooling System Present	26%	37%

5.3 COST OF SERVICES

Respondents were asked to provide the approximate cost of the latest service they received for each of the four service categories. Figure 5-4 shows the portion of homes that had a service performed and whether or not the service was provided for free. Nearly one of seven respondents that received services stated that they did not pay anything for the service. This is likely due to having a service, such as repair and maintenance, done under warranty or by the homeowner. A free service can also arise from having a service such as testing paid for or performed by their utility.

Figure 5-4
Percentage of Consumers who Paid for a Service



The average cost reported by service category is shown in Table 5-5. It should be noted that non-target services, such as system replacements, are included in this data. Thus, the average costs for heating and cooling services reflect a small portion of expensive system replacements averaged with a larger number of lower cost maintenance, testing, and repair services. The average cost of duct services usually includes cleaning and a small number of testing/upgrading services.

Table 5-5
Average Cost of Service for Consumers who Paid for Service

Service	n	Mean
Heating	193	\$585
Cooling	61	\$351
Ducts	54	\$310
Weatherization	43	\$2,814

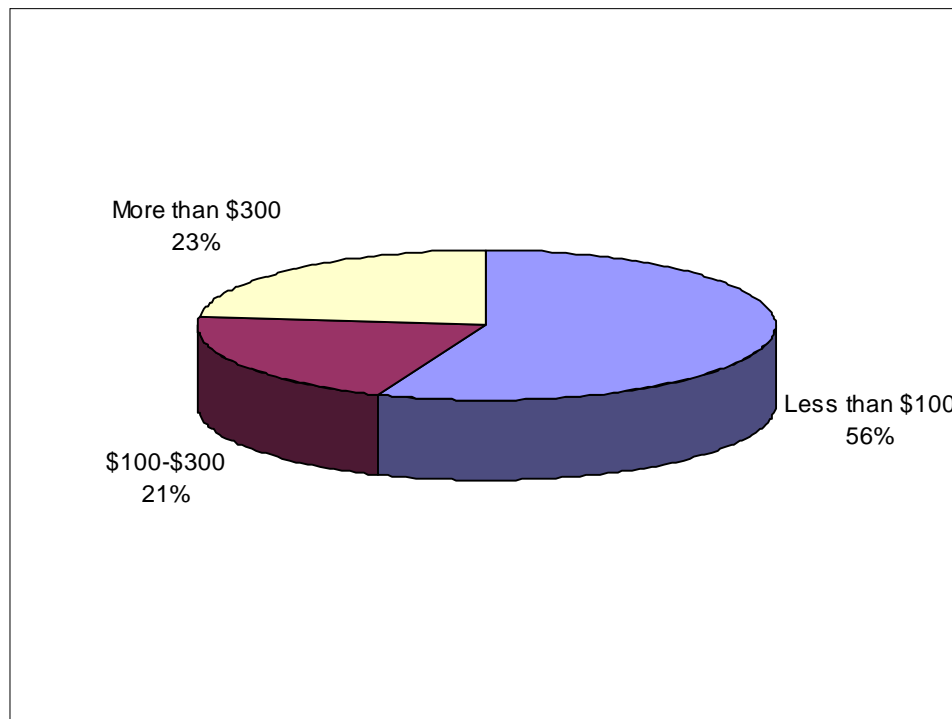
Table 5-6 provides the average costs for cases where just targeted services were installed. The heating and cooling costs in this table generally reflect the average cost of a general maintenance visit. There were very few cases where a customer only received target duct and weatherization services and paid something for these services. Duct testing services were usually done in combination with a duct cleaning. Many customers who just did weatherstripping stated that it was done for free for one reason or another.

Table 5-6
Average Cost of Service for Consumers Who Purchased Target Services Only

Service	n	Mean
Heating	102	\$93
Cooling	34	\$107
Ducts	4	\$240
Weatherization	8	\$2,658

Figure 5-5 shows the distribution of the total amount spent on services for those consumers who purchased services (60 percent of all consumers). As displayed, about one-fourth (23 percent) of the of the consumers that paid for a service, or 15 percent of all homes, spent more than \$300 for these services. This group of consumers that spent more than \$300 tended to replace their heating system, given that 10 percent of respondents replaced their heating system in the last four years. This value does not reflect the total amount paid by a consumer because the respondents were asked to provide the cost for just the most recent set of services they received in each of the four service categories. Nevertheless, it may be concluded that only a very small portion of consumers spend more than \$300 every few years for HVAC-related services unless they need to replace a heating or cooling system.

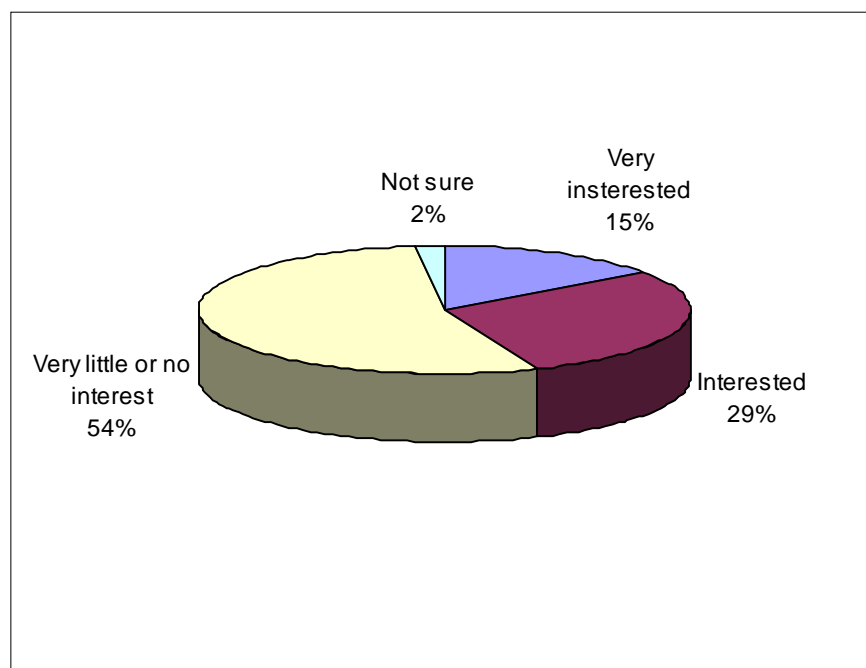
Figure 5-5
Distribution of Total Amount Spent on Services for those who Paid for Services



5.4 INTEREST IN HVAC SYSTEM SAFETY & EFFICIENCY CERTIFICATION

Respondents were asked to rate their level of interest in having their home's HVAC system checked and certified for safety and efficiency. Figure 5-6 illustrates consumer interest in system certification. About 15 percent of respondents were very interested, while 54 percent stated that they had little or no interest in having their HVAC system certified.

Figure 5-6
Consumer Interest in HVAC System Check and Certification



The respondents who stated they were interested in having their HVAC system checked and certified were also asked the amount they would be willing to pay for this service. Approximately 25 percent of the respondents reported that they would be willing to pay up to \$50 for this service. Another quarter of the respondents (26 percent) stated that they would be willing to pay between \$50 and \$99 for this service. Only one-fifth (18 percent) of the interested respondents appear willing to pay more than \$100 for system certification at this time. This suggests that there may be a disconnect between most consumers' willingness to pay and the contractors' cost of providing this service. As discussed in the Section 4, if the majority of consumers' investment criteria are not met, it is unlikely that enough demand for the products and services will occur to create significant self-sustaining markets. This finding supports the importance of planned program interventions such as marketing workshops for contractors and direct marketing to homeowners.

Table 5-7 displays the correlation between consumer interest and willingness to pay for HVAC safety and efficiency certification and the amount of target services that had been purchased in the previous four years. The willingness to pay of those respondents who stated that they were

interested in system certification is summarized in the last three columns. As shown, those respondents who purchased target services in two or more categories tend to be willing to pay more for system certification. Interestingly, the number of target services purchased does not seem to affect the portion of respondents that are not interested in system certification.

Table 5-5-7
Willingness to Pay for HVAC Certification by Number of Target Services Purchased within the Past Four Years

Number of Categories where Target Services were Purchased	Not Interested	Interested in HVAC Certification		
		\$1-\$49	\$50-\$99	\$100 or more
0	53%	20%	14%	12%
1	55%	14%	22%	9%
2+	55%	6%	11%	28%

Table 5-8 describes the relationship between consumer interest and willingness to pay for HVAC safety and efficiency certification and the type of target service purchased. Notably, those who purchased services for their heating and cooling systems were a little more likely to report willingness to pay of \$50 or more than those who purchased services for their ducts and weatherization.

Table 5-8
Willingness to Pay by Type of Target Service Purchased

Number of Categories where Target Services were Purchased	Not Interested	Interested in HVAC Certification		
		\$1-\$49	\$50-\$99	\$100 or more
Heating	55%	10%	20%	14%
Cooling	52%	9%	14%	25%
Ducts	64%	5%	5%	27%
Weatherization	50%	22%	5%	22%

5.5 PURCHASE DECISION FACTORS

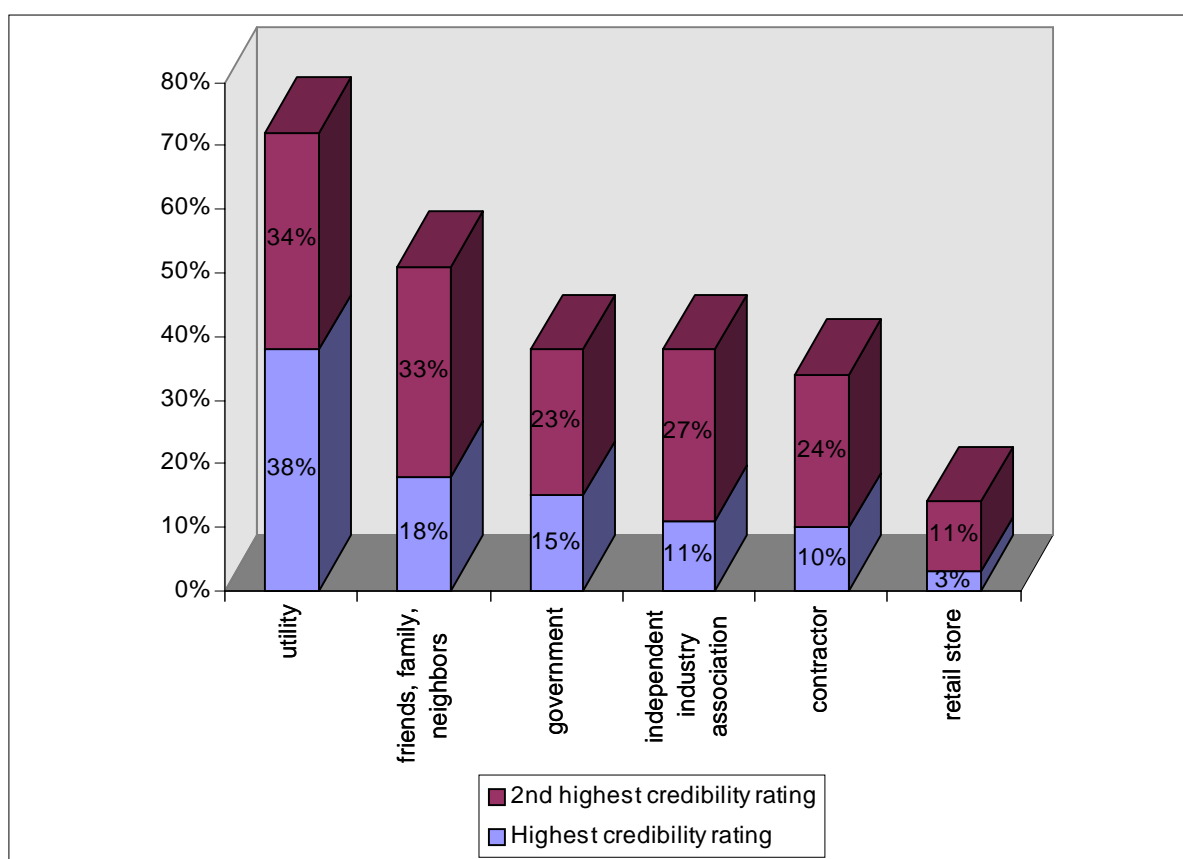
The consumer survey collected data on the several factors that may influence the consumer decision-making process including:

- Credibility of various market actors as information sources
- Market influences on purchasing behavior
- Importance of different types of information sources in making the decision to purchase.

Consumers were asked to rate the credibility of several potential information providers, including their utility, a contractor, government, independent industry association, retail stores, and family-

friends-neighbors. As Figure 5-7 displays, the utility was rated as the most credible by the respondents, with 72 percent of respondents providing a high credibility rating. Friends, family, and neighbors received the next highest credibility rating, followed by an independent industry association, and the government. Not surprisingly, contractors and retail stores were rated as the least credible by respondents.

Figure 5-7
Credibility of Information Sources

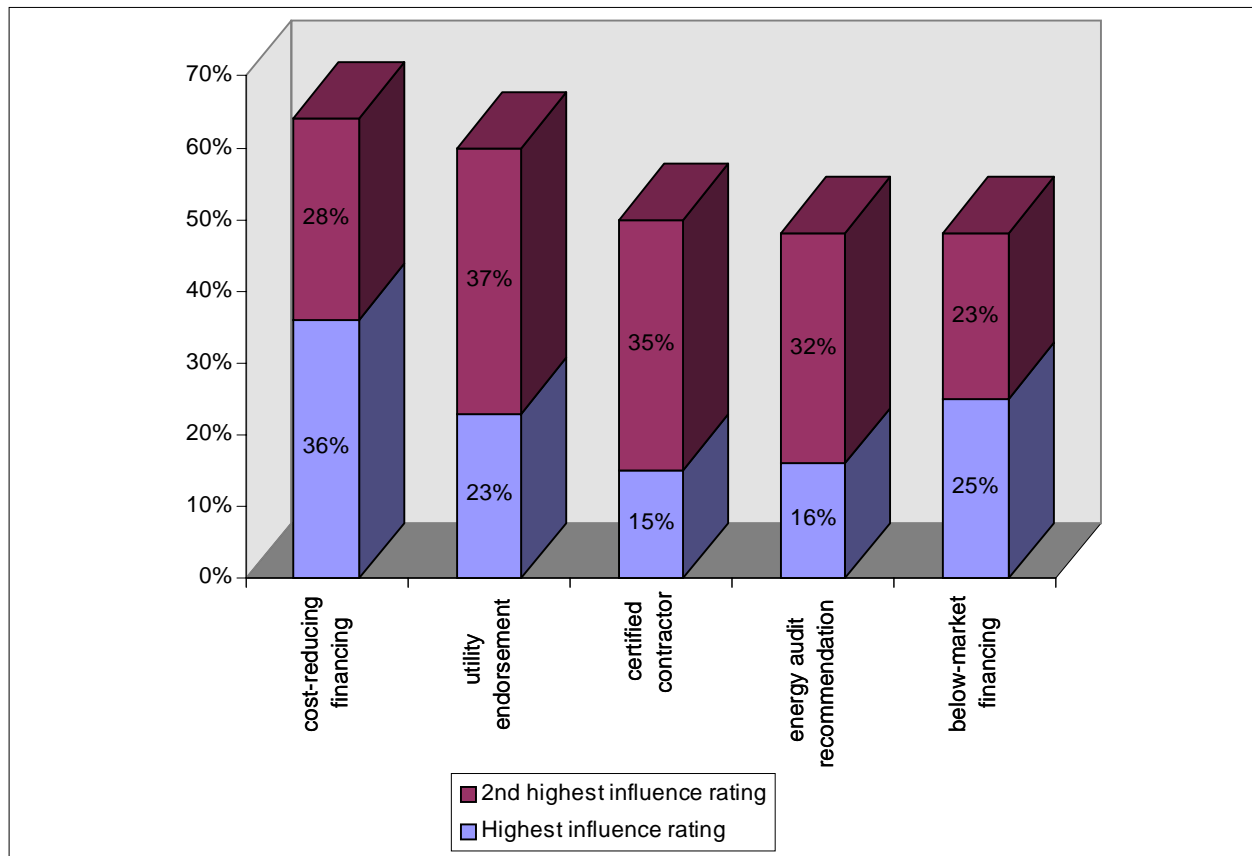


In Figure 5-7 as well as the following two figures, respondents were asked to provide a rating of credibility or likely influence on a 1-to-5 scale, where a 1 reflects no credibility or no effect while a 5 corresponds to being very credible or having a strong influence. The highest rating in these figures correspond to a 5 rating while the second highest ranking reflects a 4 rating.

Independent market events such as a utility endorsement of a heating system safety check may influence consumers' purchasing behavior. Figure 5-8 displays how consumers rated the influence of various market actions on their decision to purchase services for their home's heating, cooling, and duct systems or for weatherization services.

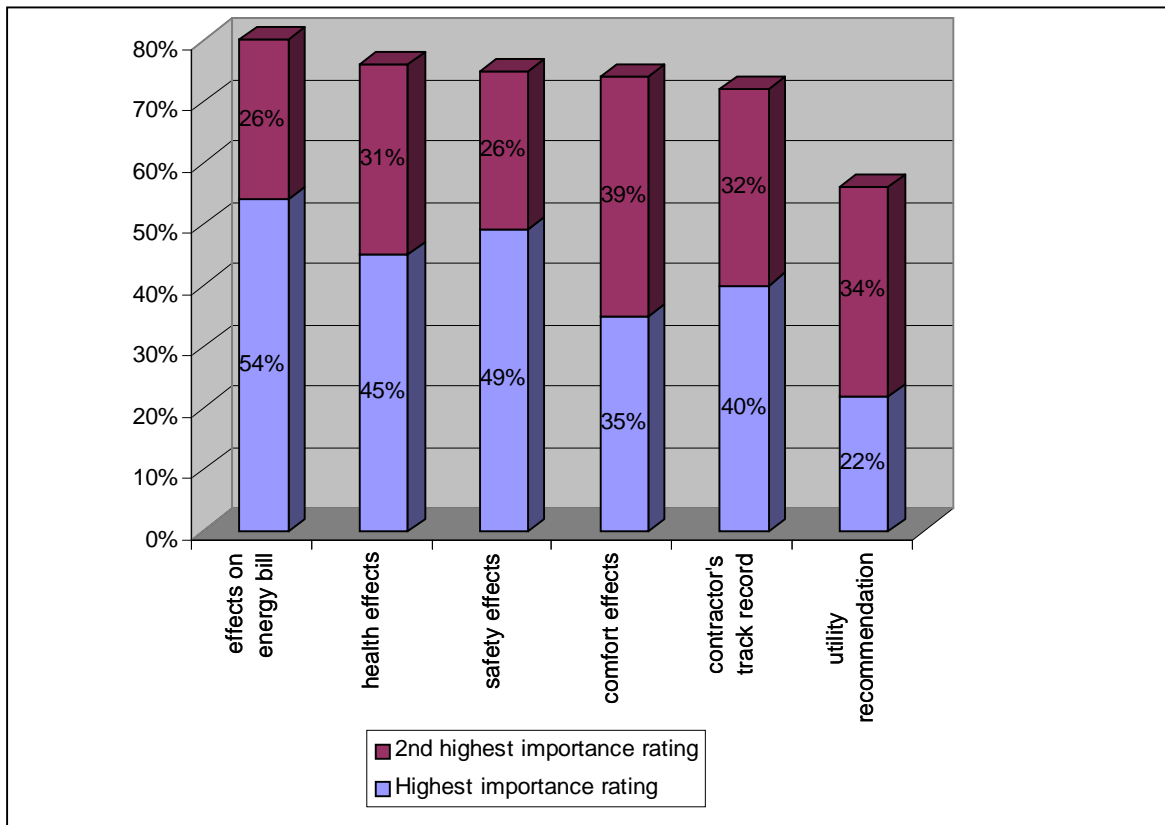
Cost-reducing financing and a utility endorsement were rated as very or extremely influential by the most respondents. Approximately one-half (48 percent) of the respondents felt that services provided by a certified contractor would influence their purchasing decision.

Figure 5-8
Influences on Servicing HVAC System



Consumers may also value information on various topics differently. For example, the comfort effects of weatherization services may be more or less important to a consumer than the potential reduction in energy usage. Figure 5-9 displays how consumers rated six topics of information on their importance in the decision-making process to service their HVAC system. Interestingly, information about effects on energy bill was ranked as the most important source of information by consumers; 54 percent felt that information of this type was very important to their decision-making process, with another 26 percent giving this factor a high importance rating of 4 on a 1-to-5 scale. Getting a recommendation from their utility was not rated by most consumers as being important as information on potential benefits or the track record of the contractor. The majority of consumers stated that they value information on all six topics, as shown in Figure 5-9.

Figure 5-9
Important Information for Consumers' Decision to Service HVAC System



Consumers may be more likely to purchase a service from a contractor who is certified by an independent industry association. As part of the survey effort, surveyors described contractor certification and stated that some contractors were currently being certified by an independent industry association. Consumers were then asked to rate the usefulness of certification in selecting a contractor. As Figure 5-10 shows, about half (51 percent) of respondents indicated that contractor certification would be very useful information when selecting a contractor. Only 8 percent felt that contractor certification would be not be useful.

Figure 5-10
Usefulness of Contractor Certification

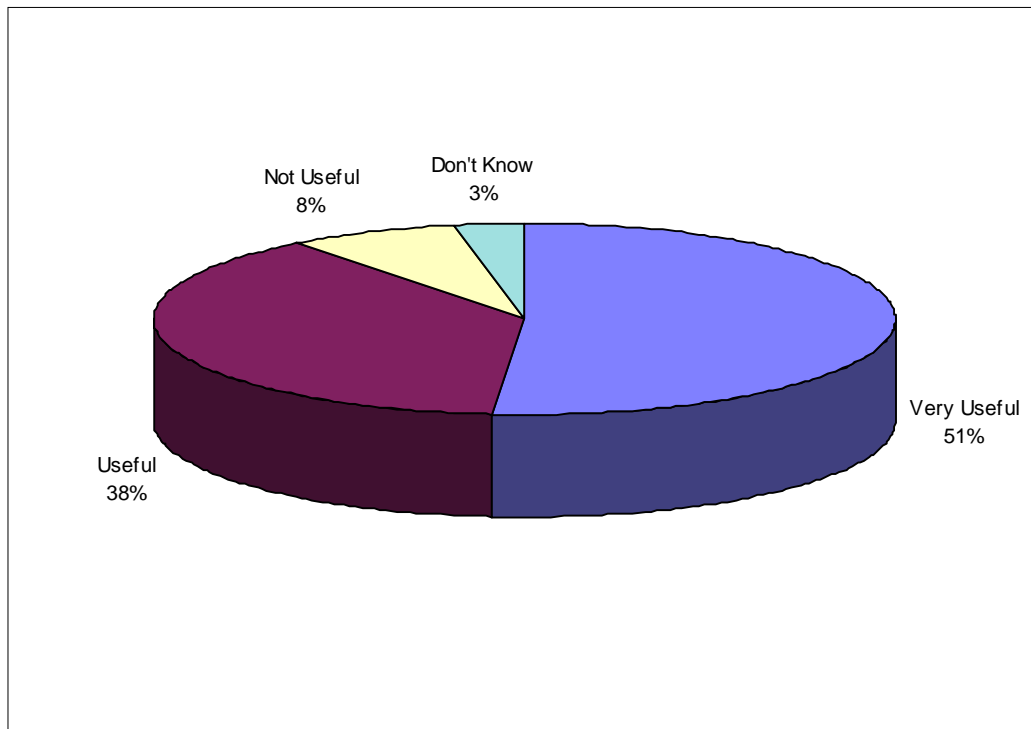


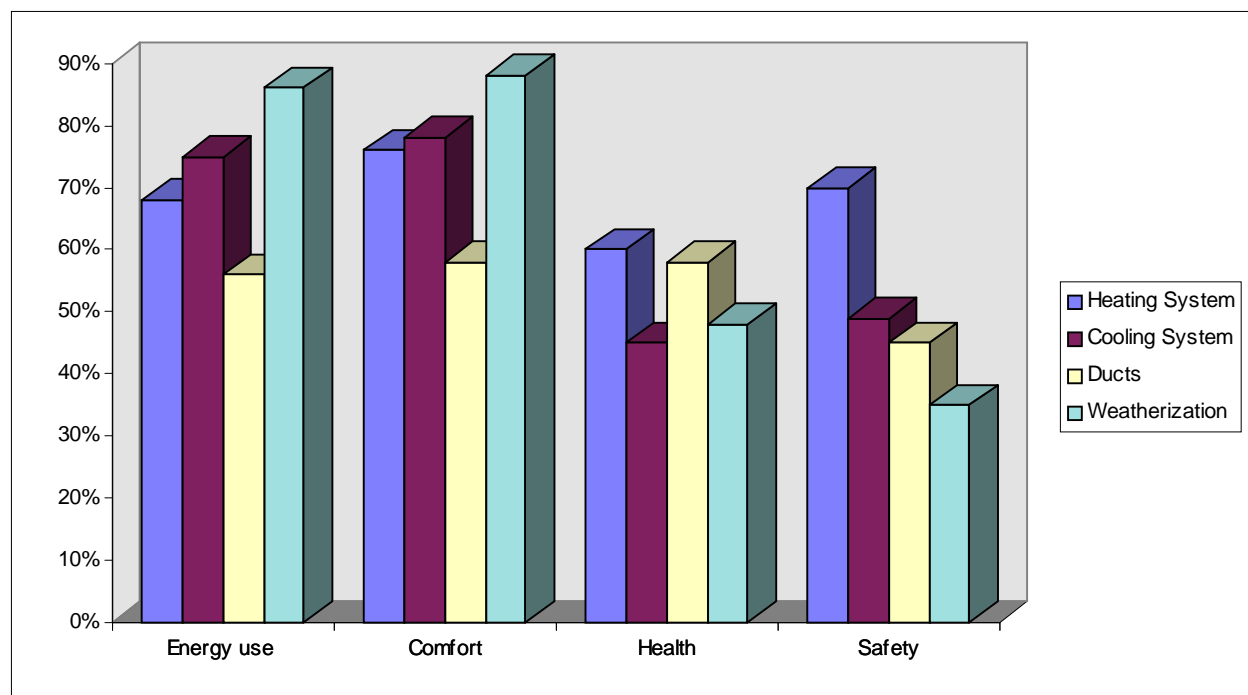
Table 5-9 presents the relationship between consumers' perceived usefulness of contractor certification and their interest in having their HVAC system checked and certified for safety and efficiency. Those respondents that are very interested in having their HVAC system certified are also more likely to find contractor certification as being useful in selecting a contractor for their HVAC services.

Table 5-9
Interest in Certifying HVAC System by Importance of Contractor Certification

Usefulness of contractor certification	Interest in Having HVAC System Check and Certified		
	Not at all interested	Somewhat interested	Very interested
more useful (highest 2 ratings)	64%	67%	83%
less useful (lowest 3 ratings)	36%	33%	17%

Survey respondents were asked to give their perceptions of what effect maintaining each system (heating, cooling, ducts, and weatherization) has on energy use, comfort, health, and safety. Figure 5-11 shows the percentage of respondents who felt that maintaining a particular system would have a very large effect on each issue.

Figure 5-11
Percentage of Respondents that Perceive a Strong Effect from Maintaining System



In general, fewer respondents felt that the maintenance of ducts would have a very large effect on energy usage and comfort relative to the other three service categories. Other than that, the perceptions of the respondents appear to be relatively in line with actual effects. Safety is viewed primarily as a heating system issue. Health effects appear either to be the least understood and may in fact be less affected by maintaining the systems relative to the other three issues.

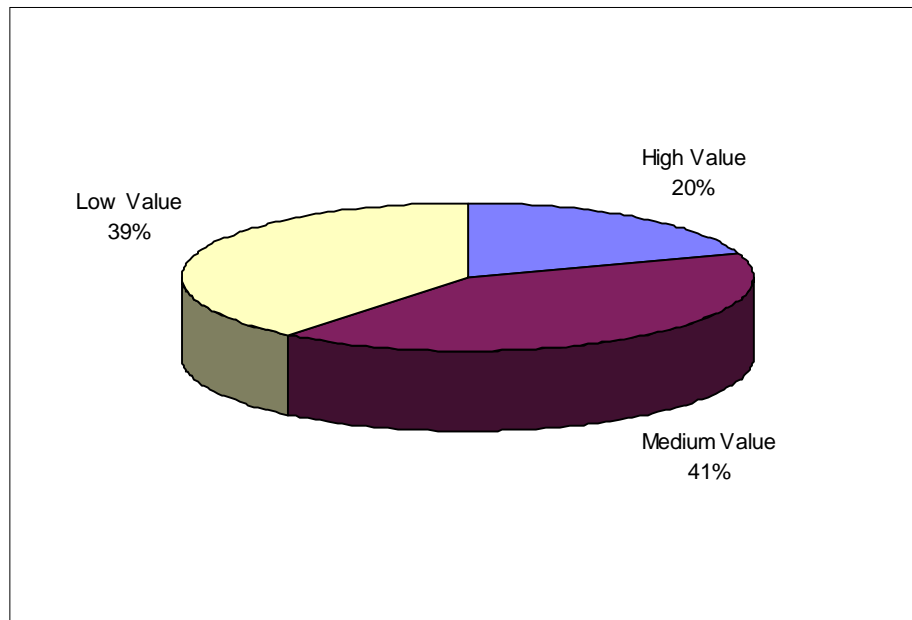
5.6 HIGH-VALUE MARKET SEGMENT

The respondents from this survey were classified into three value segments. The potential benefits from PTCS services such as system certification, routine maintenance, and weatherization vary significantly across different homes. Consumers that have a central heating or cooling system will tend to benefit more from these services and thus may value them more. In addition, the amount paid for energy should also be a predictor of value since reduction in energy usage tends to be one of the most important decision factors when purchasing these services. The age of the home can also have an effect on the value that a respondent places on these services since they are likely to believe that a newer home is already energy efficient, and they would benefit less for the various target services.

Respondents were classified into three groups according to the presence of a central heating system, age of the home, and the amount they pay for energy. The reported square footage of the home and the number of bedrooms in the home were also used to classify the respondents if they could not provide their average energy bill amounts.

The high-value group consists of respondents with a central heating system, a home more than 15 years old, and either summer or winter energy bills that exceed \$125 per month on average. The medium-value group was defined as all other homes with a central heating system and energy bills greater than \$75. The low-value segment included either homes that did not have a central heating system or had an average energy bill below \$75 per month. The percentage of homes in each of these three value segments are provided in Figure 5-12.

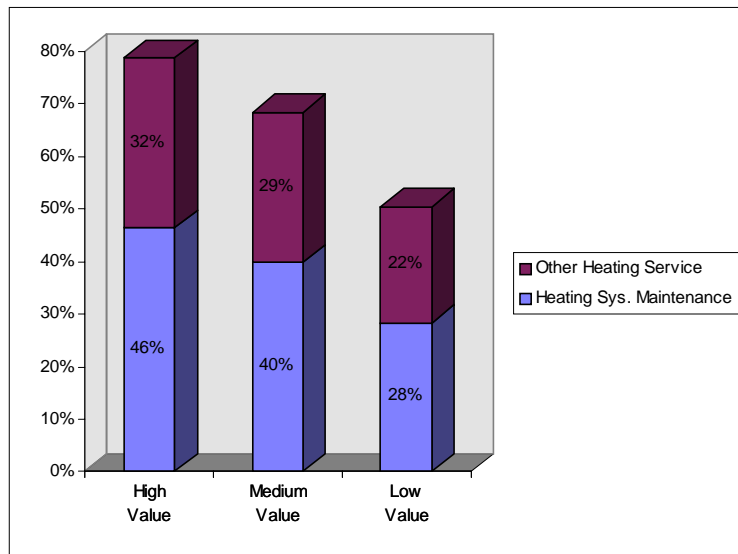
Figure 5-12
Percentage of Respondents in Each Value Segment



The primary reason for developing these value segments is to see if certain preferences, behaviors, or attitudes vary by segment. For example, it is reasonable to expect that the high-value segment may be more interested in system certification and willing to pay more for it. It would also be expected that the high-value segment has tended to buy more targeted services in the past. It would also be useful to know if the high- and medium-value segments have different responses regarding information sources and other decision factors since these two segments are the likely target for educational and other marketing activities.

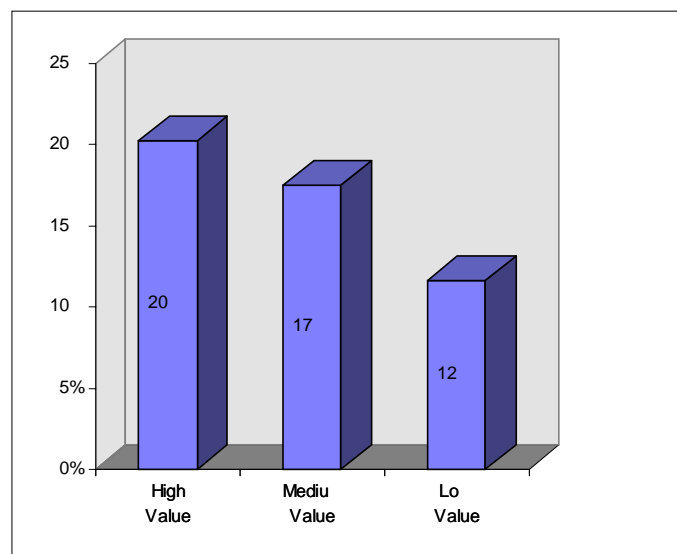
As seen in Figure 5-13, the portion of consumers that had general maintenance performed on their heating system or had some other heating service performed increases with the value segment. Eighty percent of the high-value segment had a heating service performed compared to 50 percent of the low-value segment.

Figure 5-13
Respondents Receiving Heating Services by Value Segment



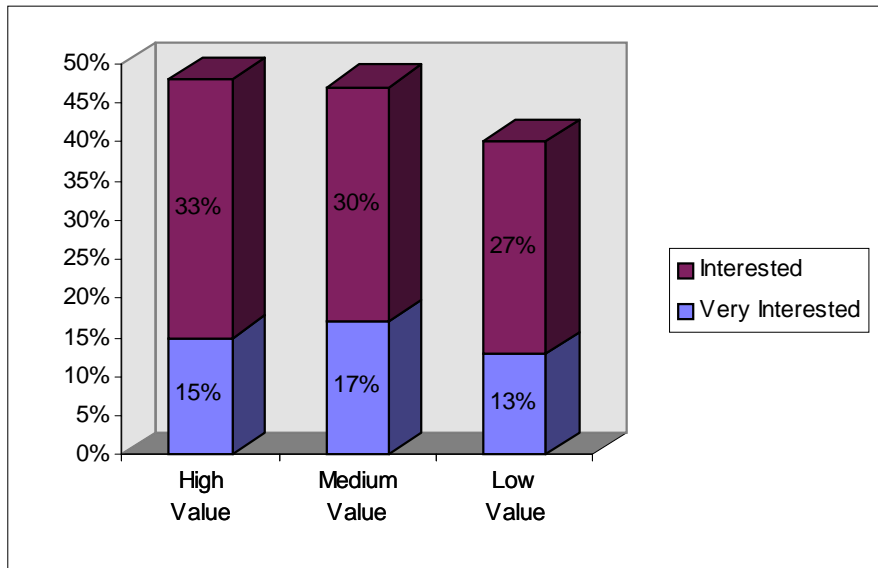
A similar finding was found regarding duct services received in the last four years, as shown in Figure 5-14. Please recall that a large portion of this activity involved duct cleaning.

Figure 5-14
Respondents that had Duct Services Performed in Last Four Years by Value Segment



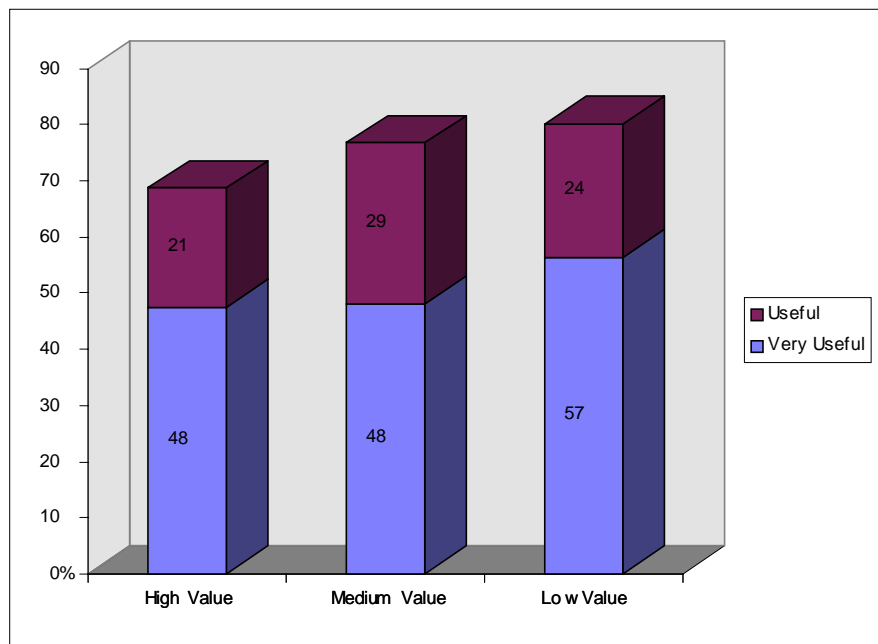
Although the purchase behavior does vary as expected by the value segments, the interest in HVAC system certification does not appear to be influenced by expected value as much. As seen in Figure 5-15, respondents in the high- and medium-value segments are only slightly more likely to be interested in system certification than those in the low-value segment.

Figure 5-15
Interest in HVAC System Testing and Certification by Value Segment



The results regarding the usefulness of contractor certification by value segment are a little counterintuitive. The respondents in the low-value segment were slightly more likely to state that contractor certification would be very useful, as shown in Figure 5-16.

Figure 5-16
Usefulness of Contractor Certification by Value Segment



There were not any significant differences across the three value segments when comparing responses to the credibility of information sources, the effect of various potential influences, and the usefulness of information on various topics. The high value respondents were about 3 percent less likely than the other two segments to give a 4 or 5 importance rating for all six of the information topics that were presented in Figure 5-9. However, a 3 percent difference is not statistically significant at a 90-percent confidence level.

5.7 CONSUMER SURVEY SUMMARY

Key findings of the consumer survey are summarized below:

- More than half of the surveyed homeowners have performed some service on the heating system in the last four years, with general maintenance being the most common service performed. A similar portion of existing central air conditioning systems were also serviced in some fashion.
- About 10 percent of the respondents stated that they had an safety or efficiency test performed on either their heating, cooling, or duct system during the last four years. Approximately 3 percent of surveyed homeowners stated that they had their duct system tested.
- The interest in contractor certification is fairly high, with more than half of the respondents giving the highest possible rating on the usefulness of certification when selecting a contractor. However, only 15 percent of the respondents stated that knowing their contractor was certified would have a strong influence on whether they purchased a service.
- Current interest in HVAC system testing and certification is somewhat mixed. While 15 percent of respondents stated that they were very interested in having their system tested and certified, more than half (54 percent) of the respondents had little or no interest in system certification. Approximately 13 percent of respondents stated that they would be willing to pay more than \$100 to have their HVAC system certified.
- Utilities are seen as a credible information source on HVAC services by a majority of respondents (72 percent). The response of friends, family, and neighbors was the only other source that was given a high credibility rating by more than half of the respondents. The government, industry association, and contractors all received similar amounts of high credibility ratings (about 35 percent), credibility ratings with retail stores getting the lowest amount of high ratings. Government had the highest percentage of respondents (18 percent) that gave it the “not at all credible” rating.
- Only about one half of respondents (57 percent) felt that their energy usage and comfort would be very affected by maintaining their duct system, compared to about 87 percent of respondents who felt that weatherization would have a very large effect on their energy usage and comfort. Relative awareness of the benefits of duct system maintenance is low compared to awareness of the benefits of maintaining the cooling and heating system also.

- Information on the benefits of maintaining their various systems is desired by a large majority of respondents (75 to 80 percent) when considering whether to purchase a service.
- When making a decision to purchase a service, incentives and utility recommendations were viewed as being very influential by about 60 percent of respondents. Contractor certification, energy audits, and low-interest loans were seen as being very influential by about 50 percent of the respondents.

6.1 INTRODUCTION

A contractor survey was administered to 104 contractors in the Pacific Northwest as part of the baseline effort of this study. This section presents findings from the analysis of the contractor survey data. Volume III of this report provides the full set of tables on frequencies and cross tabulations of contractor responses to the survey questions. The following topics are discussed in this section:

- Contractor attitudes and awareness
- Contractor practices
- Contractor awareness and interest in the PTCS program
- Composite index for EE practices of contractors.

All results presented in this section are representative of the target population of contractors, that is, contractors who provide HVAC, duct system, or weatherization services to residential single-family homes in the Pacific Northwest. The stratified sample was weighted so that findings are representative of this population.

Sample design and weighting are discussed in detail in the Survey Methods Section of this report. Two weights were computed: the simple *firm weight* that weights up to the total number of firms in the target market, and the *size of firm weight* that reflects the relative size differences between firms in the target market. All results reported in this section are weighted by the firm weight. Where results weighted by the firm weight were found to be significantly different from the results weighted by the size of firm weight, findings are presented by both weighting schemes.

Contractors that participated in the PTCS Program (*participants*) were also interviewed as part of this study. Participants were administered the baseline survey, which allows comparison between *non-participating contractors* and *participants*. This section highlights any significant differences that were found between the non-participating contractors and the participants. Section 6 of this report summarizes the participant feedback on the PTCS training and certification program.

6.2 CONTRACTOR ATTITUDES AND LEVELS OF AWARENESS

Part of the survey addresses the contractors' assessment of the market for energy-efficient products and services. Thus, contractors were asked many questions designed to identify their

level of awareness and attitudes towards the marketplace. This subsection discusses findings on the following topics:

- Market for high-efficiency HVAC/duct systems
- Barriers to the sale and purchase of energy-efficient products and services
- Factors considered by consumers when choosing a contractor
- Information needs of contractors for promoting energy-efficient practices
- Maintaining a competitive edge.

6.2.1 Market for High-Efficiency HVAC/Duct Systems

Contractors vary in their opinions on the ease or difficulty in selling high-efficiency HVAC and duct systems in the residential market. Figure 6-1 illustrates the distribution of contractors' opinions on the market for high-efficiency HVAC and duct systems, including a comparison of participant contractors. Almost half (49 percent) of the non-participating contractors (baseline) find high-efficiency unit sales to be harder than standard unit sales. A smaller but still significant segment, 37 percent, feel that sales of this nature are easier or the same as selling standard units. Notably, participants in the PTCS program are more likely to find high-efficiency unit sales to be easier or the same as standard sales than non-participant contractors.

6.2.2 Barriers to the Sale and Purchase of Energy-Efficient Products and Services

Contractors were asked to choose the most important factors that prevent them from selling energy-efficient HVAC and duct systems more frequently. As Figure 6-2 displays, 52 percent of the non-participating contractors rated cost of the system/unfavorable economics as one of the most important issues which prevent them from selling energy-efficient systems more frequently. Lack of consumer demand was also listed by a high percentage of respondents as an important barrier. Larger firms in particular feel strongly that unfavorable economics are an important barrier; when weighted to reflect the size of the firm, 75 percent reported that the cost of the system was an important barrier.

Figure 6-1
Contractors' Opinions about Selling High-efficiency HVAC/Duct Units vs. Standard Units

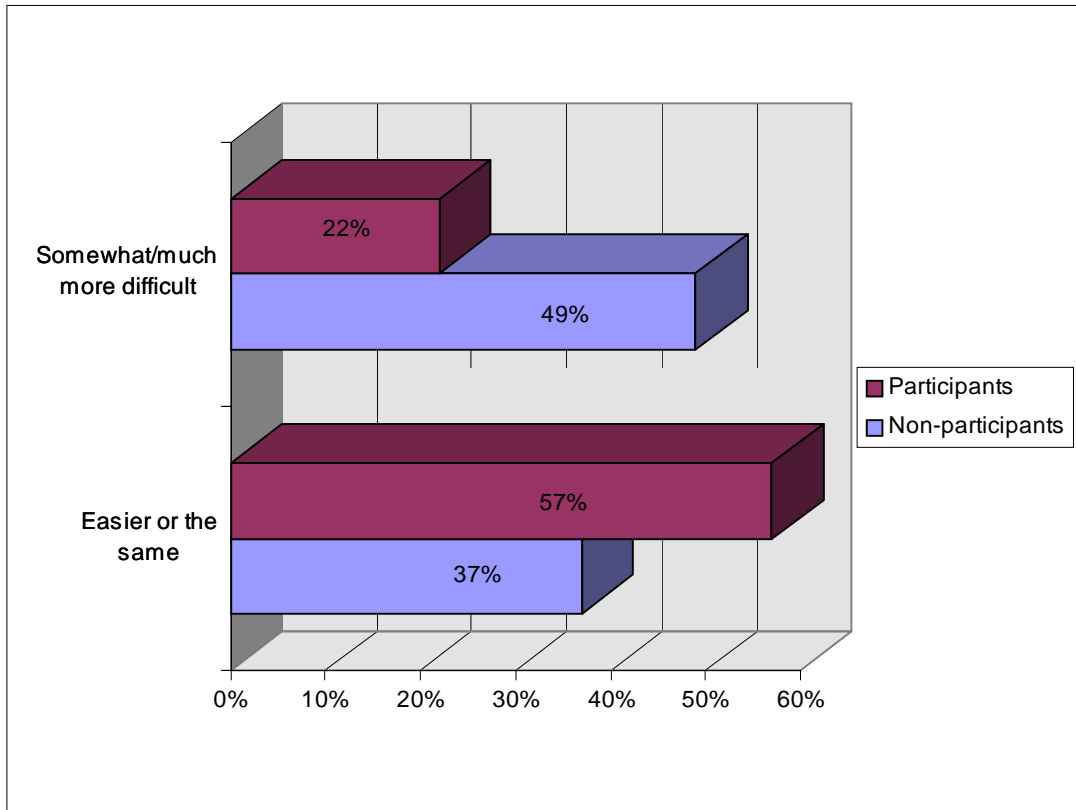
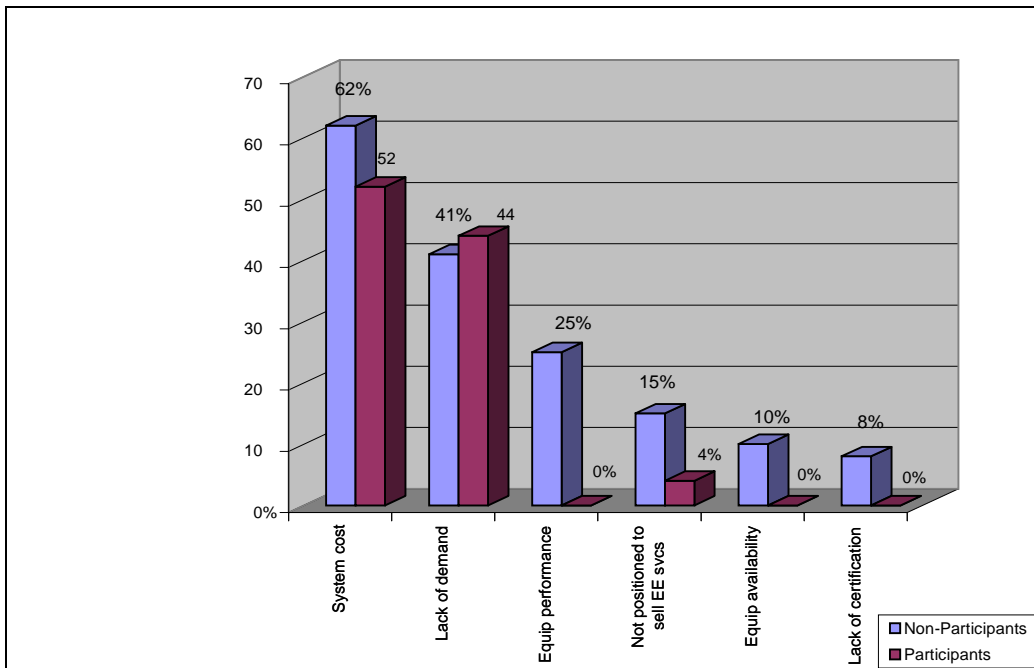


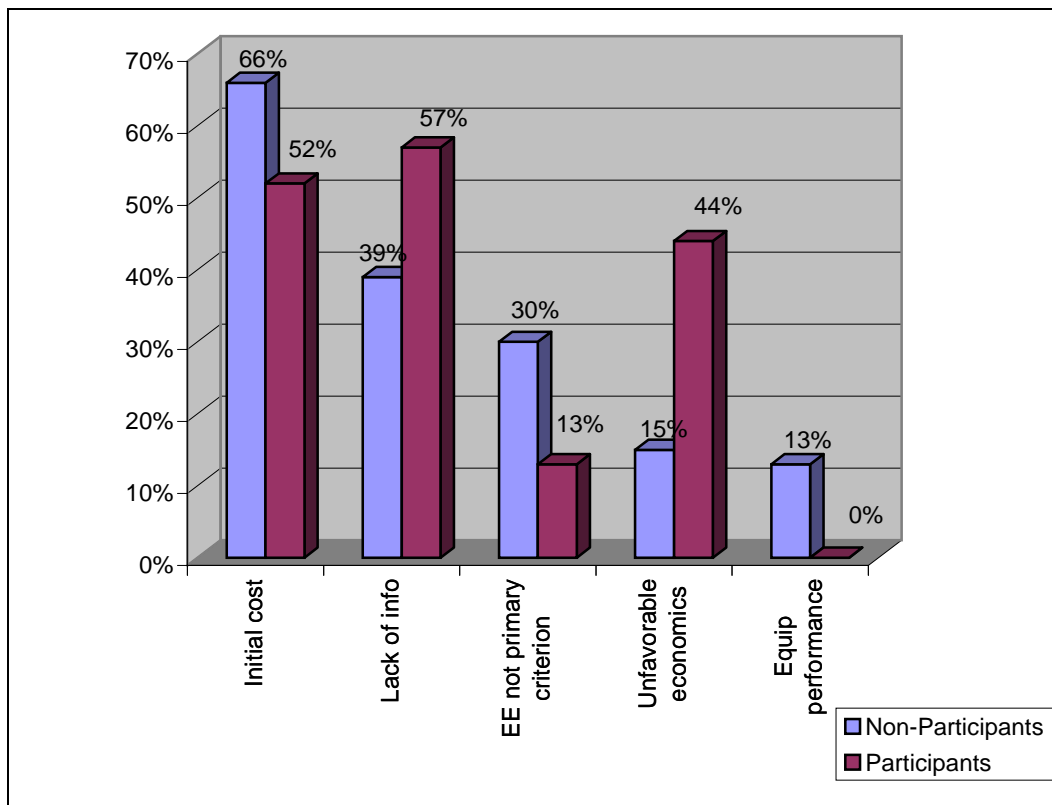
Figure 6-2
Barriers to Contractors Selling Energy-efficient HVAC and Duct Systems



Participants rated cost of system/unfavorable economics as the most important factor which prevents them from selling energy-efficient HVAC and duct systems more frequently. Additionally, lack of consumer demand ranked high as an important barrier among participants. Interestingly, no participants felt that equipment availability and equipment performance were factors preventing energy efficiency (EE) sales. While only a small percentage of non-participant contractors felt these two factors were barriers, this still appears to be an important difference between the two groups and points to the potential market effects of the training and certification program.

Figure 6-3 presents the results when contractors were asked to rate the primary reasons that prevent consumers from choosing energy-efficient products and services. The majority of the contractors felt that initial cost was a primary obstacle. Notably, many more participants felt that unfavorable economics was a primary reason why consumers don't buy energy-efficient products and services. No participants viewed equipment performance as an important barrier effecting the consumer decision making process.

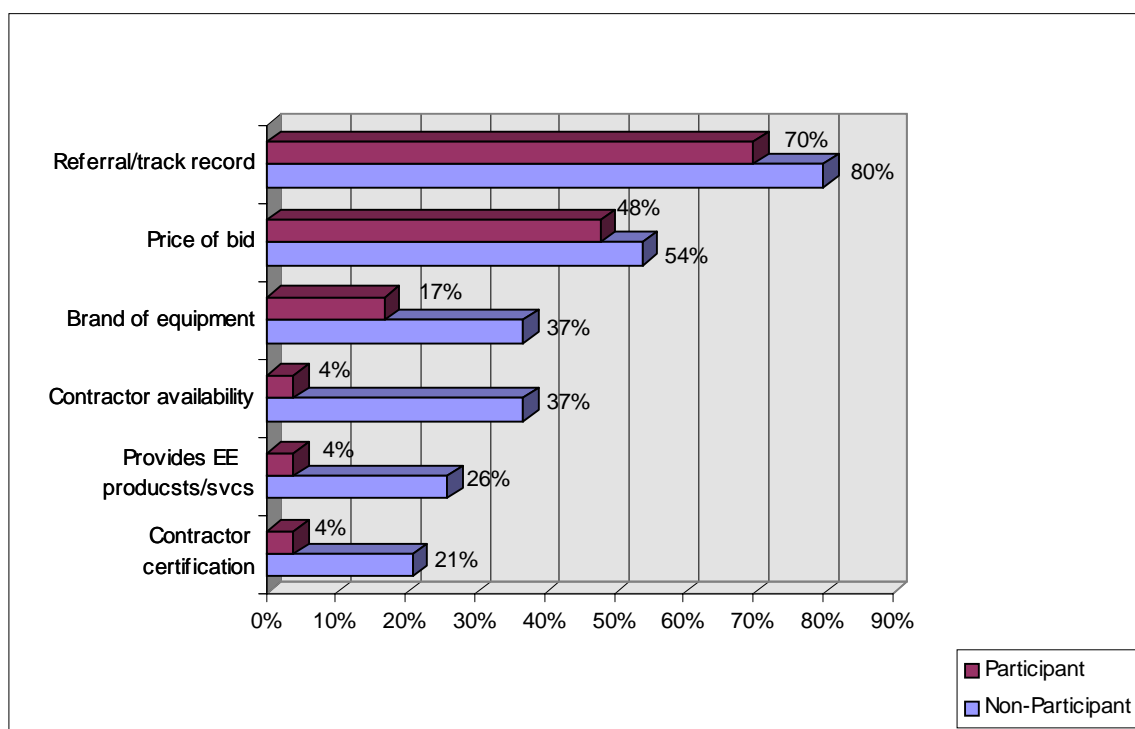
Figure 6-3
Contractor Opinions of Barriers to Consumers Choosing Energy-efficient Products and Services



6.2.3 Factors Considered by Consumers when Choosing a Contractor

Contractors were asked about factors that consumers might consider when selecting a contractor. Figure 6-4 shows the fraction of contractors that felt various factors were important to consumers when they chose a contractor. As displayed, 80 percent of the non-participating contractors and 70 percent of the participants felt that the contractor's referral or track record was one of the most important factors. The price of the bid was another factor that both non-participants and participants felt was very important. Interestingly, a much lower percentage of participants than non-participants felt that providing energy-efficient products and services, contractor availability and contractor certification are important to consumers when selecting a contractor.

Figure 6-4
Contractors' Opinions on Factors Consumers Consider when Selecting a Contractor

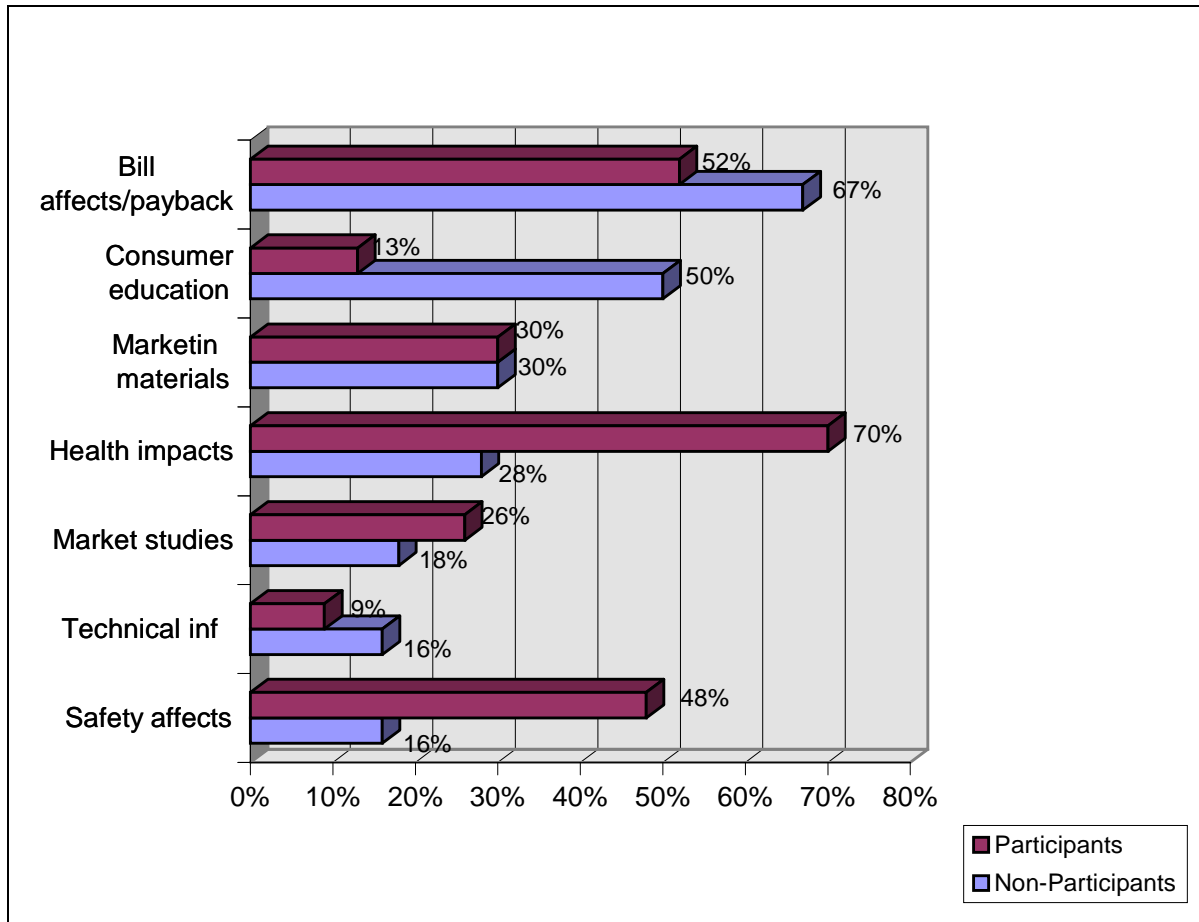


6.2.4 Information Needs of Contractors for Promoting Energy-Efficient Practices

Figure 6-5 reports the percentage of contractors who feel that various types of information would be useful in helping to promote energy-efficient practices. While 67 percent of non-participating contractors felt that information on utility bill affects and estimated payback period would be useful; half felt that consumer education would be useful. Many more program participants expressed interest in the importance of information on health and safety impacts. This is likely because participants focus on health and safety impacts as part of their selling techniques for energy-efficient services. Far fewer participants feel consumer education is important as

compared to non-participants—13 percent versus 50 percent. Participants may be more inclined to educate their customers to make their energy-efficient product and service sales and are less likely to be interested in information about consumer education.

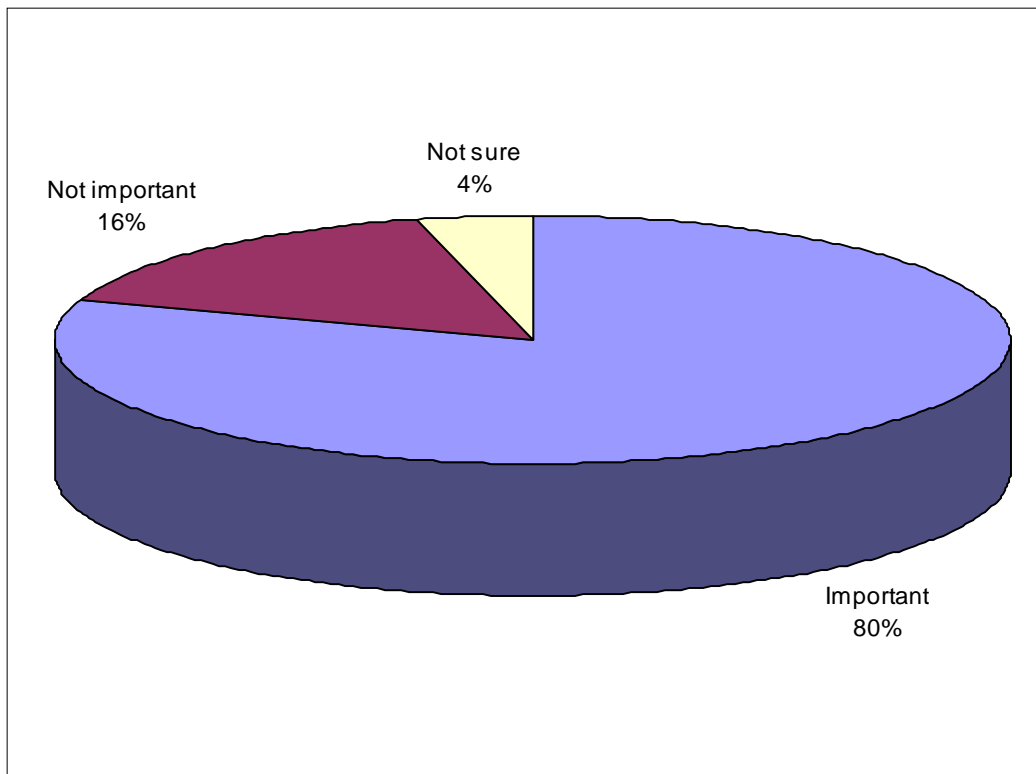
Figure 6-5
Useful Information in Helping Contractors Promote Energy-efficient Practices



6.2.5 Maintaining a Competitive Edge

Figure 6-6 shows the percentage of non-participating contractors who feel that offering system tune-ups and efficiency testing is important in maintaining their firm's competitive edge. As displayed, 80 percent of the non-participating contractors felt that offering system tune-ups is important. Although not shown in the figure below, 68 percent of the participants responded that providing system tune-ups and efficiency testing is important in helping to maintain their firm's competitive position, and no participants felt that these services were not important.

Figure 6-6
Importance to Contractors of Offering System
Tune-ups and Efficiency Testing on their Competitive Edge



6.3 CONTRACTOR PRACTICES

As part of the baseline survey effort, contractors were asked about the services that they offer and the products they sell. This subsection provides survey findings for the following contractor practices:

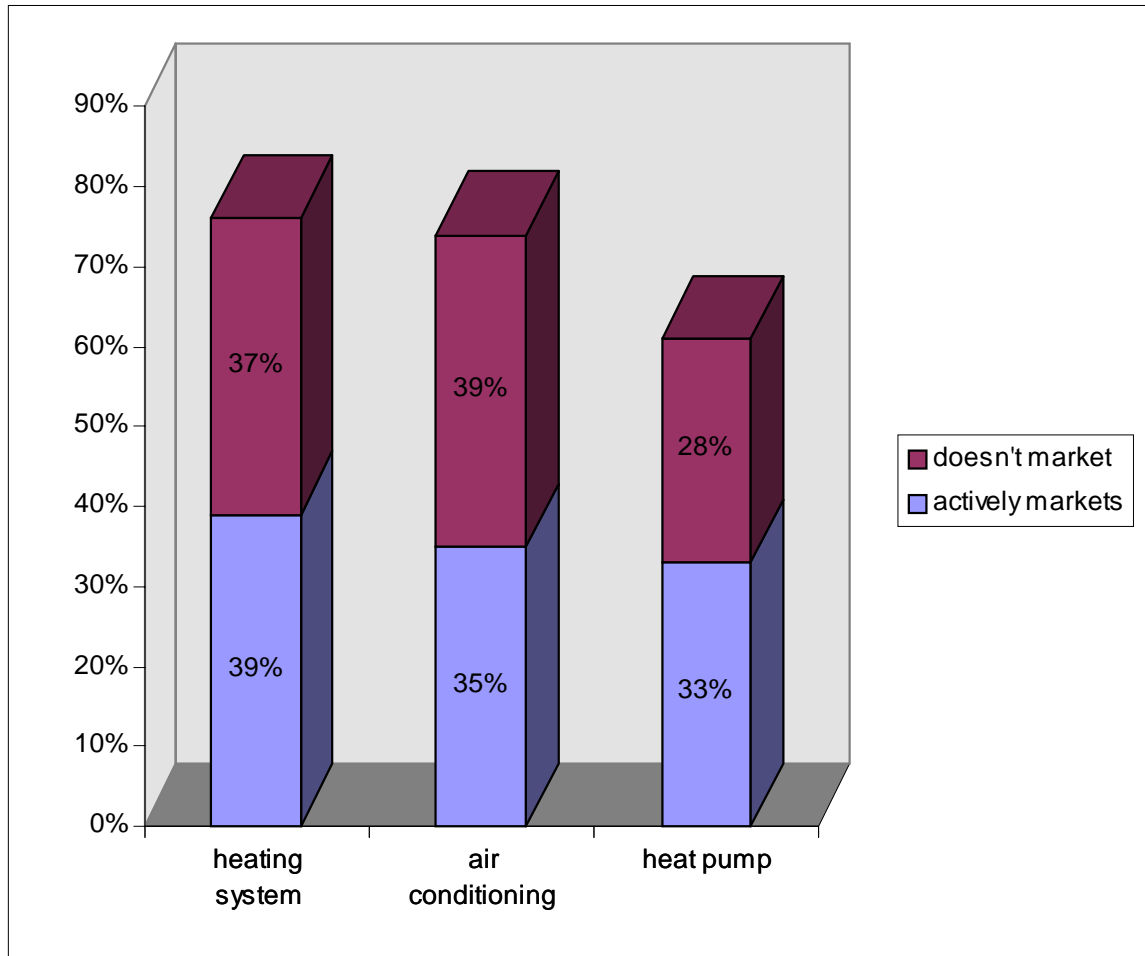
- System tune-up and efficiency testing
- Cost of system tune-ups and performance testing
- Installation of high-efficiency systems
- Duct services
- Weatherization services.

6.3.1 System Tune-ups and Performance Testing

Contractors provide a variety of different services to their residential customers, sometimes including system tune-up and performance testing. Well over half of non-participating contractors in the region perform such tune-ups and testing. Contractors are more likely to perform these services for heating and cooling systems than heat pump systems. This is partly

because contractors are less likely to install or service heat pumps than other systems because this is a specialized trade. Seventy-four percent of the non-participating contractors install or service heat pumps as compared to 83 percent and 79 percent of contractors who install or service heating and cooling systems, respectively.¹ Figure 6-7 shows the percentage of non-participating contractors who provide such services and, of those, the percent that actively markets these services.

Figure 6-7
Contractors who Provide System Tune-up and
Safety and Performance Testing and who Actively Market Services



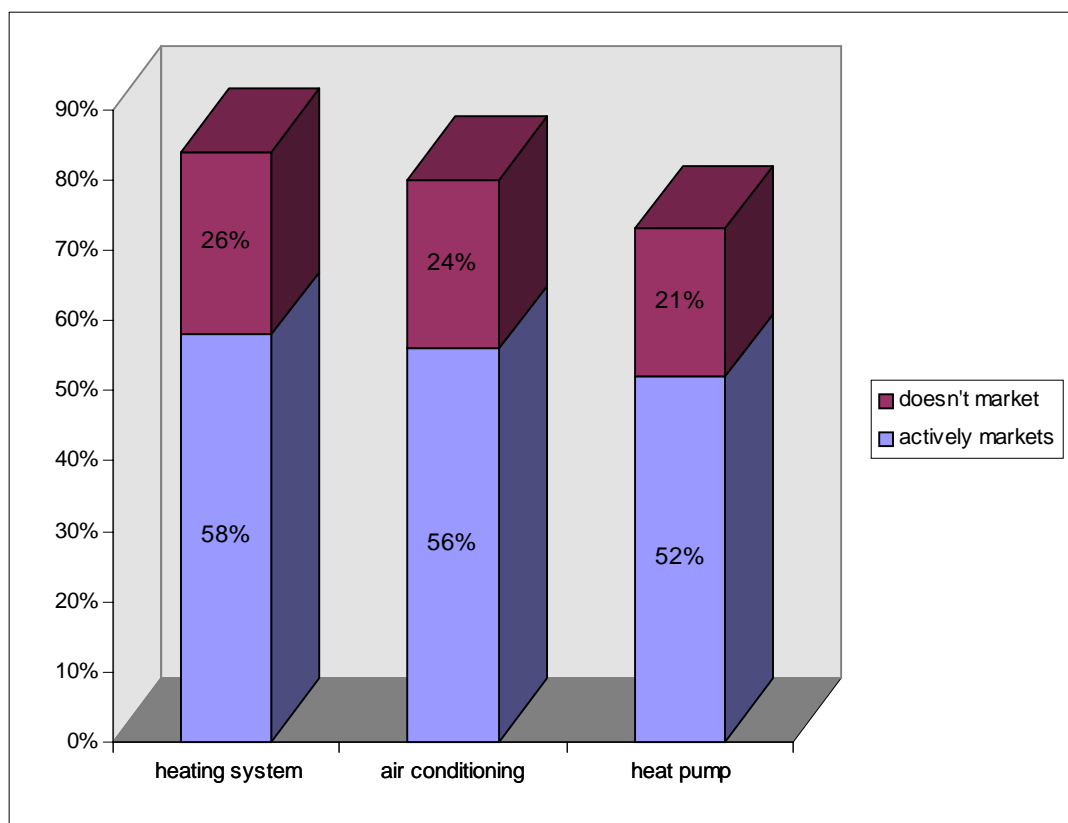
Contractors perform tune-ups and testing on residential systems at a varying degree of frequency. Almost half of non-participant contractors who report offering the services perform them at all of their jobs. The average frequency for those who offer services is performing tune-ups and testing at 67 percent of all jobs. Participant contractors are more likely to perform tune-ups and testing at their jobs. Well over half (62 percent) of those who provide the services perform them at all of

¹ Participants are also less likely to service heating, cooling, and heat pump systems: 70% service heating, 61% service cooling, and 51% service heat pumps. But of those, almost all offer tune-ups and testing. Thus, the overall percentage of participants who offer tune-ups and testing is very close to the overall percentages for non-participants.

their jobs. The average frequency over participants who provide tune-ups and testing is performing the service at 77 percent of jobs.

Figure 6-8 presents the data shown in the previous figure, except the data is weighted by the size of firm. Note that the larger firms are more likely to provide the tune-up and safety/performance testing and are more likely to actively market these services.

Figure 6-8
Contractors Who Provide System Tune-up and Safety and Performance Testing and Who Actively Market Services: Weighted by Firm Size



Cost of System Tune-ups and Performance Testing

Contractors reported the typical cost to the consumer for the system tune-up and performance testing. Table 6-1 presents the average, minimum, and maximum cost reported by the non-participating contractors.² The majority of contractors report charging consumers less than \$100. The highest amount, “greater than \$300,” is reportedly charged for servicing heat pumps, and only 3 percent of contractors report charging this amount.

² Note that the survey question provided the following ranges: Less than \$100, \$100-\$200, \$200-\$300, Greater than \$300. Midpoints were assigned for the purposes of producing statistics in Table 6-1.

Table 6-1
Typical Cost to Consumer for System Tune-up and Performance Test

System	Sample n	Average Cost	Minimum Cost	Maximum Cost
Heating	70	\$70	Less than \$100	\$100-\$200
Air Conditioning	66	\$76	Less than \$100	\$100-\$200
Heat Pump	55	\$91	Less than \$100	Greater than \$300

6.3.2 Installation of High-Efficiency Systems

Contractors who install new systems were asked what percentage of their installations were high-efficiency systems. Table 6-2 displays the percentage of installations, averaged across non-participating contractors, that are high-efficiency units. For instance, high-efficiency heating systems are installed in 47 percent of the jobs, on average. It's interesting to note that high-efficiency heating and heat pump systems are installed more frequently than high-efficiency air conditioning units. For heating and heat pump systems, about one-quarter of the non-participating contractors stated that they install high-efficiency systems over 80 percent of the time.

Table 6-2
Percentage of Installations that are High-Efficiency Units

System	Sample n	Average %
Heating	77	47%
Air Conditioning	72	20%
Heat Pump	47	47%

6.3.3 Duct Services

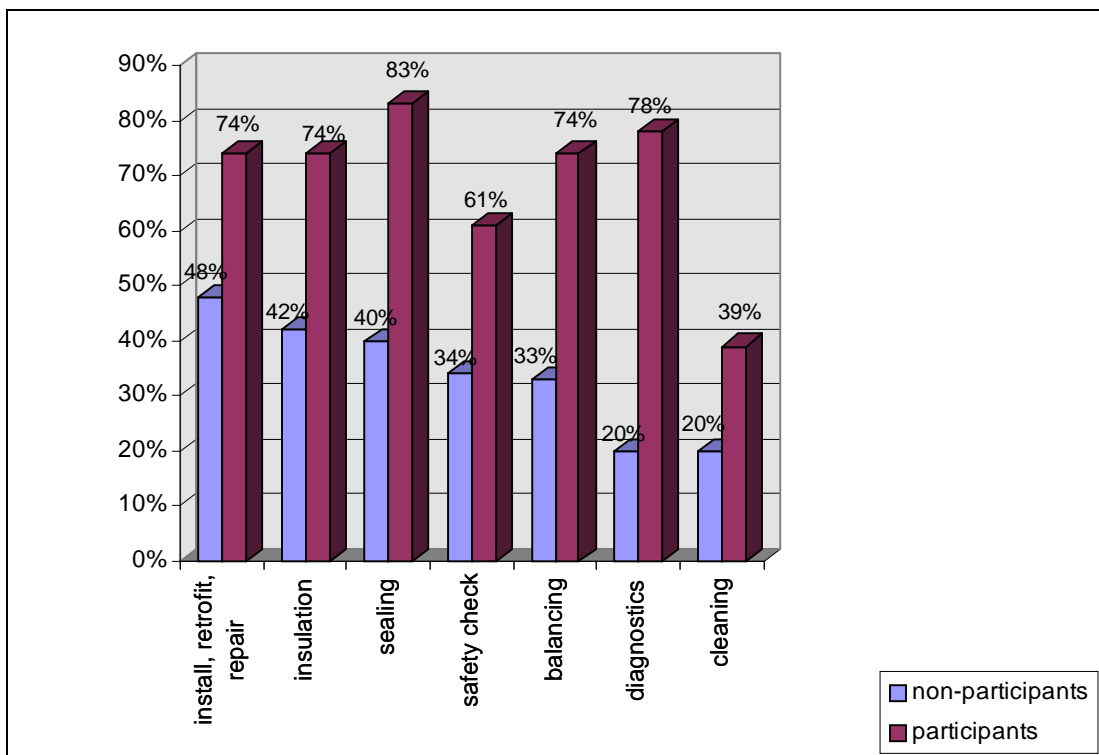
Another significant portion of the contractor survey focused on obtaining baseline data on duct services. Specifically, the following issues are examined:

- Percentage of contractors providing duct services
- Percentage of contractors providing duct diagnostics
- Duct diagnostic methods and equipment used
- Duct sealing methods
- Marketing activity for promoting duct services
- Cost of duct services
- Barriers to installing high-efficiency duct systems.

Duct Services Provided

Just over half (53 percent) of all non-participating contractors provide duct services. Ten percent provide duct services as a standalone service, and 43 percent provide duct services as one of many services. Of the contractors who offer duct services, 91 percent install, retrofit, and repair duct systems. Many provide insulation, sealing, balancing, and safety checks. Less than half provide duct diagnostics. Figure 6-9 displays each service type and the percentage of contractors that offer the service, including frequencies for participants. Note that the base population for the data presented in the following figure is *all* contractors, not just those who provide duct services. Not surprisingly, a much higher percentage of program participants provide duct services, specifically duct diagnostics and safety checks.

Figure 6-9
Duct Services Provided



Duct Diagnostics

Those contractors who provide diagnostics report using many testing techniques. Many more program participants report using blower door, pressure pan, and duct blaster techniques than the general population of contractors. Table 6-3 provides frequencies of the use of each technique over all contractors, including participants.

Table 6-3
Duct Techniques Used by Contractors

Technique	% of Non-Participating Contractors	% of Participants
Blower door	28%	59%
Pressure pan	23%	46%
Duct blaster	8%	55%
Micronanometer	31%	0%
Other	24%	0%

Over one-third of non-participating contractors who perform some kind of duct service and three-quarters of program participants own their own diagnostic equipment. Table 6-4 shows the type of equipment owned for non-participating contractors and for participants.

Table 6-4
Duct Diagnostic Equipment Owned by Contractors

Equipment	% of Non-Participating Contractors	% of Participants
Duct blaster	0%	47%
Blower door	7%	82%
Pressure pan	5%	41%
Micronanometer	11%	12%

Contractors who perform diagnostics were asked what percentage of duct service jobs they use diagnostic equipment to perform pre- and post-testing for air leakage. For pre-testing, 9 percent of non-participant contractors reported using the equipment in over 80 percent of their duct-related jobs. For post-testing, 23 percent reported using the equipment in over 80 percent of jobs. Comparatively, over half of participants reported using the equipment in over 80 percent of duct jobs for pre- and post-testing. Thus, participants are far more likely to use diagnostic equipment than the general population of contractors.

Table 6-5 summarizes the average percentage of duct jobs that diagnostic equipment is used for pre and post-testing.³

³ Base is contractors who perform diagnostic services.

Table 6-5
Percent of Duct Jobs that Diagnostic Equipment is Used for Pre- and Post-Testing

Population	Test	Sample n	Average %
Contractors	Pre	41	24%
	Post	42	38%
Participants	Pre	21	42%
	Post	19	56%

Duct Sealing

Mastic was the most frequently cited method of duct sealing, followed by duct tape. Over half of all non-participant contractors (and 87 percent of participants) use mastic for sealing ducts. Figure 6-10 displays duct sealing methods employed by contractors who perform some type of duct service.

Figure 6-10
Duct Sealing Methods Used

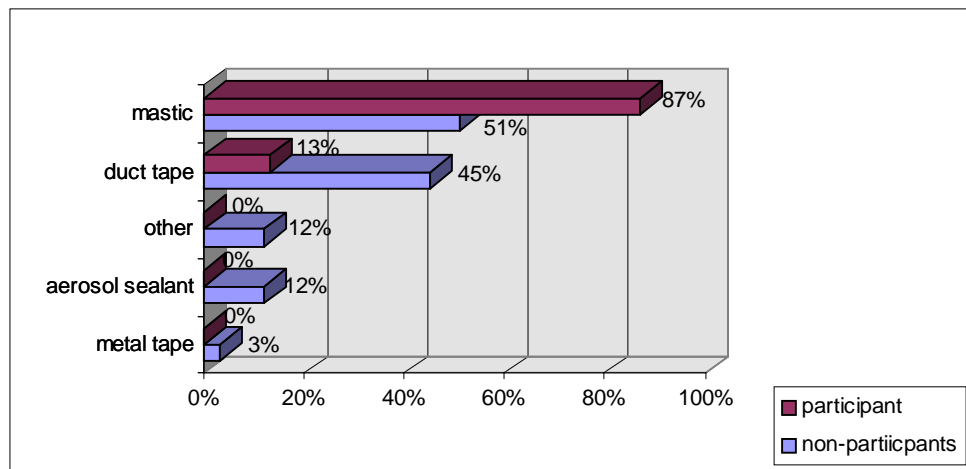
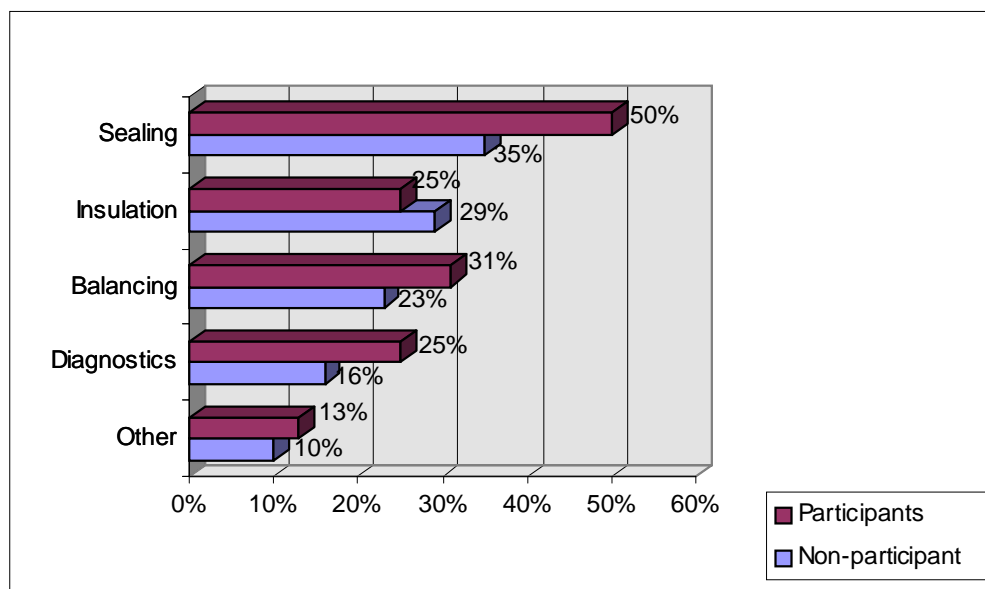


Figure 6-11 displays what is done with duct work when furnaces are replaced in existing homes. Over one-third (35 percent) of non-participating contractors who perform duct services seal ducts when they replace furnaces, and 50 percent of participating contractors perform this service.

Figure 6-11
Duct Work Performed Upon Furnace Replacement



About one-quarter (23 percent) of non-participating contractors balance the ducts versus 31 percent of the participating contractors. Interestingly, only 16 percent of non-participating contractors and 25 percent of participating contractors perform air leakage testing and diagnostics of the duct work when furnaces are replaced in an existing home.

Marketing of Duct Services

Contractors who market their services may be good candidates for participating in the PTCS Program because they are proactive. About one-quarter of non-participant contractors who provide duct services reported that they actively market their duct improvement services. Comparatively, 40 percent of participants who provide duct services actively market. This represents 12 percent of non-participant contractors and 41 percent of participants (all but one participant offers duct services).

Barriers to Installation of High-Efficiency Ducts

Contractors who provide duct services reported barriers or obstacles that prevent higher efficiency duct systems from being installed. Table 6-6 presents obstacles mentioned by non-participating contractors⁴. Fifteen percent of non-participating contractors felt that there are no barriers effecting duct efficiency installation. Note that cost is once again found to be a barrier by the majority of contractors. When applying the size of size of firm weight, we find that contractors that do 62 percent of the business reported that there are no barriers. Thus, larger firms are less likely to identify barriers that prevent higher efficiency duct systems from being installed.

⁴ This survey question was open-ended, i.e., contractors were not prompted for responses.

**Table 6-6
Barriers to High-Efficiency Duct Installation**

Barrier	Percentage
Cost	56%
Lack of consumer knowledge	2%
Pre-existing construction	10%
Other	7%
Not sure	24%

Cost of Duct Services

Contractors were asked about the typical cost of duct insulation and duct sealing in existing single-family homes. Table 6-7 displays the costs of duct sealing and insulation, as reported by the non-participating contractors. The average cost of duct sealing and duct insulation among non-participating contractors was \$338 and \$531, respectively. Upon further analysis of the data, 5 percent of contractors reported that duct sealing costs more than \$1,000, and 10 percent of contractors reported that insulation costs more than \$1,000.

**Table 6-7
Duct Sealing and Insulation Cost⁵**

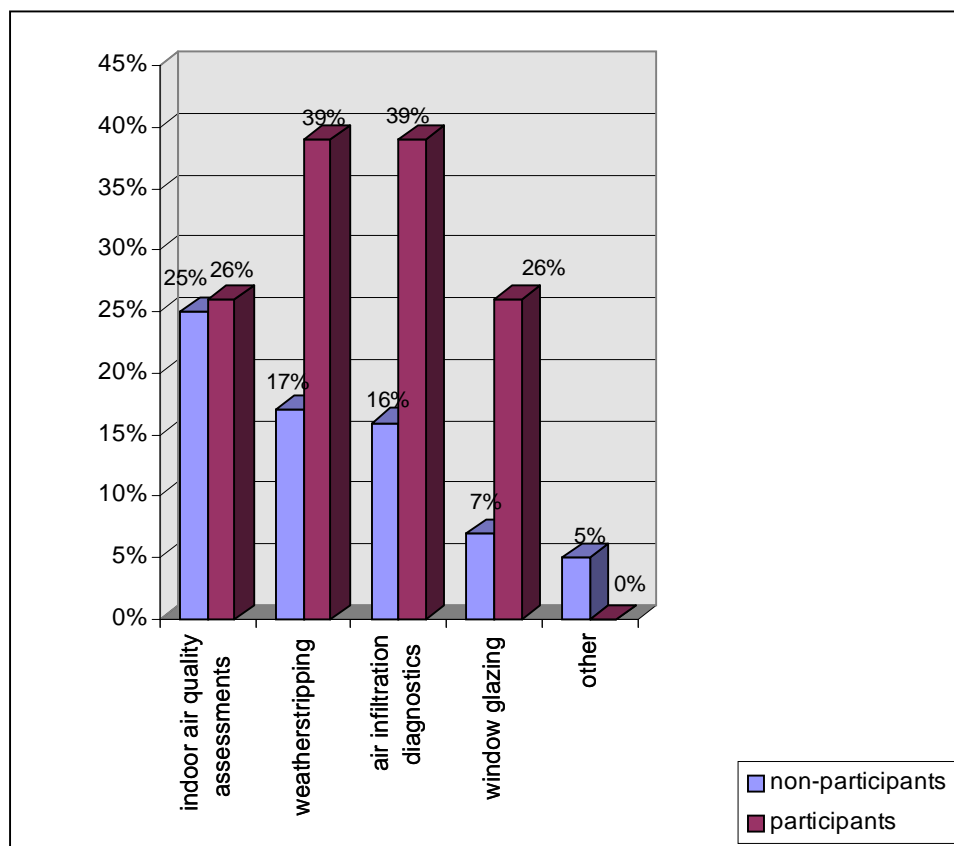
Service	Sample n	Average Cost
Duct sealing	37	\$388
Duct insulation	35	\$531

6.3.4 Weatherization Services

Contractors were asked what weatherization services they provided and which services they actively marketed. Over half (54 percent) of all non-participating contractors provide some type of weatherization service. Participant contractors are much more likely to provide weatherization services. Figure 6-12 shows the various types of services provided by the contractors.

⁵ Midpoints were assigned for the ranges provided in the survey so a distribution of responses could be summarized in this report.

Figure 6-12
Weatherization Services Provided



About one-quarter of non-participant contractors and 46 percent of participants who provide weatherization services actively market their services. Of those, the following advertisement sources are used:

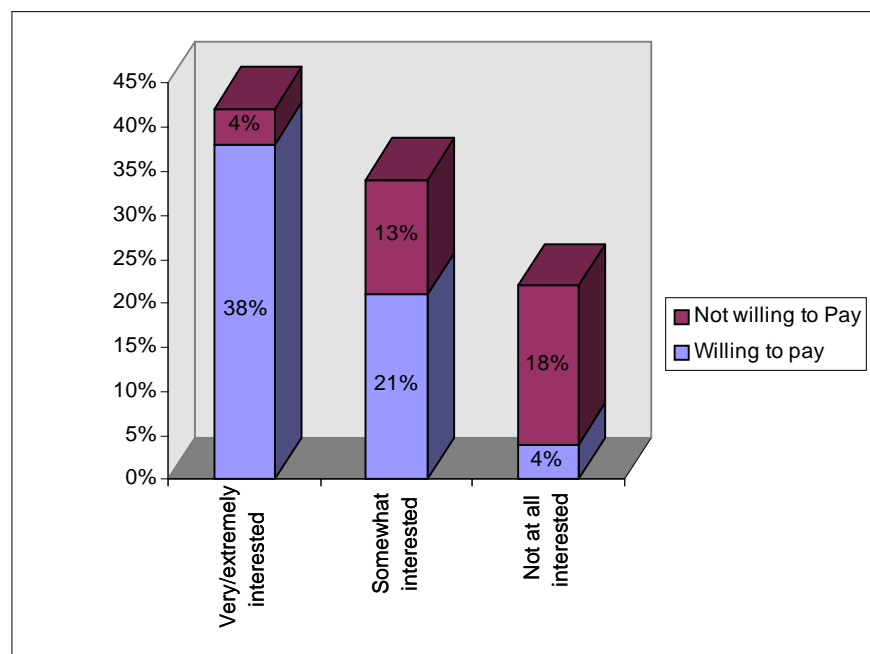
- Newspaper (14 percent)
- Word-of-mouth (8 percent)
- Yellow pages (15 percent)
- Radio ads (2 percent)
- TV ads (3 percent).

6.4 CONTRACTOR AWARENESS AND INTEREST IN PTCS PROGRAM

The baseline survey included a series of questions regarding EE programs and contractor levels of awareness and interest in such programs. Approximately one-fifth (19 percent) of the non-participating contractors were aware of programs to promote duct system efficiency. Over two-thirds (70 percent) of the non-participating contractors had heard of a program or programs that train and certify HVAC, duct, and weatherization contractors.

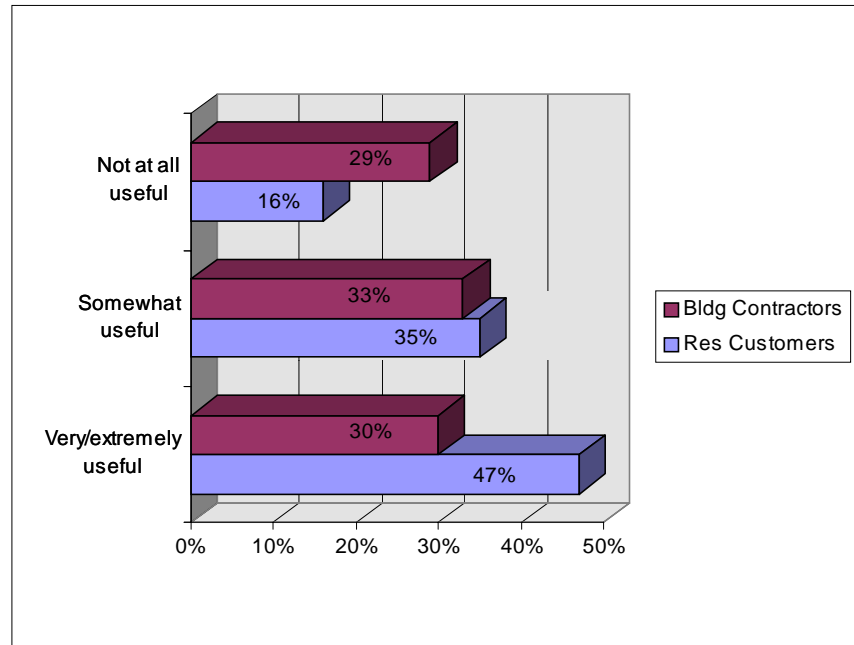
Contractors vary in their desire to participate in training and certification programs. Forty-two percent of non-participating contractors are either extremely or very interested in participating in training and certification programs. Thirty-four percent are somewhat interested and 22 percent are not at all interested in training and certification programs. When contractors were asked if they would pay to participate in a training and certification program, 60 percent of the non-participating contractors responded yes. Figure 6-13 presents non-participating contractor interest and willingness to pay for a program that trains and certifies HVAC, duct, and weatherization contractors.

Figure 6-13
Contractor Interest/Willingness to Pay for Certification Program



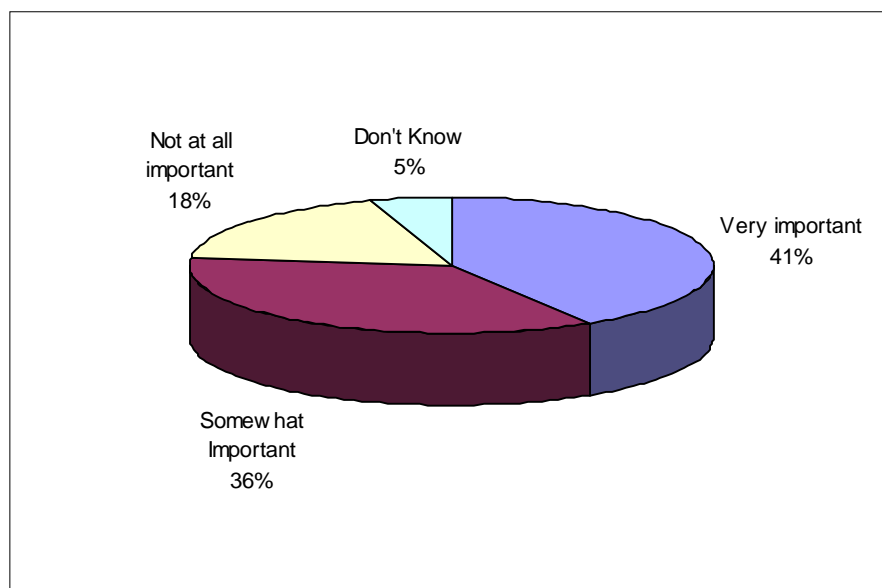
Contractors were asked about the usefulness of contractor certification as a marketing tool to residential customers and building contractors. As shown in Figure 6-14, non-participating contractors were more likely to report that certification would be a useful marketing tool to residential customers.

Figure 6-14
Usefulness of Certification as a Marketing Tool



In addition to stating their feelings about a certification program, contractors also expressed their opinions about certification labels. Figure 6-15 shows the results when non-participating contractors were asked how important offering certification labels for HVAC and duct system performance would be in terms of maintaining their firm’s competitive position. As shown, 41 percent of non-participating contractors felt certification labels were very important.

Figure 6-15
Importance of Offering Certification Labels



6.5 COMPOSITE INDEX FOR ENERGY-EFFICIENCY PRACTICES OF CONTRACTORS

A scoring index was developed to measure the EE practices of contractors in the Pacific Northwest region. This indexing or scoring system was created to provide a numeric method for assessing the practices currently employed by contractors. The distribution of scores over contractors in the region can be tracked over time to assess improvements in desired practices and effects of the program.

6.5.1 *Development of the Scoring Index*

Each surveyed contractor was assigned a composite index score between 0 and 24 points based on their responses to survey questions regarding their practices. Up to three points were awarded for each of the eight following services:

- Heating system tune-ups and testing
- Cooling system tune-ups and testing
- Heat pump system tune-ups and testing
- High-efficiency installation of heating systems
- High-efficiency installation of cooling systems
- High-efficiency installation of heat pump systems
- Duct services
- Weatherization service.

Table 6-8 describes how points were assigned for each type of service. For heating and cooling system testing, more points are awarded if the contractor actively markets the service or charges separately for the service. The percentage of new or replacement system installations that exceed a specified efficiency rating are used to assign up to nine points for installations. Marketing, ownership of diagnostic equipment, and the use of mastic for sealing were three of the factors considered to assign the three points associated with ducts. The number of weatherization services offered was used to award the three points for weatherization.

In general, contractors receiving a relatively high number of points will tend to offer a wide range of services across different system types and promote tune-up and diagnostic services. In addition, they will tend to be more effective at selling high-efficiency systems. It is also likely that contractors with the highest points differentiate themselves as experts in EE.

Offering both a wide range of services and “tune-up” services is a very critical aspect of what the venture is trying to accomplish. The contractor that offers many services including tune-ups is

able to establish a long-term relationship with customers. These contractors will be able assess what is best for their customers and educate their customers on the benefits of EE.

Table 6-8
Energy-Efficiency Practices Score: Criteria for Awarding Points

Service	Max Points	Criteria for Earning Points
System Tune-ups Gas Heating (q11-13) Air Conditioning (q17, 18) Heat Pump (q22, 23)	9 3 3 3	3 Points Actively markets the service and either: charges \$100 or more for service, or performs service on 70% of jobs 2 Points Actively markets the service or charges \$100 or more for service 1 Point Performs service at least 30% of jobs
Installations of High-efficiency Equipment Gas Heating- efficiency above 85% (q14) Air Conditioning- SEER above 12 (q19) Heat Pump- HSPF above 7.5 (q24)	9 3 3 3	3 Points 50% or more of equipment installed is H.E. 2 Points 25%-49% of equipment installed is H.E. 1 Point 11%-24% of equipment installed is H.E.
Duct Services (q26) System diagnostics and leakage testing System installation, retrofit and repair System safety checks Sealing Balancing Cleaning Insulation Other	3	3 Points Provides diagnostics checks and either: actively markets these services or owns diagnostic equipment 2 Points Provides diagnostics checks and either uses mastic for sealing or provides duct diagnostics only when replacing furnace or perform testing for air leakage for at least 50% of jobs 1 Point Provides diagnostics or safety checks or Actively markets duct services other than duct cleaning, or uses mastic for sealing
Weatherization Services (q36) Weatherstripping and caulking Window glazing Air infiltration diagnostics and testing Indoor air quality assessments Other	3	3 Points Actively markets and provides 3 or more services 2 Points Actively services or provides 2 or more services 1 Point Provides at least one service
Total	24	

6.5.2 Distribution of Scores for Contractor EE Practices

Table 6-9 shows the distribution of the composite scores for EE practices for both the non-participant and the participant contractors. The participant contractors have an average score of 10.9, compared to 8.4 for the non-participant contractors. Participants were also much more likely to have a score of 16 or more.

Table 6-9
Contractor Scoring Model: Results

EE Practices Index	Non-Participants	Participants
0 to 5	27%	26%
6 to 10	39%	17%
11 to 15	28%	26%
16 to 24	6%	30%
Average Score	8.4	10.9

When using this index for tracking EE practices over time, both the average score and the portion of contractors over a specified threshold would be of interest. The average score can be raised by many contractors making small changes to their practices or a few contractors changing their practices in a significant manner. It may be more desirable, from a market transformation perspective, that a few contractors change their practices in a significant fashion, rather than many contractors making small incremental changes. Thus, the portion of contractors with an index score higher than 10 may be a more revealing statistic than observing an increase in the average score.

Table 6-10 shows the distribution of EE practice scores by three types of contractors (large HVAC, small HVAC, and specialty contractors). The large HVAC contractors are defined as having 25 or more employees and tend to have an index distribution very similar to the participants. Specialty contractors tend to focus on weatherization or duct services and often do not install or maintain HVAC equipment. Thus, it is not surprising that these contractors tend to have lower scores since the scoring system places a lot of emphasis on HVAC equipment-related services.

**Table 6-10
Contractor Scoring Model: Results**

EE Practices Index	Large HVAC Contractors	Small HVAC Contractors	Specialty Contractors
0 to 5	20%	22%	48%
6 to 10	20%	42%	30%
11 to 15	47%	29%	23%
16 to 24	13%	7%	0
Average Score	10.4	8.8	6.2

6.6 CONTRACTOR SURVEY SUMMARY

The baseline data on contractors in the Pacific Northwest region provides the foundation for future research on the market effects of the PTCS Venture. Key findings of the contractor research are presented below:

- Contractors consider the cost of the system or unfavorable economics and lack of consumer demand as the most important barriers that prevent them from selling EE equipment.
- Eighty percent of non-participating contractors and 70 percent of participants felt the contractor's track record or a referral are the most important factors consumers consider when selecting a contractor.
- Well over half of the contractors in the region perform system tune-up and performance testing services. Contractors are more likely to perform these services for heating and cooling systems than heat pump systems. The majority of contractors report charging consumers less than \$100 for system tune-up and performance testing.
- Participant contractors are more likely to perform tune-ups and testing at their jobs. System tune-ups and performance testing is performed, on average, at 77 percent of participating contractors jobs as compared to 67 percent for non-participants. Sixty-two percent of the participants stated that they perform tune-up services at all of their jobs.
- Just over half of all contractors provide duct services. Mastic was the most frequently cited method of duct sealing, followed by duct tape. Over half of all non-participant contractors and 87 percent of participants use mastic for sealing ducts.
- About one-quarter of non-participant contractors who provide duct services reported that they actively market their duct improvement services. Comparatively, 40 percent of participants who provide duct services actively market their services.
- Fifty-six percent of non-participant contractors felt that cost was an important barrier affecting high-efficiency duct installation.

- Over half (54 percent) of all contractors provide some type of weatherization service. About one-quarter of non-participant contractors and 46 percent of participants who provide weatherization services actively market their services. Yellow pages and newspaper advertisements were the most frequently listed types of marketing.
- Forty-two percent of non-participant contractors are either extremely or very interested in participating in training and certification programs. Thirty-four percent are somewhat interested and 22 percent are not at all interested in training and certification programs. Sixty percent stated that they would be willing to pay for training and certification.
- A scoring index was developed to measure the EE practices of contractors in the Pacific Northwest region. Each surveyed contractor was assigned a composite index score between 0 and 24 points based on their responses to survey questions regarding their practices. Key findings of the scoring index are as follows:
 - ⇒ Participants scored higher on average in the EE practices scoring model than the baseline population of contractors. The mean score for participants was 10.9 versus 8.4 for non-participating contractors.
 - ⇒ While 30 percent of the participants had a composite score between 16 and 24, only 6 percent of the non-participating contractors had a score this high.
 - ⇒ Respondents were divided into three groups based on the type of contractor (large HVAC, small HVAC and specialty contractors). The distribution of EE practices scores indicated that large contractors had an index distribution similar to the participants. Thus, larger firms are more inclined to promote EE practices.

7.1 INTRODUCTION

This section presents the findings from the survey of participating contractors (participants). These contractors participated in the PTCS training and certification program on duct efficiency between April 1998 and June 2000. Section 8 provides a summary of the sampling strategy for the participant survey.

The objective of the participant survey was to gather data from participant contractors on the following:

- Attitudes and awareness of energy efficiency practices
- Practices
- Potential interest in other PTCS training and certification programs
- Feedback on the program.

The participants were asked the same questions from the baseline survey instrument as the non-participating contractors. In addition, participants were also asked a series of questions about the PTCS training and certification program. Any significant differences that were found between the non-participating contractors and the participants are highlighted in Section 6. Volume III of this report provides the full set of tables on frequencies and cross-tabulations of participant responses to the survey questions.

Of the participating contractors interviewed, approximately 52 percent described themselves as HVAC contractors. Table 7-1 summarizes the distribution of contractor types.

**Table 7-1
Contractor Type**

Contractor Type	# of Respondents (n=23)	% of Respondents
HVAC	12	52%
Weatherization	5	22%
General	1	4%
Design-build	2	9%
Electrical	1	4%
Other	2	9%

The remainder of this section is divided into the following four subsections:

- Effect of the PTCS training and certification program on contractor practices
- Value of the program to participating contractors
- Opinions on the PTCS diagnostic protocols
- Suggested improvements to the training and certification program.

7.2 EFFECT OF THE PROGRAM ON CONTRACTOR PRACTICES

Participants described several ways in which they had changed their duct practices in response to participating in the PTCS program.

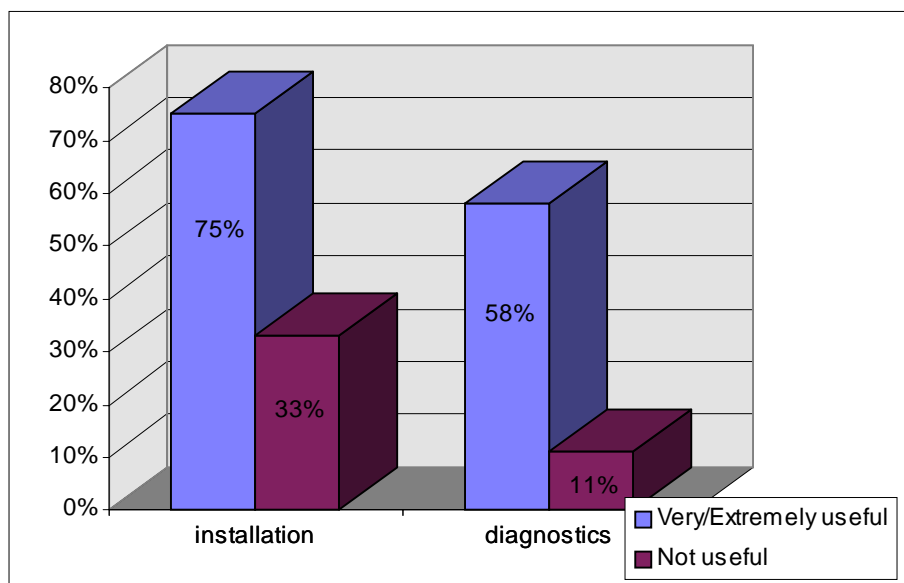
Table 7-2 displays three common duct practices and the percent of participants that have changed the specified practices as a result of program participation. As displayed, the majority changed their installation and sealing practices, and just under half changed their diagnostic practices.

Table 7-2
Changes in Duct Practices

Duct Practice	# that changed their practice n=23	% that changed their practice
Installation	12	55%
Diagnostics	9	41%
Sealing	14	64%

As Figure 7-1 shows, contractors who found the value of PTCS contractor certification to be very or extremely useful were more likely to have changed their duct practices relative to other contractors who didn't rate the value of certification as high. Specifically, 75 percent and 58 percent of contractors who rated the value of certification as high changed their duct installation and diagnostic practices, respectively.

Figure 7-1
Changes in Duct Practices by Perceived Value of Certification



Contractors who found the PTCS training to be very or extremely useful were also more likely to report changes in their duct diagnostic behavior; 68 percent changed their practices versus only 39 percent of those who didn't find the training very useful.

7.2.1 Marketing

To sell energy-efficient duct practices, contractors must at some level inform the homeowner about efficiency procedures. Eighty-seven percent of participants stated that they inform homeowners about duct efficiency procedures. This practice varies by contractor type; all of the HVAC contractors stated that they educate homeowners, while only 73 percent of non-HVAC participants stated that they educate homeowners.

7.3 VALUE OF THE PROGRAM TO CONTRACTORS

The following are several components to the PTCS program for which participants provided feedback:

- Training
- Certification
- Marketing workshop
- Marketing materials
- Labeling.

By definition, all of the contractors interviewed for the participant survey participated in the training and certification program. Over one-third (39 percent) reportedly use the marketing materials they received as part of the training. Ten of the 23 respondents in this group, or 43 percent, attended the marketing workshop. Not surprisingly, those that attended a PTCS marketing workshop were far more likely to have used the PTCS marketing materials—70 percent vs. 18 percent. Table 7-3 summarizes participation.

Table 7-3
Participation in Program Components

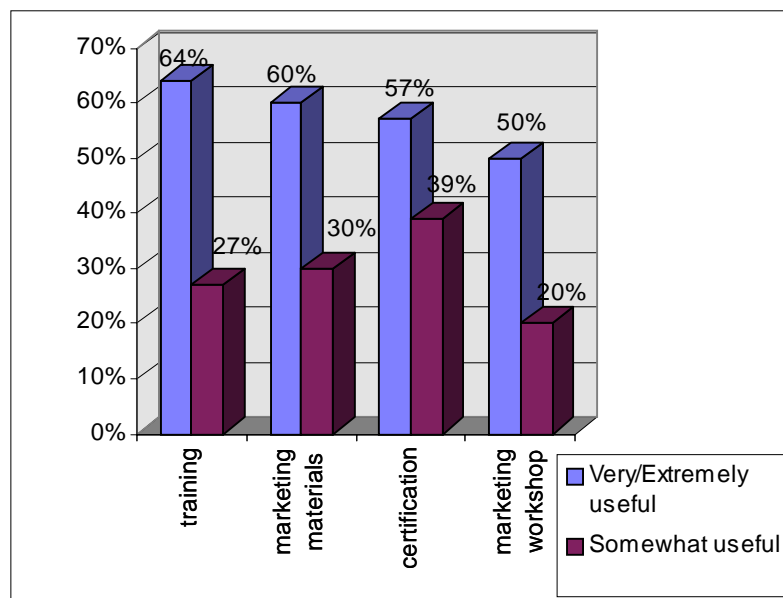
Program Component	# that participated n=23	% that participated
Training	23	100%
Certification*	23	100%
Marketing Workshop	10	43%
Use of Marketing Materials	9	39%

- Full or provisional certification

7.3.1 Contractor Feedback

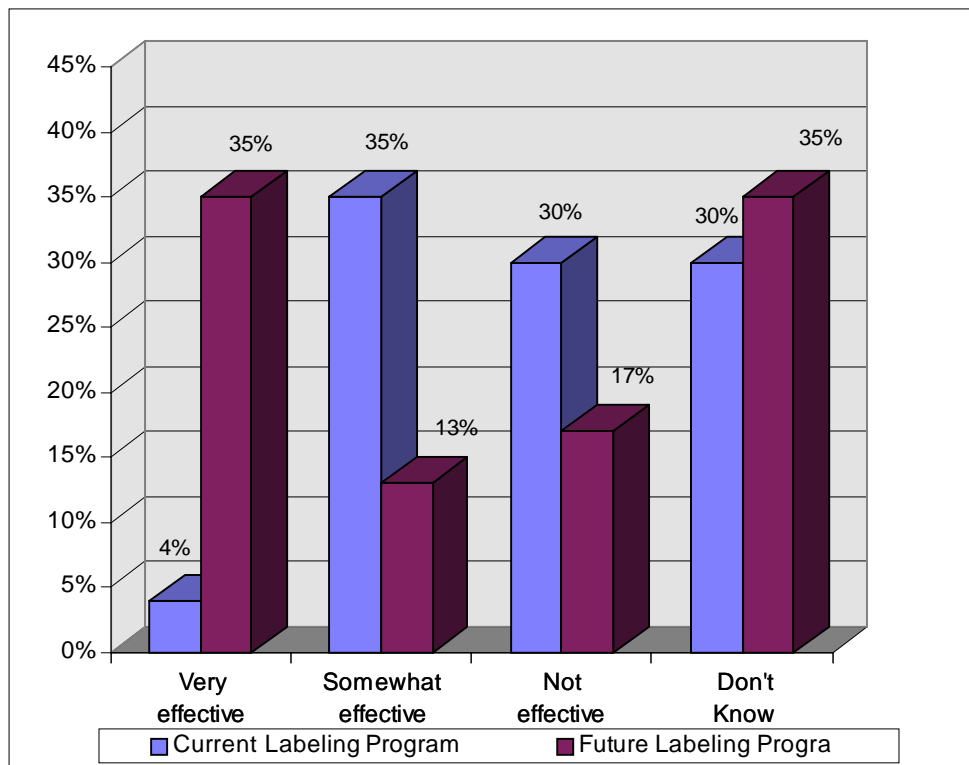
Figures 7-2 and 7-3 provide a snapshot of how useful and effective participants found the program components. As shown, the majority of participants found the training, certification, and marketing components very or extremely useful. Notably, only one contractor in the participant sample felt that these program elements were not at all useful.

Figure 7-2
Usefulness and Effectiveness of Program Components



Participants were asked to state how effective the PTCS labeling program has been in helping them to sell system safety and performance testing. Additionally, participants were asked to state how effective the PTCS labeling program will likely be in the future. Figure 7-3 displays how participants responded to each of these questions. As displayed, only 4 percent of the participating contractors felt that the current labeling program is highly effective. This is likely due to the fact that the labeling program has yet to be fully launched by PTCS. Notably, the majority (53 percent) of participants felt that the system certification labeling program has the potential to be very or extremely effective in the future.

Figure 7-3
Effectiveness of Labeling Program



7.4 OPINIONS ON PTCS DIAGNOSTIC PROTOCOLS

Over half of the participants completely agree with the PTCS diagnostic protocols for duct testing and only one contractor reportedly strongly disagrees with the protocols. Table 7-4 summarizes the reasons listed by participants who did not agree with the diagnostic protocols. Note that while one participant felt that the protocols were not strict enough, two felt that they are too strict. Another contradiction found was that two participants reported that the instructor was not knowledgeable enough, while those satisfied with the protocols reported that they found the instructor highly knowledgeable. This group of contractors mirrors the population of contractors in that they are a diverse group with varying levels of knowledge about the subject. While some feel satisfied with an instructor because they may be new to the subject, others might

feel that they already know the material. This poses a challenge to the instructor and to the program designers in attempting to challenge those more sophisticated contractors while still providing the basic concepts to those contractors who are newer to the subject.

Table 7-4
Reasons for Disagreement with Protocols

Reason	# n=5
Uses equipment differently than instructed	1
Protocol should be stricter	1
Protocol is too strict- cannot be that thorough in practice	2
Instructor not knowledgeable enough	2
Pressure pans produce inconsistent results; don't agree with their use	1

*multiple mentions allowed

7.5 SUGGESTED IMPROVEMENTS TO THE PROGRAM

Part of the rationale for surveying PTCS program participants was to get feedback on how to improve the program and attract more contractors to participate. Participants provided open-ended responses to the following three questions:

1. In what other ways do you think improved duct installations can be promoted?
2. How would you suggest to get more contractors to participate in training?
3. Do you have any suggestions on how to improve the program?

7.5.1 Duct Efficiency Promotional Ideas

Many contractors responded with suggestions for alternative methods for promoting improved duct installations. Over one-third felt that utility rebates and consumer education are warranted. One respondent felt that building codes requiring efficient ducts may be the only way to significantly increase the amount of improved ducts installed. Table 7-5 summarizes all responses to this open-ended question.

Table 7-5
Duct Efficiency Promotional Ideas

Ideas	# n=23	%
Building codes requiring efficient ducts	1	4%
Work with mortgage lenders/real estate	4	17%
Hold contractors responsible	1	4%
Utility rebates	8	35%
Consumer education	8	35%
Train housing inspectors	1	4%
Low interest loans	2	9%
Increase program marketing	4	17%
Raise electricity prices	1	4%

*multiple mentions allowed

7.5.2 Contractor Participation Suggestions

Participants were asked for suggestions on how to get more contractors to participate in the PTCS training program. About one-quarter felt that marketing the program would attract more contractors. Four respondents, representing 17 percent of the sample, felt that consumer education would be an effective method for getting higher participation rates. More radical ideas were increasing electricity prices, requiring the training course as part of contractor certification (licensing), and requiring performance ratings on duct installations. Table 7-6 summarizes the participant responses to this open-ended question.

Table 7-6
Methods to Get More Contractor Participation in Training

Methods	# n=23	%
Consumer education	4	17%
Increase marketing of program	6	26%
Increase electricity prices	1	4%
More contractor education	4	17%
Require performance ratings on duct installations	1	4%
Require training course as part of contractor certification	1	4%

*multiple mentions allowed

7.5.3 Suggestions for Improving the Program

Slightly less than half of the participants responded to the question asking for general feedback for improving the program. Consumer education and increasing program marketing were mentioned again as ways to improve the program. Other interesting suggestions were to add energy-efficient practices to the building codes and to make duct requirements and rebate programs broader and more consistent across the Pacific Northwest. Table 7-7 summarizes the suggestions that participants provided regarding ways to improve the program.

Table 7-7
Ideas for Improving the Program

Ideas for Improving Program	#
	n=10
Add energy efficient practices to the building code	1
Increase awareness of duct efficiency importance among state building board members	1
Consumer education	2
Make duct requirements broader/more consistent across the region	1
Broader/more consistent rebates across region	1
Increase program marketing	2
Consolidate training course information	1
Better follow-up with program participants	1

This section presents an overview of the survey methods used for this baseline study.

8.1 SAMPLE FRAME

The sample frame for the baseline study consists of residential consumers and contractors, the end-users and upstream market actors specifically targeted by the PTCS Program, who reside or practice in the Pacific Northwest region of Oregon, Washington, Idaho, and Montana. Two distinct groups of contractors were interviewed. Those contractors who have participated in the PTCS duct efficiency training and certification course were interviewed as “participants”. Additionally, a random sample of contractors specializing in HVAC, ducts, and weatherization were also interviewed. Table 8-1 summarizes the baseline survey response counts.

Table 8-1
Baseline Survey Response Counts

Market Actor	Number of Completes
Residential Homeowners	503
Contractors (Non-Participants)	104
Contractors (Participants)	23

Specific issues pertaining to each survey are summarized in the following subsections.

8.1.1 Residential Baseline Survey

A baseline survey of 503 residential homeowners in Idaho, Montana, Oregon, and Washington was conducted by telephone in late June and early July 2000. The key objectives of the consumer survey were to develop baseline data on:

- Housing characteristics and demographics
- Consumer behavior and practices
- Cost of services
- Consumer knowledge of energy-efficiency measures
- Consumer awareness of and participation in energy-efficiency programs (including performance testing programs)
- Consumers’ willingness to pay for services such as safety and efficiency testing and certification

- Consumer attitudes about the perceived value of contractor certification programs and equipment labeling.

In addition, the survey instrument was designed to help identify potential barriers to and consumer interest in the PTCS Program.

Consumer Sampling Strategy and Final Disposition

Based on establishing equal proportions, XENERGY established quotas by state, as shown in the third column of Table 8-2. Respondents were screened out if they did not own their home or had wood or pellet heating.¹

Table 8-2
Residential Household Population versus Sample

State	# Households	% Household of Total	Number of Respondents	% of Respondents*
Idaho	503,000	11%	52	10%
Montana	2,386,000	8%	39	8%
Oregon	1,401,000	30%	150	30%
Washington	383,000	51%	262	52%
Total	4,673,000	100%	503	100%

- *relative weights not necessary since sample percentages reflect population percentages.

Table 8-3 summarizes the results of applying the screening criteria to the consumers in the initial sample.

Table 8-3
Consumer Sample Attrition and Screening Results

	Oregon	Washington	Idaho	Montana	Total
Sample Frame	1,497	2,604	523	330	4,954
Refusals	300	372	83	74	829
Screened-out	228	357	74	45	704
Completed	150	262	52	39	503

8.1.2 Contractor Baseline Survey

A baseline survey of 104 contractors in Idaho, Montana, Oregon, and Washington was conducted by telephone in late August of 2000. The key objectives of the contractor survey were to develop baseline data on:

¹ Respondents who were in the process of buying their home were included in the sample.

- Contractor characteristics and firmographics
- Contractor behavior and practices
- Contractor perceptions of barriers to selling energy efficiency products and services
- Cost of services
- Contractor opinions on contractor certification and certification labels
- Contractor awareness of and participation in energy-efficiency programs (including performance testing programs).

In addition, the survey instrument was designed to help identify potential barriers to and contractor interest in the PTCS Program.

Contractor Sampling Strategy and Final Disposition

A source of the sample frame is Dunn & Bradstreet (D&B) MarketPlace Databases (Apr-Jun 2000). The sample was stratified based on contractor type and size. Table 8-4 summarizes the population that the sample was drawn.

**Table 8-4
Contractor Firm Population Versus Sample**

Strata	Contractor Type	Size of Business	Total # of firms (Population)
Large HVAC	HVAC	25 or more full-time employees	167
Small HVAC	HVAC	less than 25 full-time employees	2,970
Specialty	All but HVAC	All sizes	676
Total			3,813

Table 8-5 displays the SIC codes for the large and small contractors that were included in the sample frame.

**Table 8-5
SIC Codes for Large and Small HVAC Contractors**

SIC Code	SIC Code Description
1711-0000	Plumbing, heating, air-conditioning
1711-0400	Heating and air conditioning contractors
1711-0401	Mechanical contractor
1711-0405	Warm air heating and air conditioning contractor
1711-9901	Refrigeration contractor
1742-0203	Insulation, buildings

Table 8-6 displays the SIC codes for the specialty contractors that were included in the sample frame.

Table 8-6
SIC Codes for Specialty Contractors

SIC Code	SIC Code Description
1711-0100	Boiler and furnace contractors
1711-0103	Heating systems repair and maintenance
1711-0104	Hydronics heating contractor
1711-0404	Ventilation and duct work contractor
1751-0200	Window and door installation and erection
1751-0202	Window and door (prefabricated) installation
1761-9901	Architectural sheet metal work
1761-9903	Sheet metal work, nec
1799-0200	Coating, caulking, and weather, water, and fireproofing
1799-0201	Caulking (construction)
1799-0210	Weather stripping
7349-0202	Air duct cleaning
7623-9901	Air conditioning repair
7699-1804	Door and window repair

The total sample frame included 2,000 contractors, 100 percent of the large HVAC and specialty contractors and 1,157 small HVAC contractors, which were chosen on a random basis.

Table 8-7 summarizes the results of applying the screening criteria to the contractors in the initial sample frame and the number of refusals.

Table 8-7
Contractor Sample Attrition and Screening Results²

	Large HVAC	Small HVAC	Specialty	Total
Sample Frame	167	1,157	676	2,000
Refusals	44	85	85	214
Screened-out 1*	28	70	91	184
Screened-out 2*	0	8	4	12
Screened-out 3*	26	35	27	85
Surveys Completed	15	45	44	104

Contractor Weighting

Weighting involved applying sample weights to each respondent so as to present results that represent the target market of contractors in the Pacific Northwest. Two weights were computed:

² Screened out 1 = Don't provide HVAC/duct/weatherization services. Screened out 2 = Don't provide services on full time basis. Screened out 3 = Does less than 25% of business with residential customers.

the simple firm weight that weights up to the total number of firms in the target market, and the size weight that reflects the relative size differences between firms in the target market. Both are discussed below.

Simple Firm Weight

The firm weight is calculated by dividing the total number of firms in the target market for each of the three strata by the number of firms sampled in each strata. Table 8-8 presents the sample weights.

Table 8-8
Contractor Simple Firm Weight

Strata	Total # of firms	Sample # of firms	Firm weight
	(a)	(b)	(a/b)
Large HVAC	167	15	11.1
Small HVAC	2,970	45	66.0
Specialty	676	44	15.4
Total	3,813	104	

Size Weight

A second weight was computed that to take into account the size of the various contractor firms. The simple firm weights shown in Table 8-8 is calculated so that results are representative of the target market. Each firm in the target market is represented equally. The size weight weighs each firm relative to their size, measured by the number of employees at each firm. For instance, the responses of a firm with 100 employees in the target market would be weighted ten times as much as a firm with 10 employees.

The size weight was calculated by multiplying the simple firm weight by the number of employees reported by each contractor sampled. For instance, a sample point in the large HVAC strata represents 11.1 firms, as shown in Table 8-8. If that sample point has 100 employees, its size weight would be 1,110. Table 8-9 presents the size weight for nine of the sample points, three from each strata. This table illustrates that although only three simple firm weights exist, 104 size weights exist. That is, each firm has its own unique size weight.

**Table 8-9
Contractor Firm Size Weight**

Strata	Total # of firms (a)	Sample # of firms (b)	Firm weight (c)=(a/b)	Sample ID	Reported # of Employees (d)	Size weight (c*d)
Large HVAC	167	15	11.1	1	120	1,332
			11.1	2	90	999
			11.1	3	40	444
Small HVAC	2,970	45	66.0	4	1	66
			66.0	9	6	396
			66.0	10	2	132
Specialty	676	44	15.4	28	2	30.8
			15.4	68	1	15.4
			15.4	146	3	46.2
Total	3,813	104				

Weighting Method for Report

Both weights were used for analyzing the contractor survey data. The results section presents all results weighted by the simple firm weight. Where findings differed between the two weighting schemes, the size weight results were discussed.

8.1.3 PTCS Program Participant Survey

XENERGY surveyed 23 contractors who participated in the PTCS duct efficiency training and certification program by telephone in July and August of 2000. The key objectives of the participant survey were to gather program feedback on:

- The number of homes tested since participation in the program
- Effects of the program on contractor behavior and practices
- Participants' opinions on the value of the program
- Suggestions for improvement of the program.

In addition to program-related questions, participants were administered the contractor baseline survey.

Participant Sampling Strategy and Final Disposition

XENERGY was provided a list of certified contractors by the PTCS program administrator in late June 2000.³ This list contained 88 certified contractors and 29 unique firms. XENERGY attempted to survey 1 certified contractor from each of the 29 firms. Twenty-three firms were

³ List provided by Tom Hewes at OSU (DuctMa36300.xls, dated 6/30/00).

administered the survey and 6 firms were either unavailable or refused to participate in the survey. XENERGY later received a list from the Alliance that contained 113 certified contractors and 47 unique firms, an additional 25 contractors and 18 unique firms. Upon comparing the two lists, XENERGY noted that contractors who were trained by WSU were not included on the original list provided by the PTCS program administrator. As a result, only contractors that were trained by OSU were surveyed. Nevertheless, as Table 8-10 shows, approximately 50 percent of the PTCS training and certification participants were sampled.⁴

Table 8-10
Participant Population and Sample

	Participants
Certified contractors	113
Unique companies with certified contractors	47
Completed	23
Percent Surveyed	49%

⁴ Potential sampling bias could be present.

This section summarizes key baseline findings specifically pertaining to the PTCS Venture and the market for HVAC, duct, and weatherization services in the Pacific Northwest.

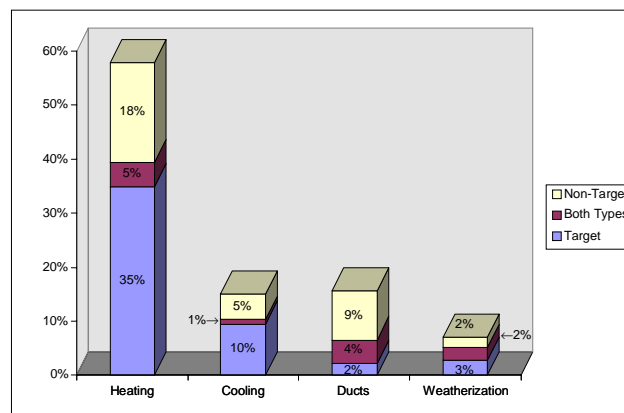
9.1 CONSUMER FINDINGS

The primary focus of the PTCS program is on providing HVAC, duct, and weatherization services to residential consumers. The results of the survey indicate that more than half of homeowners in the Pacific Northwest have performed some service on their heating system in the last four years, with general maintenance being the most common service performed. A similar portion of existing central air conditioning systems was also serviced in some fashion. From a program planning perspective, this finding illustrates the market potential for PTCS trained and certified contractors to promote and provide efficiency-related services. Once the contractors have their foot in the door, they should fully utilize the opportunity to promote PTCS related services, such as performance testing, duct sealing, and weatherization practices. **This finding validates the strategy of the PTCS organization to promote the concept of bundled services to contractors as a means of enhancing energy-efficiency opportunities and profit-earning potential.**

9.1.1 Safety and Performance Testing Activity Low Relative to Potential

Safety and performance testing are important components of the services promoted by the PTCS Venture. The consumer baseline survey indicated that approximately 10 percent of the consumers had a safety or efficiency test performed on either their heating, cooling or duct system during the last four years. As Figure 9-1 displays, this represents only a small percentage of the consumers who reported receiving services within the last four years, or significant untapped market potential. **This finding highlights the importance of continued and**

Figure 9-1
Respondents Receiving Services Within Four Years

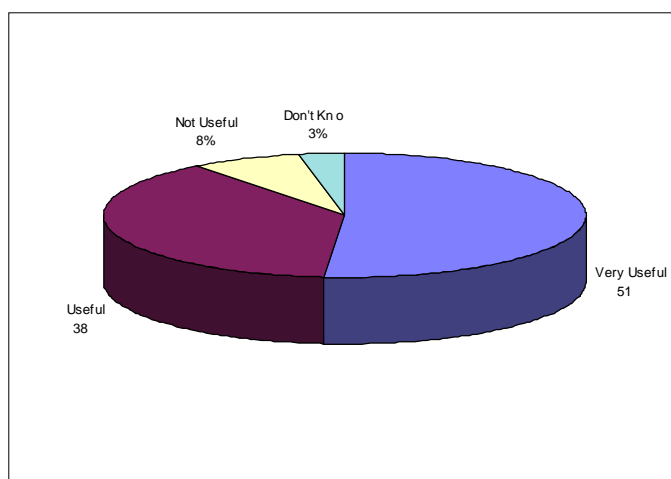


sustained marketing to increase consumer awareness of the benefits of safety and performance testing services.

9.1.2 Consumer Interest in Contractor Certification is High

Contractor training and certification are core components of the PTCS Venture. As Figure 9-2 shows, more than half of the respondents to the consumer survey gave the highest possible rating on the usefulness of certification when selecting a contractor. This high level of consumer support is extremely promising for the PTCS Venture. If contractor certification is promoted to consumers as a strong indicator quality and reliability, then contractors will be more likely to get certified. **The PTCS Venture should continue to focus on increasing consumer awareness of the availability of PTCS certified contractors and develop the planned PTCS contractor referral system as a means to reduce the hassle costs associated with consumers obtaining qualified and reputable contractors.**

Figure 9-2
Usefulness of Contractor Certification



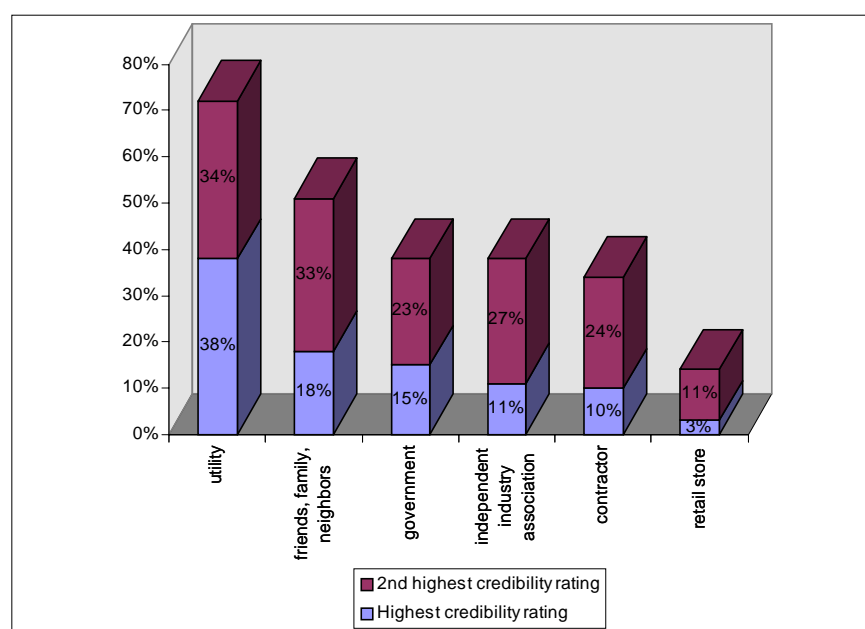
9.1.3 Potential to Improve Consumer Interest in and Willingness to Pay for HVAC System Testing and Certification

The baseline findings indicate that consumer interest in HVAC system testing and certification is low relative to market potential. While 15 percent of respondents stated that they were very interested in having their system tested and certified, more than half (54 percent) of the respondents had little or no interest in system certification. Most importantly from a program planning perspective, only 18 percent of interested respondents stated that they would be willing to pay more than \$100 to have their HVAC system certified. As consumer awareness of the benefits of HVAC system testing and certification increases, it's likely that consumer willingness to pay will also increase. **Nonetheless, the PTCS Venture should consider willingness to pay issues with respect to cost of service when planning market interventions.**

9.1.4 Utilities Receive High Credibility Rating

One of the more significant findings of this study is that utilities are viewed by consumers as being a highly credible source of information. Consumers were asked to rate the credibility of several potential information providers, including their utility, a contractor, government, independent industry association, retail stores, and family-friends-neighbors. As Figure 9-3 displays, the utility was rated as the most credible by the respondents, with 72 percent of respondents providing a high credibility rating. Friends, family, and neighbors received the next highest credibility rating.

Figure 9-3
Credibility of Information Sources



Consumers also rated the influence of various market actions on their decision to purchase services for their home's heating, cooling, and duct systems or for weatherization services. Cost-reducing financing and a utility endorsement were rated as very or extremely influential by most respondents. These findings confirm the perceived high credibility of utilities in the region. **Therefore, the PTCS Venture should leverage the perceived high credibility of utilities and work to partner with and seek the endorsement of local utilities whenever possible.**

9.1.5 Duct System Awareness Still Low Relative to Other Systems

Relative awareness of the benefits of duct system maintenance is low compared to awareness of the benefits of maintaining the cooling and heating system. Only about one half of respondents (57 percent) felt that their energy usage and comfort would be very affected by maintaining their duct system compared to about 87 percent of respondents who felt that weatherization would have a very large effect on their energy usage and comfort. **The PTCS Venture should continue to work to increase overall consumer awareness of duct systems and, more specifically, educate consumers about the importance of duct maintenance and sealing.**

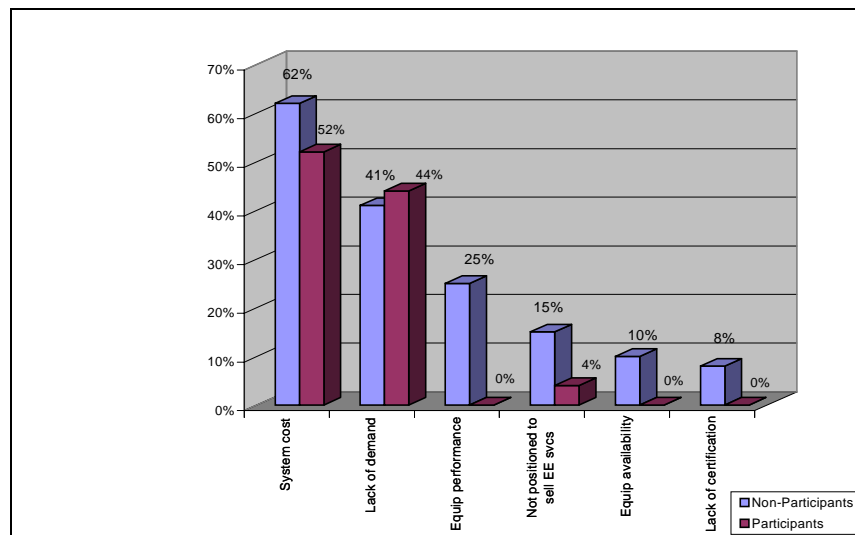
9.2 CONTRACTOR RESULTS

This research on both participating and non-participating contractors allows for the evaluation of the market effects of the duct efficiency program as well as provides the baseline for future research on the market effects of the PTCS Venture and its expanded scope of services. Through comparing the behavior of participating and non-participating contractors, there are strong indications of market effects of the duct efficiency program. For instance, the findings indicate that participating and non-participating contractors use different methods for duct sealing. This is a strong indicator that the duct efficiency training and certification program is effective in promoting sound, energy-efficient practices. Other noteworthy findings of the contractor research are presented in the following subsections.

9.2.1 Contractor Perceptions of Barriers Differ

As Figure 9-4 shows, contractors consider the cost of the system and lack of consumer demand as the most important factors that prevent them from selling energy-efficient HVAC and duct systems more frequently. It's interesting to note that fewer program participants felt system cost was an important factor preventing the sale of energy-efficient equipment. Additionally, no program participants felt equipment performance or equipment availability are important barriers. **This indicates that the training is effective in educating contractors on the economics of efficiency decisions as well as reducing concerns regarding the performance and availability of energy-efficient equipment.**

Figure 9-4
Barriers to Contractors Selling Energy-Efficient HVAC and Duct Systems



9.2.2 Contractor Referral or Track Record Perceived as Important by Contractors

Eighty percent of non-participating contractors and 70 percent of participants felt the contractor's track record or a referral are the most important factors consumers consider when selecting a contractor. Similar to the consumer results, this finding emphasizes the importance of promoting the PTCS organization as a credible third-party organization that trains and certifies contractors. **A consumer marketing program that associates contractor certification as the best indicator of a contractor's track record will go a long way to encourage contractors to get certified. Additionally, the PTCS organization should focus on developing the contractor referral system in the near term as a means of promoting PTCS-certified contractors.**

9.2.3 Participant Contractors are more likely to Perform Tune-ups and Testing

Participant contractors are more likely to perform system tune-ups and testing at their jobs. Participants provide system tune-ups and testing services at 77 percent of their jobs as compared to non-participants, who provide these services at 67 percent of their jobs.¹ Sixty-two percent of the participants who provide system tune-ups, safety, and performance testing services perform them at *all* of their jobs. Comparatively, slightly less than half of non-participating contractors who stated they provide these services offer them at *all* of their jobs. **These findings highlight the market effects of the duct efficiency program and imply that as more contractors are trained, the incidence of safety and performance testing will increase.**

9.2.4 Potential to Improve Marketing Activity of Contractors

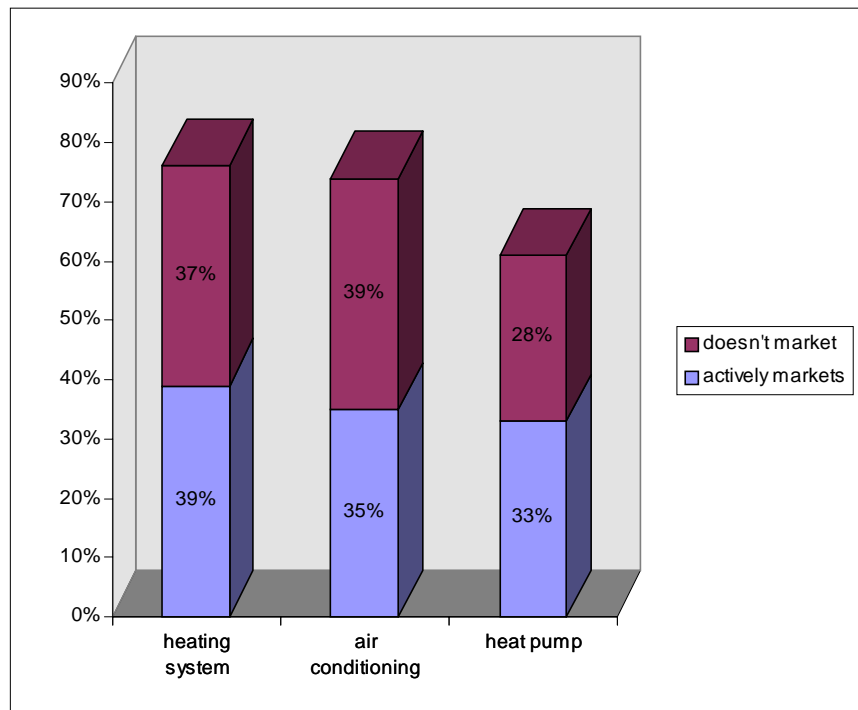
There is certainly potential to improve the amount of marketing activity currently being undertaken by contractors to promote testing services. Figure 9-5 shows the percentage of non-participating contractors who provide system tune-up, safety, and performance testing services, and of those, the percent that actively markets these services. As shown, a large percentage of contractors who offer these services do not actively market these services. **This clearly emphasizes the importance of providing contractors with marketing materials and training designed to enhance their ability to effectively promote PTCS related services.**

9.2.5 Participating Contractors are More Likely to Use Diagnostic Equipment

The findings indicate that many more program participants report using blower door, pressure pan, and duct blaster testing techniques than the general population of contractors. Additionally, participants use diagnostic equipment for both pre- and post-testing more frequently than non-participating contractors. **This is a strong indicator of the market effects of the training and certification program.**

¹ The average frequency for those contractors who offer system tune-ups, safety and performance testing services.

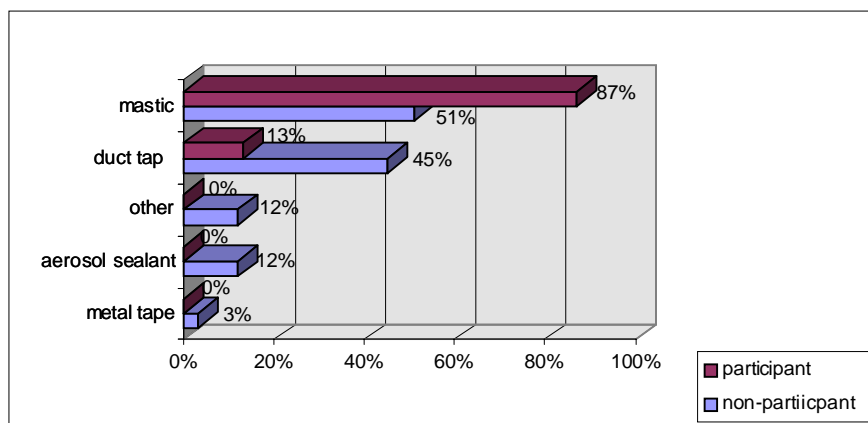
Figure 9-5
Contractors Who Provide System Tune-up and Safety and Performance Testing and Who Actively Market Services



9.2.6 Participants More Likely to Use Mastic for Duct Sealing

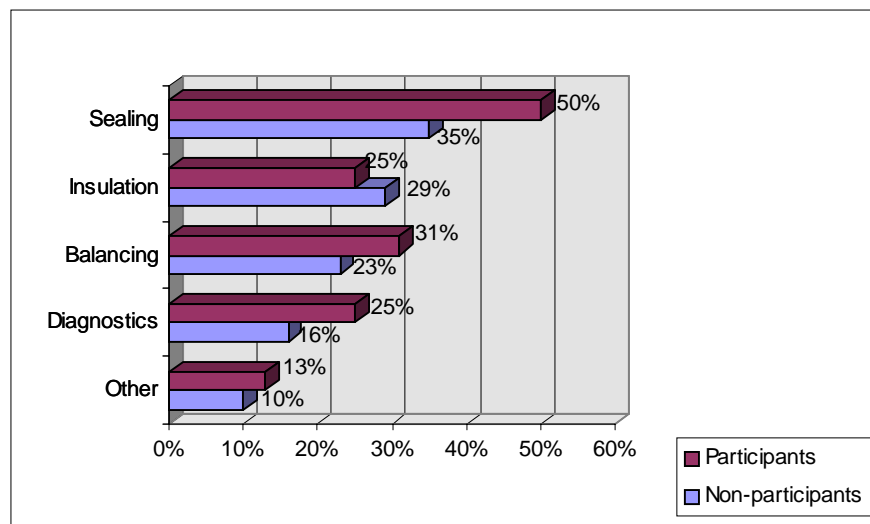
The methods used for duct sealing vary between participating and non-participating contractors. As Figure 9-6 displays, mastic is used by a much larger percentage of participating than non-participating contractors. **Since mastic is the preferred sealing methodology promoted by PTCS, this finding is a strong indicator of program success.**

Figure 9-6
Duct Sealing Methods Used



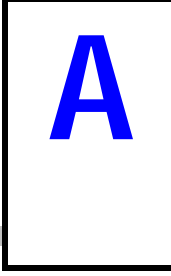
The findings also indicate that participating contractors are much more likely to seal duct work when they are replacing a furnace system, as displayed in Figure 9-7. **Again, this is an indicator that the PTCS Venture has been effective in promoting energy-efficient duct practices to their trained and certified contractors.**

Figure 9-7
Duct Work Performed Upon Furnace Replacement



9.2.7 Contractors are Interested in Training and Certification Programs

Forty-two percent of the non-participant contractors are either extremely or very interested in participating in training and certification programs. Thirty-four percent are somewhat interested and 22 percent are not at all interested in training and certification programs. Sixty percent stated that they would be willing to pay for training and certification. **The PTCS Venture simply has to leverage this high level of interest to recruit contractors to participate in their training and certification courses.**



***PTCS CERTIFIED CONTRACTOR AND
LICENSED FIRM LISTS***

Table A-1
PTCS Certified Contractors as of June 2000

Name	Company	Address	City	State	Zip	Phone	Status	Certification Date
Max Ball		1517 Hastings	Coeur D'Alene	ID	83814			
Albert Walter	Albert Walter Energy Services	1437 NW 8th	Redmond	OR	97756	(541) 923-5219	Provisional	April 16, 1999
Terry McKilligan	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Full	August 10, 1998
Richard Taft	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	September 10, 1998
David Sparks Jr.	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	January 8, 1999
David Sparks Sr.	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	January 8, 1999
Rob Obrist	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	January 8, 1999
Steve Hegele	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	January 8, 1999
Charlie Gray	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	February 1, 2000
Kenneth Ewalt	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	February 1, 2000
Albert Obrist	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	February 10, 2000
Alfie Simmons	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	February 10, 2000
Tom Lewis	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	February 10, 2000
Jason Blair	Alpha Energy Savers	14548 SE 172nd	Clackamas	OR	97015	(503) 239-6520	Provisional	March 2, 2000
Bob Ashley	Apollo	1207 W. Columbia Dr.	Kennewick	WA	99336	(509) 586-1104		07/23/1999
Jack Bartholomew	Applied Building Science	PO Box 86189	Portland	OR	97286	(503) 234-1286	Provisional	September 22, 1998
Rick Peterson	Arctic Refrigeration	1240 American Fruit Rd.	Wenatchee	WA	98801			07/23/1999
Ricky Smith	Area Heating	2721 NE 65th Ave.	Vancouver	WA	98661	(360) 737-0811		01/15/2000
Tom Dollemore	Area Heating	2721 NE 65th Ave.	Vancouver	WA	98661	(360) 737-0811		01/15/2000
Kevin Brooks	Associated Heating	PO Box 412	Eugene	OR	97440	(541) 683-2590	Provisional	May 20, 1999
Doyle Morris	BFCAC	720 W. Court	Pasco	WA	99301	(509) 545-4058		07/23/1999
James Gottula	Big Dog Construction	6820 W. Clearwater	Kennewick	WA	99336	(509) 735-8411		07/23/1999
Chris Quinton	Cambell & Bruce	1803 W. Court	Pasco	WA	99301	(509) 545-9848		07/23/1999

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PTCS CERTIFIED CONTRACTOR AND LICENSED FIRM LISTS

Name	Company	Address	City	State	Zip	Phone	Status	Certification Date
Gerry Borden	Chelan Co. PUD	P.O. Box 1231	Wenatchee	WA	98807	(509) 663-8121		07/23/1999
John Heller	Chelan Co. PUD	P.O. Box 1231	Wenatchee	WA	98807	(509) 663-8121		07/23/1999
Dianne Crosetto	Chelan Co. PUD	P.O. Box 1231	Wenatchee	WA	98807	(509) 663-8121		01/15/2000
Mike Shelton	Chelan Heating & Sheet Metal	P.O. Box 1884	Chelan	WA	98816			07/23/1999
Tim Clark	Chelan Heating & Sheet Metal	312 W. Gibson St.	Chelan	WA	98816			07/23/1999
Randall H. Olsen	Clack. County Weatherization	PO Box 215	Marylhurst	OR	97036	(503) 636-5101	Provisional	September 10, 1998
Jeff Greene	Comfort Design Services	4057 NW Northcliff	Bend	OR	97701	(541) 317-9347	Provisional	November 24, 1998
Andy Slaybaugh	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	July 2, 1998
Dustin Terpening	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	July 2, 1998
Keith Cooper	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	July 2, 1998
Robert Slayter	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	July 2, 1998
Nathan Brown	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	January 10, 2000
Stacy Breaux	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	(541) 726-0100	Provisional	March 8, 2000
Andres Cedillo	Dayco	11 N. Auburn	Kennewick	WA	99336	(509) 586-3672		07/23/1999
Ken Day	Dayco Heating	11 N. Auburn	Kennewick	WA	99336	(509) 586-9464		07/23/1999
Alan Van Zuuk	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
Bradley Andrews	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
Bruce Manclark	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
David Baumgartner	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
Drew Edwards	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
John Viner	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
Matthew Fergason	Delta T	PO Box 11622	Eugene	OR	97440	(541) 995-6105	Full	April 16, 1998
Richard Schulenbarger	Energy Solutions	P.O. Box 70101	Vancouver	WA	98665	(360) 281-5746		07/23/1999
David Odom	Energy Tech	720 W. Court	Pasco	WA	99301	(509) 545-4058		07/23/1999
Steven Bell	Energy Tech	720 W. Court	Pasco	WA	99301	(509) 545-1057		07/23/1999
Bill Barnum	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000
Donna L. Baker	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Provisional	February 11, 2000
Kandy Daniel	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Provisional	February 11, 2000
Karen Grant	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000

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PTCS CERTIFIED CONTRACTOR AND LICENSED FIRM LISTS

Name	Company	Address	City	State	Zip	Phone	Status	Certification Date
Laurie Anderson	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000
Marsha Baker	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000
Steve Sills	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000
Ted Duran	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Provisional	February 11, 2000
Terry Williamson	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Provisional	February 11, 2000
Victor M. Cid	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Provisional	February 11, 2000
Vivian Haney	Fleetwood Homes of Oregon	PO Box 628	Woodburn	OR	97071	(503) 981 3136	Full	June 23,2000
Jim Scott	Hendrix Heating	750 NW Cornell	Corvallis	OR	97330	(541) 753 6760	Provisional	January 10, 2000
Rich Friedel	Hendrix Heating	750 NW Cornell	Corvallis	OR	97330	(541) 753 6760	Provisional	January 10, 2000
Jon Mannila	Home Comfort Heating and Air Conditioning	PO Box 24205	Eugene	OR	97402	(541) 345 2838	Provisional	March 8, 2000
Leonard G. Lostrom	Home Comfort Heating and Air Conditioning	PO Box 24205	Eugene	OR	97402	(541) 345 2838	Provisional	March 8, 2000
Rich St. Andrew	Home Experts	16713-B E. Sprague	Veradale	WA	99037	(509) 893-9540		07/23/1999
Andy Gramer	HVAC By Terry	2870 SW 221st Avenue	Hillsboro	OR	97123	(503) 649 3458	Provisional	March 27, 2000
Jeremy Frey	HVAC By Terry	2870 SW 221st Avenue	Hillsboro	OR	97123	(503) 649 3458	Provisional	March 27, 2000
Andy Sanders	Jahnke Heating & Air Conditioning	112 S. Pacific Highway	Talent	OR	97540	(541) 779-8496	Provisional	October 1, 1998
Brandon Bowman	Jahnke Heating & Air Conditioning	112 S. Pacific Highway	Talent	OR	97540	(541) 779-8496	Provisional	
Michael Jahnke	Jahnke Heating & Air Conditioning	112 S. Pacific Highway	Talent	OR	97540	(541) 779-8496	Provisional	
Steve Mason	James Heating and Air Conditioning	115 Lawrence Street	Eugene	OR	97401	(541) 461-2101	Provisional	June 8, 1998
John Marshall	JHM Sheetmetal	15760 Burgess Road	LaPine	OR	97739	(541) 536-2246	Provisional	June 11, 1999
Wendy Ronning	JHM Sheetmetal	15760 Burgess Road	LaPine	OR	97739	(541) 536-2246	Provisional	June 11, 1999
Bob Englund	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000
Charles Schifferdecker	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000
Dan Giarrusso	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000

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PTCS CERTIFIED CONTRACTOR AND LICENSED FIRM LISTS

Name	Company	Address	City	State	Zip	Phone	Status	Certification Date
Harold Kelly	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000
Rick Baird	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000
Sharon Brouillette	Marshall's Heating	4110 Olympic Avenue	Springfield	OR	97478	(541) 747-7445	Provisional	March 30, 2000
Michael Boyd	May or May Not Construction	2920 SE 20th Ave.	Albany	OR	97321	(541) 928-8608	Provisional	April 16, 1998
Greg Smith	Metal Masters, Inc.	3825 Crater Lake Highway	Medford	OR	97504	(541) 779 1049	Provisional	March 29, 1999
Ron Powell	Mike's Heating and AC	PO Box 748	Albany	OR	97321	(541) 928 1804	Provisional	
Denton Hempstead	Mike's Heating and AC	PO Box 748	Albany	OR	97321	(541) 928 1804	Provisional	
Billy Aleshire	Mount Hood Weatherization	20369 Homestead Drive	Oregon City	OR	97045	(503) 656-9366	Provisional	February 1, 2000
Juan Padron	Mount Hood Weatherization	20369 Homestead Drive	Oregon City	OR	97045	(503) 656-9366	Provisional	February 1, 2000
Daniel Flores	Mount Hood Weatherization	20369 Homestead Drive	Oregon City	OR	97045	(503) 656-9366	Provisional	March 7, 2000
Jeff Moller	Palm Harbor Homes	3737 Palm Harbor Rd.	Millersburg	OR	97321	(541) 926 2626	Provisional	05/11/00
Gary Smith	Palm Harbor Homes	3737 Palm Harbor Rd.	Millersburg	OR	97321	(541) 926 2626	Provisional	05/11/00
Gary Atchison	Palm Harbor Homes	3737 Palm Harbor Rd.	Millersburg	OR	97321	(541) 926 2626	Provisional	05/11/00
James Kincaid	Palm Harbor Homes	3737 Palm Harbor Rd.	Millersburg	OR	97321	(541) 926 2626	Provisional	05/11/00
William Smith	Ponderosa Heating	PO Box 100	Sisters	OR	97759	(541) 549-1605	Provisional	November 24, 1998
Cliff McClure	Quality Heating	336 S. 3rd Street	Redmond	OR	97756	(541) 923 4752	Provisional	January 25, 1999
Jeremy Simpson	Quality Heating	336 S. 3rd Street	Redmond	OR	97756	(541) 923 4752	Provisional	January 25, 1999
Michael R. McClure	Quality Heating	336 S. 3rd Street	Redmond	OR	97756	(541) 923 4752	Provisional	January 25, 1999
Lonnie Brewer	Renaud Electric Co., Inc.	2300 Talley Way	Kelso	WA	98626	(425) 423-8281	Provisional	04/16/98
Frank K. Bourn	Richart Family, Inc.	14600 NE 20th Ave.	Vancouver	WA	98686	(360) 574-5859	Provisional	09/10/98
Ron Clemmer	Richart Family, Inc.	14600 NE 20th Ave.	Vancouver	WA	98686	(360) 574-5859	Provisional	09/10/98
Darrell Shoote	Richart Family, Inc.	14600 NE 20th Ave.	Vancouver	WA	98686	(360) 574-5859	Provisional	09/10/98
Dwain Voeller	Richart Family, Inc.	14600 NE 20th Ave.	Vancouver	WA	98686	(360) 574-5859	Provisional	09/10/98
Mark Parker	Scott's Mechanical	1437 Industrial Way SW	Albany	OR	97321	(541) 928 4817	Provisional	May 14, 1998
Dave Schmidt	Scott's Mechanical	1437 Industrial Way SW	Albany	OR	97321	(541) 928 4817	Provisional	August 22, 1998
Dave Scott	Scott's Mechanical	1437 Industrial Way SW	Albany	OR	97321	(541) 928 4817	Provisional	August 22, 1998
Ed Scott	Scott's Mechanical	PO Box 885	Albany	OR	97321	(541) 928 4817	Provisional	January 20, 2000
Seanna Green	Scott's Mechanical	PO Box 885	Albany	OR	97321	(541) 928 4817	Provisional	January 20, 2000
Lloyd Schutt	Skut Construction	1603 Cross St. #1	Wenatchee	WA	98807			07/23/1999

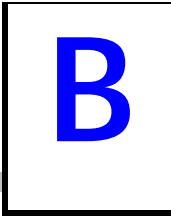
APPENDIX A

PTCS CERTIFIED CONTRACTOR AND LICENSED FIRM LISTS

Name	Company	Address	City	State	Zip	Phone	Status	Certification Date
Al Stephens	Stephens Heating & A/C	1920 SW Third St.	Corvallis	OR	97333	(541) 754 1681	Provisional	October 7, 1999
Jesse Aday	Super Duct Services	19 Silvest Rd	Orondo	WA	98843	509-784-3828		01/30/2000
J. T. Tackitt	T & T Construction	622 Yakima St.	Wenatchee	WA	98807			07/23/1999
James Mattson	T & T Construction	539 Walker St.	Wenatchee	WA	98801			07/23/1999
John Peters	Teseca	6918 E. Fourth Plain Blvd.	Vancouver	WA	98661	(360) 694-8451		07/23/1999
Dan Rock	The Insulation Man	1200 Eastmont Ave. #11	East Wenatchee	WA	98802			07/23/1999
Mark George	Total Comfort	565 21st Street SE	Salem	OR	97301	(503) 399-9052	Provisional	February 28, 1999
Rick Sellars	Total Comfort	565 21st Street SE	Salem	OR	97301	(503) 399-9052	Provisional	February 28, 1999
Tom Brodbeck	Universal Energy	PO Box 68478	Portland	OR	97268	(503) 471-1601	Full	April 16, 1998

**Table A-2
PTCS Licensed Firms as of June 2000**

Name	Company	Address	City	State	Zip	Phone	Date signed	Expiration
Robert L. Obrist	Alpha Energy Savers, Inc.	14548 SE 172nd	Clackamas	OR	97015	503-239-6520	09/14/1999	10/01/2000
Richard L. Peterson	Arctic Refrigeration	1240 American Fruit Rd.	Wenatchee	WA	98801	509-734-2284	11/09/1999	12/31/2000
Wes Wilson	Area Heating & Cooling	2721 NE 65th Ave	Vancouver	WA	98661	360-737-0811	11/16/1999	12/31/2000
James Gottula	Big Dog Construction	6820 W. Clearwater	Kennewick	WA	99336	509-734-2284	11/10/1999	12/31/2000
David Goetsch	Central WA Heating, Inc.	P.O. Box 2277	Wenatchee	WA	98807	509-663-3557	11/09/1999	12/31/2000
Robert Lawrence	Comfort Flow Heating	1951 Don Street	Springfield	OR	97477	541-726-0100	03/04/2000	03/03/2001
Ken Day	Dayco Heating	11 N. Auburn	Kennewick	WA	99336	509-586-9464	11/08/1999	12/31/2000
Richard Shulenbarger	Energy Solutions	P.O. Box 70101	Vancouver	WA	98665	360-281-5746	11/16/1999	12/31/2000
Jim Scott & Rich Friedel	Hendrix Heating	750 NW Cornell	Corvallis	OR	97330	541-753-6760	12/09/1999	12/31/2000
Leonard Lostrom	Home Comfort Heating	PO Box 24205	Eugene	OR	97402	541-345-2838	03/04/2000	03/03/2001
Terry Frank	HVAC By Terry	5650 SE Pine	Hillsboro	OR	97123	503-649-3458	03/24/2000	03/23/2001
David L. Adams	Intermountain West Insulation	6820 W. Clearwater	Kennewick	WA	99336	509-735-8411	11/10/1999	12/31/2000
Michael Boyd	May or May Not Const., Inc.	2920 SE 20th Ave.	Albany	OR	97321	541-928-8608	12/09/1999	12/31/2000
Juan Padron	Mt Hood Weatherization	412 S. Beaver creek Rd, # 611	Oregon City	OR	97045	503-656-9321	03/24/2000	03/23/2001
Bill Spezza	Ponderosa Heating	P.O. Box 100	Sisters	OR	97759	541-549-1605	12/10/1999	12/31/2000
David Hocker	Quality Heating	336 S. 3rd Street	Redmond	OR	97756	541-923-4752	12/10/1999	12/31/2000
Dwain Voeller	Richart Builders	14600 NE 20th Ave.	Vancouver	WA	98686	360-574-5859	11/16/1999	12/31/2000
Ed Scott	Scott's Mechanical	1437 Industrial Way SW	Albany	OR	97321	541 928 4817	03/04/2000	03/03/2001
Lloyd R. Schutt	Skut Construction	1603 Cross St. #1	Wenatchee	WA	98807	509-662-7241	11/09/1999	12/31/2000
Pete Dallaire	Smith Insulation	331 W. Columbia Dr.	Kennewick	WA	99336	509-586-0408	11/10/1999	12/31/2000
John C. Peters	Taseca	6918 E. Fourth Plain Blvd.	Vancouver	WA	98661	360-694-8451	11/16/1999	12/31/2000
Jerry Page	Total Comfort Weatherization	564 21st SE	Salem	OR	97301	503-399-9052	03/24/2000	03/23/2001
Darrel Peak	Vincent Construction	1504 W. Frontage	Pasco	WA	99301	509-545-9822	11/10/1999	12/31/2000



CONSUMER SURVEY INSTRUMENT

TZONE

Respondent's time zone

N=	503	100%
Eastern	3	0%
Central	4	0%
Mountain.....	5	18%
Pacific	6	82%
Alaska	7	0%

WAVE

ten sample waves

N=	503	100%
WAVE One Initial sample	01	315 63%
WAVE Two	02	107 21%
WAVE Three	03	43 9%
WAVE Four.....	04	38 8%
WAVE Five	05	0 0%
WAVE Six	06	0 0%

ZIP

zip FROM SAMPLE

STATE

state from sample

N=	503	100%
Oregon	41	150 30%
Washington	53	262 52%
Idaho	16	52 10%
Montana	30	39 8%

INT02

Hello, my name is ___ calling from the Northwest Energy Efficiency Alliance. We are contacting homeowners as part of a study on home heating, cooling and duct systems. We are not selling anything. May I please speak with the person in the house who is most familiar with your heating and air conditioning systems? IF PERSON WHO IS MOST FAMILIAR IS DIFFERENT FROM THE FIRST PERSON, REINTRODUCE.

N=	503	100%
Continue.....	51	501 100%
02 ARRANGE CALL-BACK - OUT OF HOME (Later completed)	02	=> /NAME 1 0%
03 RESPONDENT NOT AVAILABLE/TOO BUSY (Later completed)	03	=> /CALL1 1 0%

Q1

First, do you own or rent your home?

N=	503	100%
Own..... 1	494	98%
Rent (or lease)..... 2	0	0%
In the process of buying (making payments)..... 3	9	2%
Don't know/Refused..... 4	0	0%

INT03

=> +1 if Q1=1 3

THANK AND TERMINATE Own or rent? <q1 >

N=	0	0%
NQ 60 - Renters 60	=> /END	0 0%
NQ 61 - Don't know/Refused home ownership..... 61	=> /END	0 0%

Q2

What is the primary fuel you use to heat your home?

N=	503	100%
Natural gas 01	228	45%
Electricity..... 02	202	40%
Oil 03	37	7%
Propane 04	24	5%
Cord wood/pellets 05	0	0%
Electric heat pump 06	=> Q4	12 2%
Other (SPECIFY): 97	0	0%
NONE 00	0	0%
Don't know/Refused..... 99	0	0%

INT04

=> +1 if NOT Q2=05 97 00 99

THANK AND TERMINATE

N=	0	0%
NQ 62 - Wrong or no primary fuel type..... 62	=> /END	0 0%

WORD1

=> * if IF((Q2=01 03 04),1,2)

N=	491	100%
Is that a centralized forced air furnace, wall units, or something else? 1	309	63%
Is that a centralized forced air furnace, heat pump, wall units, baseboard heaters, portable heaters or something else? 2	182	37%

Q3

<word1 > (Wording determined in WORD1 based on Q2)

N=		491	100%
Centralized forced air..... 01		362	74%
Heat pump..... 02		30	6%
Wall units..... 03		51	10%
Baseboard 04		40	8%
Portable heaters..... 05		8	2%
Other (SPECIFY)..... 97		0	0%
NONE 00		0	0%
Don't know/Refused..... 99		0	0%

INT05

=> +1 if	NOT Q3=97 00 99
----------	-----------------

THANK AND TERMINATE

N=		0	0%
NQ 63 - Other or no furnace or heating unit type 63	=> /END	0	0%

Q4

Approximately, how old is your home?

N=		503	100%
Less than 1 year 000		5	1%
Don't know/Not sure 998		8	2%
Refused 999		0	0%

Q5

Is your home a . . .

N=		503	100%
Manufactured or Mobile home 1		79	16%
Single family detached house..... 2		393	78%
Duplex or triplex..... 3		7	1%
Townhouse or row house 4		3	1%
Or condominium? 5		15	3%

Don't know/Refused..... 6		6	1%

WORD2

=> * if	IF((Q5=1),2,1)
---------	----------------

N=		503	100%
IF NEEDED: Not including any unheated garage or unfinished basement areas..... 1		424	84%
NOTE: ENTER SQUARE FEET OR WIDTH/LENGTH DIMENSIONS 2		79	16%

Q6

What is the approximate square footage of the living space in your home?

<word2 >

N=	503	100%
RECORD SQUARE FEET (OR WIDTH-LENGTH DIMENSIONS)..... 01	461	92%
Don't know/Refused..... 99	42	8%

Q7

How many bedrooms do you have in your home? IF NEEDED: Whether you use it as bedroom or not.

N=	503	100%
Don't know/Refused..... 99	0	0%

Q8

=> Q14 if Q3=04-05

Now I would like to ask you a few questions about your home's heating system. What percent of your home's heating is supplied by your PRIMARY heating system?

N=	455	100%
100%	346	76%
Don't know/Refused..... 999	8	2%

Q9

When was the last time that your heating system was serviced? (OKAY IF SELF-MAINTAINED).

N=	455	100%
Less than 4 years ago 1	289	64%
4 to 8 years ago..... 2	20	4%
More than 8 years ago..... 3	10	2%
Never been serviced..... 4	=> Q13 108	24%
Don't know/Refused..... 5	=> Q13 28	6%

Q10

For which of the following reasons did you have your heating system last serviced?

N=	319	100%
Equipment repair..... 01	71	22%
Upgrading or replacing equipment..... 02	54	17%
Safety and efficiency testing 03	47	15%
General maintenance..... 04	184	58%
Or something else? (SPECIFY): 97	0	0%
.....	0	0%
Don't know/Refused..... 99	4	1%

Q11

Was the service performed by . . .

N=	319	100%
Utility service personnel	01	37 12%
A general building contractor	02	5 2%
A heating system specialist or contractor	03	228 71%
Or someone else (SPECIFY):	97	2 1%

Homeowner/self	88	41 13%
Don't know/Refused	99	8 3%

Q12

Approximately how much did it cost to service your heating system? IF NEEDED/SELF-MAINTAINED: Please include the cost of materials and supplies.

N=	319	100%
Don't know/Refused	99999	76 24%

Q13

How strongly do you think the general condition of your heating system and its maintenance affect the following issues in your home. Use a 1 to 5 scale, with 5 meaning that the issue is extremely affected and 1 meaning that it is not affected at all.

N=	455	100%
CONTINUE	1	455 100%

Q13A

(How strongly do you think the general condition and maintenance of your heating system affects...) Your Comfort? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your comfort is extremely affected and 1 meaning that it is not affected at all.

N=	455	100%
Not affected at all	1	18 4%
Two	2	20 4%
Three	3	64 14%
Four	4	113 25%
Extremely affected	5	232 51%
Don't know/Refused	6	8 2%

Q13B

(How strongly do you think the general condition and maintenance of your heating system affects...) Your Health? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your health is extremely affected and 1 meaning that it is not affected at all.

N=	455	100%
Not affected at all	1	54 12%
Two	2	25 5%
Three	3	89 20%
Four	4	105 23%
Extremely affected	5	168 37%
Don't know/Refused	6	14 3%

Q13C

(How strongly do you think the general condition and maintenance of your heating system affects...) Your Safety? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your safety is extremely affected and 1 meaning that it is not affected at all.

N=	455	100%
Not affected at all..... 1	37	8%
Two..... 2	27	6%
Three..... 3	62	14%
Four..... 4	87	19%
Extremely affected..... 5	233	51%
Don't know/Refused..... 6	9	2%

Q13D

(How strongly do you think the general condition and maintenance of your heating system affects...) Your Utility Energy Bills? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your utility energy bills are extremely affected and 1 meaning they aren't affected at all.

N=	455	100%
Not affected at all..... 1	23	5%
Two..... 2	31	7%
Three..... 3	81	18%
Four..... 4	110	24%
Extremely affected..... 5	198	44%
Don't know/Refused..... 6	12	3%

Q14

Do you have any type of cooling or air conditioning system in your home besides ceiling or portable fans?

N=	503	100%
Yes..... 1	177	35%
No..... 2	325	65%
Don't know/Refused..... 3	1	0%

=> Q21

=> Q21

Q15

Now I have a few questions about your home's cooling system. Which of the following types of cooling systems do you have?

N=	177	100%
Centralized air conditioning unit..... 01	78	44%
Heat pump with air conditioning..... 02	45	25%
Swamp cooler..... 03	8	5%
Room air conditioner..... 04	39	22%
Whole house fan..... 05	6	3%
Or something else (SPECIFY)..... 97	5	3%

Don't know/Refused..... 99	0	0%

Q16

=> Q21 if NOT Q15=01-02

When was the last time your cooling system was serviced? (OKAY IF SELF-MAINTAINED).

N=		121	100%
Less than 4 years ago	1	76	63%
4 to 8 years ago	2	3	2%
More than 8 years ago	3	5	4%
Never been serviced.....	4	31	26%
Don't know/Refused.....	5	6	5%

=> Q20
=> Q20

Q17

For which of the following reasons did you have your cooling system LAST serviced?

N=		84	100%
Equipment repair.....	01	14	17%
Upgrading or replacing equipment.....	02	19	23%
Safety and efficiency testing	03	7	8%
General maintenance such as refrigerant check or coil cleaning.....	04	53	63%
Or something else? (SPECIFY):	97	0	0%

Don't know/Refused.....	99	0	0%

Q18

Was the service performed by . . .

N=		84	100%
Utility service personnel	01	1	1%
A general building contractor	02	2	2%
A heating and cooling system specialist or contractor	03	77	92%
Or someone else (SPECIFY):	97	0	0%

Homeowner/self	88	3	4%
Don't know/Refused.....	99	1	1%

Q19

Approximately how much did it cost to service your cooling system? IF NEEDED/SELF-MAINTAINED: Please include the cost of materials and supplies.

N=		84	100%
Don't know/Refused.....	99999	13	15%

Q20

How strongly do you think the general condition of your cooling system and its maintenance affect the following issues in your home. Use a 1 to 5 scale, with 5 meaning that the issue is extremely affected and 1 meaning that it is not affected at all.

N=		121	100%
CONTINUE.....	1	121	100%

Q20A

(How strongly do you think the general condition and maintenance of your cooling system affects...) Your Comfort? IF NEEDED: Use a 1 to 5 scale, with 5 meaning you comfort is extremely affected and 1 meaning it's not affected at all.

N=	121	100%
Not affected at all..... 1	3	2%
Two..... 2	4	3%
Three..... 3	17	14%
Four..... 4	33	27%
Extremely affected..... 5	62	51%
Don't know/Refused..... 6	2	2%

Q20B

(How strongly do you think the general condition and maintenance of your cooling system affects...) Your Health? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your health is extremely affected and 1 meaning it's not affected at all.

N=	121	100%
Not affected at all..... 1	21	17%
Two..... 2	11	9%
Three..... 3	32	26%
Four..... 4	18	15%
Extremely affected..... 5	37	31%
Don't know/Refused..... 6	2	2%

Q20C

(How strongly do you think the general condition and maintenance of your cooling system affects...) Your Safety? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your safety is extremely affected and 1 meaning it's not affected at all.

N=	121	100%
Not affected at all..... 1	23	19%
Two..... 2	12	10%
Three..... 3	24	20%
Four..... 4	18	15%
Extremely affected..... 5	41	34%
Don't know/Refused..... 6	3	2%

Q20D

(How strongly do you think the general condition and maintenance of your cooling system affects...) Your Utility Energy Bills? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your utility bills are extremely affected and 1 meaning they aren't affected at all.

N=	121	100%
Not affected at all..... 1	2	2%
Two..... 2	7	6%
Three..... 3	20	17%
Four..... 4	36	30%
Extremely affected..... 5	54	45%
Don't know/Refused..... 6	2	2%

Q21

=> Q26 if	NOT Q3=01-02 AND (Q14=2-3 OR NOT Q15=01-02)
-----------	---

Now I'd like to know about your house's duct system. The Duct system is round or rectangular tubes that deliver heated or cooled air from the central heater or air conditioner to the rest of the home. The air from the ducts enters the home through the registers in the walls, ceiling or floor. Have you had any of the following services on your ducts since you moved into your home?

N=		401	100%
Duct testing	1	18	4%
Duct sealing	2	22	5%
Professional duct cleaning	3	90	22%
Duct insulation	4	27	7%
Or Duct repair?	5	26	6%
.....		0	0%
None.....	6	=> Q25 276	69%
Don't know/Refused.....	7	=> Q25 6	1%

Q22

Was the service performed by . . .

N=		119	100%
Utility service personnel	01	8	7%
A general building contractor	02	7	6%
A heating, cooling or duct specialist or contractor.....	03	89	75%
Or someone else (SPECIFY):	97	4	3%
.....			
Homeowner/self	88	11	9%
Don't know/Refused.....	99	3	3%

Q23

When was this service performed?

N=		119	100%
Less than 4 years ago	1	79	66%
4 to 8 years ago	2	22	18%
More than 8 years ago.....	3	17	14%
Don't know/Refused.....	4	1	1%

Q24

Approximately how much did it cost to service your ducts? IF MULTIPLE SERVICES, ENTER COST OF THE MOST RECENT SERVICE.

N=		119	100%
Don't know/Refused.....	99999	45	38%

Q25

How strongly do you think the general condition of your ducts affect the following issues in your home. Use a 1 to 5 scale, with 5 meaning that the issue is extremely affected and 1 meaning it's not affected at all.

N=	401	100%
CONTINUE..... 1	401	100%

Q25A

(How strongly do you think the condition of your ducts affects...) Your Comfort? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your comfort is extremely affected and 1 meaning it's not affected at all.

N=	401	100%
Not affected at all..... 1	32	8%
Two..... 2	38	9%
Three..... 3	83	21%
Four..... 4	90	22%
Extremely affected..... 5	145	36%
Don't know/Refused..... 6	13	3%

Q25B

(How strongly do you think the condition of your ducts affects...) Your Health? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your health is extremely affected and 1 meaning it's not affected at all.

N=	401	100%
Not affected at all..... 1	39	10%
Two..... 2	38	9%
Three..... 3	70	17%
Four..... 4	92	23%
Extremely affected..... 5	143	36%
Don't know/Refused..... 6	19	5%

Q25C

(How strongly do you think the condition of your ducts affects...) Your Safety? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your safety is extremely affected and 1 meaning it's not affected at all.

N=	401	100%
Not affected at all..... 1	64	16%
Two..... 2	54	13%
Three..... 3	81	20%
Four..... 4	57	14%
Extremely affected..... 5	125	31%
Don't know/Refused..... 6	20	5%

Q25D

(How strongly do you think the condition of your ducts affects...) Your Utility Energy Bills
 IF NEEDED: Use a 1 to 5 scale, with 5 meaning your utility bills are extremely affected and
 1 meaning they aren't affected at all.

N=		401	100%
Not affected at all..... 1		39	10%
Two..... 2		36	9%
Three..... 3		75	19%
Four..... 4		97	24%
Extremely affected 5		130	32%
Don't know/Refused..... 6		24	6%

Q26

Now I'd like to ask you a few questions about weatherization of your home. This would
 include weatherstripping, caulking and window glazing or installation. Have you replaced
 or added any windows or glass doors within the last 12 months? (GLASS OR FRAME)

N=		503	100%
Yes..... 1		73	15%
No 2	=> Q29	427	85%
Don't know/Not sure/Refused 3	=> Q29	3	1%

Q27

How many windows did you replace?

N=		73	100%
None..... 00		13	18%
Don't know/Refused..... 99		0	0%

Q28

How many glass doors did you replace?

N=		73	100%
None..... 00		38	52%
Don't know/Refused..... 99		0	0%

Q29

Have you ever had your home serviced to provide weatherization services?

N=		503	100%
Yes..... 1		95	19%
No 2	=> Q34	404	80%
Don't know/Not sure/Refused 3	=> Q34	4	1%

Q30

When was the last time that your home received weatherization services? (OKAY IF SELF-MAINTAINED).

N=		95	100%
Less than 4 years ago	1	35	37%
4 to 8 years ago	2	20	21%
More than 8 years ago.....	3	35	37%
Never been serviced.....	4	=> Q34	1 1%
Don't know/Refused.....	5	=> Q34	4 4%

Q31

Did you have weatherstripping, window treatment, insulation or something else done?

N=		90	100%
Weatherstripping.....	01	43	48%
Window treatment.....	02	42	47%
Insulation	03	55	61%
New windows/storm windows/double paned	04	10	11%
Something else (SPECIFY):	97	8	9%
Don't know/Refused.....	99	3	3%

Q32

Was the service performed by . . .

N=		90	100%
Utility service personnel	01	19	21%
A general building contractor	02	26	29%
A weatherization specialist or contractor	03	29	32%
Or someone else (SPECIFY):	97	0	0%

Homeowner/self	88	17	19%
Don't know/Refused.....	99	3	3%

Q33

Approximately how much did it cost for these weatherization services? IF NEEDED/SELF-MAINTAINED: Please include cost of materials and supplies.

N=		90	100%
Don't know/Refused.....	99999	34	38%

Q34

How strongly do you think weatherization practices affect the following issues in your home. Use a 1 to 5 scale, with 5 meaning that the issue is extremely affected and 1 meaning that it is not affected at all.

N=		503	100%
CONTINUE.....	1	503	100%

Q34A

(How strongly do you think weatherization practices affect...) Your Comfort? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your comfort is extremely affected and 1 meaning it's not affected at all.

N=	503	100%
Not affected at all..... 1	16	3%
Two..... 2	19	4%
Three..... 3	76	15%
Four..... 4	140	28%
Extremely affected 5	247	49%
Don't know/Refused..... 6	5	1%

Q34B

(How strongly do you think weatherization practices affect...) Your Health? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your health is extremely affected and 1 meaning it's not affected at all.

N=	503	100%
Not affected at all..... 1	62	12%
Two..... 2	66	13%
Three..... 3	124	25%
Four..... 4	88	17%
Extremely affected 5	151	30%
Don't know/Refused..... 6	12	2%

Q34C

(How strongly do you think weatherization practices affect...) Your Safety? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your safety is extremely affected and 1 meaning it's not affected at all.

N=	503	100%
Not affected at all..... 1	89	18%
Two..... 2	95	19%
Three..... 3	108	21%
Four..... 4	69	14%
Extremely affected 5	128	25%
Don't know/Refused..... 6	14	3%

Q34D

(How strongly do you think weatherization practices affect...) Your Energy Utility Bills? IF NEEDED: Use a 1 to 5 scale, with 5 meaning your utility bills are extremely affected and 1 meaning they aren't affected at all.

N=	503	100%
Not affected at all..... 1	12	2%
Two..... 2	11	2%
Three..... 3	45	9%
Four..... 4	122	24%
Extremely affected 5	306	61%
Don't know/Refused..... 6	7	1%

Finally I have a few questions about how you make home energy decisions. I'd like you to rate some possible sources of information about servicing your heating, ventilating and cooling system or home weatherization. Think about how credible each source of information is and rate it on a scale of 1 to 5, with 1 being Not At All Credible and 5 being Very Credible. How credible would information be if you received it from (READ A-F):

- A) Your Utility? PRESS CODE@Q35A
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused
- B) A Contractor? PRESS CODE@Q35B
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused
- C) The Government? PRESS CODE@Q35C
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused
- D) Independent Industry Association? PRESS CODE @Q35D
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused
- E) A retail store? PRESS CODE@Q35E
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused
- F) Family, Friends and Neighbors? PRESS CODE@Q35F
 1 Not At All Credible 2 Two 3 Three 4 Four 5 Very Credible 6 DK/Refused

Q35A

N=.....	503	100%
Not at all credible.....1	13	3%
Two.....2	16	3%
Three.....3	97	19%
Four.....4	173	34%
Very Credible.....5	193	38%
Don't know/Refused.....6	11	2%

Q35B

N=.....	503	100%
Not at all credible.....1	36	7%
Two.....2	84	17%
Three.....3	188	37%
Four.....4	119	24%
Very Credible.....5	49	10%
Don't know/Refused.....6	27	5%

Q35C

N=.....	503	100%
Not at all credible.....1	88	17%
Two.....2	70	14%
Three.....3	142	28%
Four.....4	116	23%
Very Credible.....5	73	15%
Don't know/Refused.....6	14	3%

Q35D

N=	503	100%
Not at all credible..... 1	26	5%
Two..... 2	53	11%
Three..... 3	193	38%
Four..... 4	136	27%
Very Credible..... 5	56	11%
Don't know/Refused..... 6	39	8%

Q35E

N=	503	100%
Not at all credible..... 1	72	14%
Two..... 2	137	27%
Three..... 3	209	42%
Four..... 4	54	11%
Very Credible..... 5	17	3%
Don't know/Refused..... 6	14	3%

Q35F

N=	503	100%
Not at all credible..... 1	32	6%
Two..... 2	64	13%
Three..... 3	148	29%
Four..... 4	165	33%
Very Credible..... 5	89	18%
Don't know/Refused..... 6	5	1%

Q36

Certification is like a license in that it requires a minimum level of experience and competency. Training and certification of heating, air conditioning and weatherization contractors is now performed by an independent industry association. In choosing a contractor, how useful do you think knowing they were certified would be? Please rate on a scale from 1 to 5, with 1 being Not At All Useful for you and 5 being Very Useful for you.

N=	503	100%
Not at all useful..... 1	15	3%
Two..... 2	23	5%
Three..... 3	65	13%
Four..... 4	127	25%
Very Useful..... 5	258	51%
Don't know/Refused..... 6	15	3%

Q37

Here are some things that might influence your decision to purchase services for your home's heating, cooling and duct system or for weatherization services. For each service please rate it on a 1 to 5 scale. First . . .

N=	503	100%
CONTINUE..... 1	503	100%

Q37A

Services endorsed by the local utility company? AS NEEDED: Would you give that a "5" for being a strong influence on your decision to purchase these services, a "1" for having no effect on your decision or some number in between?

N=	503	100%
Has no effect	1	25 5%
Two	2	25 5%
Three	3	141 28%
Four	4	184 37%
Strong influence	5	117 23%
Don't know/Refused	6	11 2%

Q37B

Services offered by a contractor who was certified by a credible third party? AS NEEDED: Would you give that a "5" for being a strong influence on your decision to purchase these services, a "1" for having no effect on your decision or some number in between?

N=	503	100%
Has no effect	1	34 7%
Two	2	36 7%
Three	3	167 33%
Four	4	175 35%
Strong influence	5	76 15%
Don't know/Refused	6	15 3%

Q37C

An energy audit recommending certain services? AS NEEDED: Would you give that a "5" for being a strong influence on your decision to purchase these services, a "1" for having no effect on your decision or some number in between?

N=	503	100%
Has no effect	1	38 8%
Two	2	60 12%
Three	3	147 29%
Four	4	160 32%
Strong influence	5	79 16%
Don't know/Refused	6	19 4%

Q37D

Financing offered at a below market rate interest rate? AS NEEDED: Would you give that a "5" for being a strong influence on your decision to purchase these services, a "1" for having no effect on your decision or some number in between?

N=	503	100%
Has no effect	1	72 14%
Two	2	49 10%
Three	3	125 25%
Four	4	114 23%
Strong influence	5	127 25%
Don't know/Refused	6	16 3%

Q37E

Financial arrangements that would reduce or eliminate your out-of pocket costs? AS NEEDED: Would you give that a "5" for being a strong influence on your decision to purchase these services, a "1" for having no effect on your decision or some number in between?

N=	503	100%
Has no effect	34	7%
Two	29	6%
Three	104	21%
Four	140	28%
Strong influence	180	36%
Don't know/Refused	16	3%

Q38

Here are some types of information that might help you decide whether to pay for system testing and tune up services for your heating, air conditioning and duct systems. Please rate how important each type of information would be in helping you decide to purchase such services. Use the same 1 to 5 scale, with "1" being Not At All Important in your purchase decision and "5" being Very Important.

N=	503	100%
CONTINUE	503	100%

Q38A

Effects on energy bill? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Very Important.

N=	503	100%
Not at all important	11	2%
Two	9	2%
Three	69	14%
Four	133	26%
Very important	272	54%
Don't know/Refused	9	2%

Q38B

Potential health effects? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Very Important.

N=	503	100%
Not at all important	19	4%
Two	18	4%
Three	76	15%
Four	154	31%
Very important	224	45%
Don't know/Refused	12	2%

Q38C

Potential comfort effects? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Ver Important.

N=	503	100%
Not at all important	1	14 3%
Two	2	19 4%
Three	3	92 18%
Four	4	194 39%
Very important	5	174 35%
Don't know/Refused	6	10 2%

Q38D

Potential safety effects? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Ver Important.

N=	503	100%
Not at all important	1	16 3%
Two	2	16 3%
Three	3	87 17%
Four	4	132 26%
Very important	5	244 49%
Don't know/Refused	6	8 2%

Q38E

Contractor's track record? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Ver Important.

N=	503	100%
Not at all important	1	17 3%
Two	2	18 4%
Three	3	90 18%
Four	4	160 32%
Very important	5	203 40%
Don't know/Refused	6	15 3%

Q38F

Utility Recommendation? AS NEEDED: Use the same 1 to 5 scale, with "1" being Not At All Important in your system testing and tune-up purchase decision and "5" being Ver Important.

N=	503	100%
Not at all important	1	20 4%
Two	2	37 7%
Three	3	152 30%
Four	4	169 34%
Very important	5	112 22%
Don't know/Refused	6	13 3%

Q39

How interested would you be in having your home's heating, ventilating and or cooling system checked and certified for safety and efficiency? On a scale of 1 to 5, where "5 means you are Very Interested and "1" means you are Not At All Interested.

N=		503	100%
Not at all interested	1	217	43%
Two	2	55	11%
Three	3	92	18%
Four	4	54	11%
Very Interested	5	74	15%
Don't know/Refused	6	11	2%

Q40

=> +1 if Q39=1-2

How much would you be willing to pay to have to your home's heating, ventilating or cooling system checked and certified for safety and efficiency?

N=		231	100%
\$0 to \$49	1	57	25%
\$50 to \$99	2	59	26%
\$100 to \$299	3	41	18%
\$300 to \$499	4	4	2%
\$500 to \$699	5	0	0%
\$700 or more	6	2	1%
Don't know/Refused	7	68	29%

Q41

Are you aware of any utility sponsored programs that promote energy efficiency?

N=		503	100%
Yes	1	227	45%
No	2	=> Q43	271 54%
Don't know	3	=> Q43	5 1%
Refused	4	=> Q43	0 0%

Q42

Did the programs you heard of pertain to . . .

N=		227	100%
Gas Heating systems	01	114	50%
Heat Pumps/Air Conditioners	02	76	33%
Duct Systems	03	56	25%
Home Weatherization	04	142	63%
Electric Heat/electricity	05	21	9%
Water heater/water	06	12	5%
Other (SPECIFY):	97	9	4%
Don't know	98	11	5%
Refused	99	0	0%

Q42A

Please describe what you know about these programs. BRIEFLY RECORD COMMENTS SUCH AS NAME OF UTILITY WHO SPONSORED PROGRAM, NAME OF PROGRAM AND/OR TYPE OF PROGRAM (REBATE, LOAN, ETC.)

N=	227	100%
MISCELLANEOUS COMMENTS..... 01	18	8%
Free service..... 02	2	1%
Give energy audit/free energy check..... 03	44	19%
Replace lights/showerheads/aerators..... 04	6	3%
Offers water heater blankets..... 05	3	1%
Do weatherstripping/caulking 06	4	2%
Replace windows with double paned 10	16	7%
Weatherization 11	28	12%
Insulation 12	13	6%
Heat pumps/furnaces..... 13	9	4%
Hot water heaters 14	14	6%
Low income program/for elderly and disabled 20	9	4%
Tax credits/incentives 21	5	2%
Offers financing/low income loans 22	23	10%
Rebates/credit on bill 23	13	6%
Incentives/rebates for switching from electric to gas 24	15	7%
Recommended contractors..... 30	7	3%
Set standards for builders/builders have to meet standards..... 31	2	1%
Information/flyers/pamphlets 35	18	8%
Utility talks about it but don't remember what/don't know..... 40	12	5%
PUD/Public Utility..... 45	17	7%
Montana Power..... 46	7	3%
Northwest Natural Gas..... 47	5	2%
PGE..... 48	6	3%
Puget Sound Energy..... 49	5	2%
Bonneville Power..... 50	4	2%
Other Utility Names..... 51	32	14%
Good Sense Program 52	3	1%
Don't know..... 98	44	19%
Refused..... 99	2	1%

Q43

Besides utility programs, have you heard of any other promotional or government sponsored programs which promote energy efficient practices for your home pertaining to weatherization and heating, air conditioning and duct systems?

N=	503	100%
Yes..... 1	78	16%
No 2	=> Q45 413	82%
Don't know..... 3	=> Q45 12	2%
Refused..... 4	=> Q45 0	0%

Q43A

=> Q45 if NOT Q43=1

Please describe what you know about these promotional or government sponsored programs. BRIEFLY RECORD COMMENTS SUCH AS SPONSOR, NAME OF

PROGRAM, WHAT PROGRAM DOES (TAX CREDITS, MANUFACTURER'S REBATES, LOW-INCOME PROGRAMS, MARKETING ETC.)

N=		78	100%
MISCELLANEOUS COMMENTS	01	12	15%
Low income program	02	10	13%
Tax credits/incentives	03	11	14%
Hot Line	04	1	1%
Duct cleaning	08	3	4%
Weatherization	09	22	28%
TV ads	12	4	5%
Public service announcements	13	1	1%
HVAC Private companies/contractors	17	4	5%
Good Sense Program	20	1	1%
Port of Seattle	21	2	3%
County	22	2	3%
State(OR,WA,ID,MT)	23	5	6%
Federal	28	9	12%
HUD	29	1	1%
HRDO	30	2	3%
EPA	31	1	1%
Dept. of Energy	32	2	3%
Utility Programs	50	10	13%
Don't know	98	17	22%
Refused	99	1	1%

Q44

Have you ever participated in a utility program for energy efficiency?

N=		78	100%
Yes	1	20	26%
No	2	56	72%
Don't know/Not sure	3	2	3%
Refused	4	0	0%

Q44A

Who sponsored the program and what did it do? BRIEFLY RECORD COMMENTS SUCH AS NAME OF UTILITY WHO SPONSORED PROGRAM, NAME OF PROGRAM AND/OR TYPE OF PROGRAM (REBATE, LOAN, ETC.)

N=		20	100%
MISCELLANEOUS COMMENTS	01	7	35%
Energy audit	02	6	30%
Replaced lights/showerheads/aerators (FREE)	03	3	15%
Replaced windows/doors/insulation (SUBSIDIZED)	04	5	25%
PUD/Public Utility	05	5	25%
Montana Power	06	3	15%
Northwest Natural	07	2	10%
PP&L	08	2	10%
Don't know	98	0	0%
Refused	99	0	0%

Q45

What was your typical monthly energy bill last summer? (ELECTRIC, NATURAL GAS, OIL) IF HAVE MORE THAN ONE ENERGY BILL (I.E. ELECTRICITY AND NAT. GAS) ASK HOW MUCH THEY WERE COMBINED.

N=	503	100%
\$997 or more..... 997	2	0%
Don't know..... 998	88	17%
Refused..... 999	10	2%

Q46

What was your typical monthly energy bill last winter? (ELECTRIC, NATURAL GAS, OIL) IF MORE THAN ONE ENERGY BILL (I.E. ELECTRICITY AND NAT. GAS) ASK HOW MUCH THEY WERE COMBINED.

N=	503	100%
\$997 or more..... 997	3	1%
Don't know..... 998	72	14%
Refused..... 999	8	2%

Q47

How many people live in your in your home at least half of the year?

N=	503	100%
Don't know/Not Sure..... 98	1	0%
Refused..... 99	5	1%

Q48

What is your home zip code?

N=	503	100%
Don't know..... 77777	4	1%
Refused..... 99999	11	2%

Q49

In case my supervisor needs to check or verify my work, may I have your first name only please?

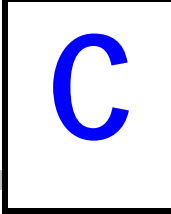
N=	503	100%
RECORD FIRST NAME..... 01	488	97%
Refused..... 99	15	3%

GENDR

RECORD GENDER

N=	503	100%
Male..... 1	251	50%
Female..... 2	252	50%

That concludes my questions. Thank you very much for your time and cooperation.



CONTRACTOR SURVEY INSTRUMENT

1:

QX

Hello, my name is _____ and I am calling from Atlantic Marketing Research on behalf of the Northwest Energy Efficiency Alliance. We are contacting HVAC and weatherization contractors as part of a study on residential energy services and products. Please be assured that we are not selling anything. We would like to ask you a series of questions about your company's practices and opinions relating to HVAC and weatherization services.

<fname ><comp >

(1/ 52)

Continue.....	01	D	
No time now - Arrange callback	02		=> INT
Refusal - Thank and terminate	03		=> INT

«QX »

2:

QX1

May I please speak to the person who is in charge of your residential business? IF PERSON WHO IS IN CHARGE OF THE RESIDENTIAL HVAC BUSINESS IS DIFFERENT THAN THE FIRST PERSON, REPEAT OPENING STATEMENT ABOVE

(1/ 54)

Yes - continue	01		
Not available - Arrange callback	02		=> INT
No time now - Arrange callback	03		=> INT
No/Refused- Thank and terminate	98		=> INT

«QX1 »

3:

QX2

We would like to ask you a few questions regarding your company's experiences with the residential heating, ventilating and air conditioning (HVAC) market. The whole survey should take about 10 minutes to complete. Be assured that all information is confidential and is being used for research purposes only.

(1/ 56)

Continue.....	01		
No time now - Arrange callback	02		=> INT
Refusal - Thank and terminate	98		=> INT

«QX2 »

4:

QIINT

I would like to ask you a few preliminary questions to determine whether your situation is appropriate for this particular survey. First....

(1/ 58)

Continue.....	01	D	
---------------	----	---	--

«QIINT »

5: Q1

Do you or your firm provide HVAC, duct system or weatherization services to new or existing residential single family homes?

(1 / 60)

- Yes..... 01
 - No - [SCREENOUT 1] 02 => INT
 - DK [SCREENOUT 1] 97 => INT
 - Refused [SCREENOUT 1] 98 => INT
- «Q1 »

6: Q2

Does your firm provide services on a full-time or part-time basis?

(1 / 62)

- Full time..... 01
 - Part time [SCREENOUT 2]..... 02 => INT
 - DK [SCREENOUT 2] 97 => INT
 - Refused [SCREENOUT 2] 98 => INT
- «Q2 »

7: Q3

Does your firm do a quarter or more of your HVAC related business with residential customers?

(1 / 64)

- Yes..... 01
 - No [SCREENOUT 3] 02 => INT
 - DK [SCREENOUT 3] 97 => INT
 - Refused [SCREENOUT 3] 98 => INT
- «Q3 »

8: Q4

I would like to ask you a few questions regarding your business. Which of the following best describes your firm...? [READ LIST - ACCEPT ONLY ONE RESPONSE]

(1 / 66)

- HVAC Contractor 01
 - Weatherization Contractor 02
 - Sheet metal Contractor..... 03
 - General Contractor..... 04
 - Part of a design-build firm 05
 - Electrical Contractor 06
 - OTHER: Specify..... 94 O
 - DK [DO NOT READ] 97
 - Refused [DO NOT READ] 98
- «Q4 »
- «O_Q4 »

12:

Q7B

ENTER PERCENT

Roughly what percent of your business at this location serves the small commercial (less than 10,000 square feet) sectors?

(1/ 78)

\$E 0 100

DK 997

Refused 998

«Q7B »

13:

Q7C

ENTER PERCENT

Roughly what percent of your business at this location serves other sectors?

(1/ 81)

\$E 0 100

DK 997

Refused 998

«Q7C »

14:

Q7TOT

=> * if Q7A+Q7B+Q7C

(1/ 84)

«Q7TOT »

15:

Q7CHK

=> * if V01(Q7TOT==100 OR Q7TOT==2991)

(1/ 88)

DOESN'T ADD UP TO 100%..... 0 => Q7A

OK 1

«Q7CHK »

16:

Q8

I am going to read you a list of factors that consumers might consider when selecting a contractor. [READ ENTIRE LIST FIRST, THEN ASK FOR MOST IMPORTANT ITEMS] [ACCEPT MULTIPLE RESPONSES] Could you tell me which of those factors are the most important ones?

(1/ 89 - 91 - 93 - 95 - 97 - 99 - 101)

Price of bid..... 01

Contractor's referral or track record..... 02

Contractor's availability to deliver services and equipment 03

Contractor carries particular brand of equipment 04

Contractor provides energy efficient products and services..... 05

Contractor certification 06

OTHER: Specify 94 O

DK [DO NOT READ] 97 X

Refused [DO NOT READ] 98 X

«Q8_01 »

«Q8_02 »

«Q8_03 »
 «Q8_04 »
 «Q8_05 »
 «Q8_06 »
 «Q8_07 »
 «O_Q8 »

17:

Q9

=> Q25 if Q4=02

ENTER PERCENT

Approximately what percent of your customers request high efficiency gas heating units
 INTERVIEWER: IF 0%, ASK RESPONDENT IF THEY INSTALL THIS TYPE OF
 HEATING UNIT--IF NO, CODE AS 996 (N/A)

(1/ 103)

\$E 0 100

N/A 996 => Q15
 DK 997
 Refused 998

«Q9 »

18:

Q10

Does your company provide gas heating system tune-up and safety and performance testing?

(1/ 106)

Yes 01
 No 02 => Q14
 DK 97 => Q14
 Refused 98 => Q14

«Q10 »

19:

Q11

ENTER PERCENT

In what percent of all your jobs in homes do you provide safety and efficiency testing on gas heating equipment?

(1/ 108)

\$E 0 100

DK 997
 Refused 998

«Q11 »

20:

Q12

=> Q14 if Q11==0

What is the typical cost to the consumer for a system tune-up and safety and performance testing of a gas heating unit?

(1 / 111)

- Less than \$100 01
- \$100-\$200 02
- \$200-\$300 03
- Greater than \$300 04
- DK/Refused 97

«Q12 »

21:

Q13

Does your company actively market system tune-up and performance testing for gas heating units?

(1 / 113)

- Yes 01
- No 02
- DK 97
- Refused 98

«Q13 »

22:

Q14

ENTER PERCENT

In the last year, approximately what percent of the residential gas furnaces that you installed had an efficiency level above 85%?

(1 / 115)

- \$E 0 100
- DK 997
- Refused 998

«Q14 »

23:

Q15

ENTER PERCENT

Approximately what percent of your residential customers request high efficiency air conditioning units? INTERVIEWER: IF 0%, ASK IF THEY INSTALL THIS TYPE OF A/C UNIT--IF NOT, CODE AS 996 (N/A)

(1 / 118)

- \$E 0 100
- N/A 996 => Q20
- DK 997
- Refused 998

«Q15 »

24:

Q16

Does your company provide air conditioning system tune-up and performance testing?

(1/ 121)

- Yes 01
- No 02 => Q19
- DK 97 => Q19
- Refused 98 => Q19

«Q16 »

25:

Q17

What is the typical cost to the consumer for air conditioning system tune-up and performance testing?

(1/ 123)

- Less than \$100 01
- \$100-\$200 02
- \$200-\$300 03
- Greater than \$300 04
- DK 97
- Refused 98

«Q17 »

26:

Q18

Does your company actively market system tune-up and performance testing for air conditioning units?

(1/ 125)

- Yes 01
- No 02
- DK 97
- Refused 98

«Q18 »

27:

Q19

ENTER PERCENT

In the last year, what percent of the residential air conditioners that you installed had a SEER greater than 12?

(1/ 127)

- \$E 0 100
- DK 997
- Refused 998

«Q19 »

28:

Q20

ENTER PERCENT

Approximately what percent of your residential customers request high efficiency heat pump units? INTERVIEWER: IF 0%, ASK RESPONDENT IF THEY INSTALL HEAT PUMP UNITS--IF NO, CODE AS 996 (N/A)

(1/ 130)

\$E 0 100

- N/A 996 => Q25
- DK 997
- Refused 998
- «Q20 »

29:

Q21

Does your company provide heat pump system tune-up and performance testing?

(1/ 133)

- Yes 01
- No 02 => Q24
- DK 97 => Q24
- Refused 98 => Q24
- «Q21 »

30:

Q22

What is the typical cost to the consumer for heat pump system tune-up and performance testing?

(1/ 135)

- Less than \$100 01
- \$100-\$200 02
- \$200-\$300 03
- Greater than \$300 04
- DK 97
- Refused 98
- «Q22 »

31:

Q23

Does your company actively market system tune-up and performance testing for heat pumps?

(1/ 137)

- Yes 01
- No 02
- DK 97
- Refused 98
- «Q23 »

32:

Q24

ENTER PERCENT

In the last year, approximately what percent of the residential heat pumps that you installed had a HSPF above 7.5?

(1/ 139)

\$E 0 100

DK 997

Refused 998

«Q24 »

33:

Q25

Do you provide duct sealing and servicing as a stand alone service or as part of a larger package of services?

(1/ 142)

Stand alone service 01

One of many services 02

Do not provide duct services 03 => Q35

DK 97 => Q35

Refused 98 => Q35

«Q25 »

34:

Q26

What duct services does your company provide? Do you provide: [READ LIST - ACCEPT MULTIPLE RESPONSES]

(1/ 144 - 146 - 148 - 150 - 152 - 154 - 156 - 158)

Duct system diagnostics and leakage testing 01

Duct system installation, retrofit and repair 02

Duct system safety checks 03

Duct sealing 04

Duct balancing 05

Duct cleaning 06

Duct insulation 07

Other [SPECIFY] 94 O

Don't know 97 X

Refused 98 X

«Q26_01 »

«Q26_02 »

«Q26_03 »

«Q26_04 »

«Q26_05 »

«Q26_06 »

«Q26_07 »

«Q26_08 »

«O_Q26 »

38:

Q29

Does your company own its duct leakage diagnostic equipment?

(1/ 174)

- Yes..... 01
 - No 02 => Q30
 - DK 97 => Q30
 - Refused 98 => Q30
- «Q29 »

39:

Q29A

What type?

(1/ 176)

- SPECIFY 94 O
 - DK 97
 - Refused 98
- «Q29A »
- «O_Q29A »

40:

Q30

=> +1 if NOT (N_34=01 OR N_34=04)

What method do you use to seal ducts?

(1/ 178)

- Duct tape..... 01
 - Mastic 02
 - Aerosol sealant..... 03
 - OTHER: Specify..... 94 O
 - DK 97
 - Refused 98
- «Q30 »
- «O_Q30 »

41:

Q31

What is done with the ducts when furnaces ARE REPLACED in existing homes? [DO NOT READ LIST - ACCEPT MULTIPLE RESPONSE]

(1/ 180 - 182 - 184 - 186 - 188)

- Air leakage testing and diagnostics 01
 - Duct sealing 02
 - Duct insulation 03
 - Duct balancing 04
 - OTHER: Specify..... 94 O
 - DK 97
 - Refused 98
- «Q31_01 »
- «Q31_02 »
- «Q31_03 »
- «Q31_04 »
- «Q31_05 »
- «O_Q31 »

46:

Q35

ENTER PERCENT

In what percent of your jobs do customers specifically request weatherization services
 INTERVIEWER: IF 0%, ASK RESPONDENT IF THEY DO WEATHERIZATION--IF
 NO, CODE AS 996 (N/A)

(1/ 202)

\$E 0 100

N/A 996 => Q40
 DK 997
 Refused 998

«Q35 »

47:

Q36

What weatherization services do you typically provide? Do you provide: [READ LIS
 ACCEPT - MULTIPLE RESPONSES]

(1/ 205 - 207 - 209 - 211 - 213)

None..... 00 => Q40
 Weatherstripping and caulking 01
 Window glazing 02
 Air infiltration diagnostics and testing 03
 Indoor air quality assessments 04
 Other [SPECIFY]..... 94 O
 Don't know [DO NOT READ]..... 97 X
 Refused [DO NOT READ]..... 98 X

«Q36_01 »
 «Q36_02 »
 «Q36_03 »
 «Q36_04 »
 «Q36_05 »
 «O_Q36 »

48:

Q37

Have you added or replaced any windows (glass or frame) or glass doors in your
 weatherization jobs in the last 12 months?

(1/ 215)

Yes 01
 No 02 => Q39
 DK 97 => Q39
 Refused 98 => Q39

«Q37 »

49:

Q38

READ LIST

Where do you typically buy your windows and glass doors? Do you buy them in a... [READ LIST]?

(1/ 217 - 219 - 221 - 223)

- Retail store (Home Depot, etc.) 01
- Window manufacturer..... 02
- Lumber yard..... 03
- OTHER: Specify..... 94 O
- DK 97
- Refused 98

«Q38_01 »
 «Q38_02 »
 «Q38_03 »
 «Q38_04 »
 «O_Q38 »

50:

Q39

Does your company actively market weatherization services?

(1/ 225)

- Yes..... 01
- No 02 => Q40
- DK 97 => Q40
- Refused 98 => Q40

«Q39 »

51:

Q39A

How? [TV, radio, newspaper, flyers, mailers, other]

(1/ 227)

- SPECIFY 94 O
- DK/Refused 97

«Q39A »
 «O_Q39A »

52:

Q40

Now we would like to ask a few questions about energy efficiency. What are some of the most important factors which prevent you and your firm from selling energy efficient HVAC and duct systems more frequently? Do you think.....[READ LIST - ACCEP MULTILE RESPONSES] is an important issue?

(1/ 229 - 231 - 233 - 235 - 237 - 239)

- Equipment availability 01
- Equipment reliability or performance issues..... 02
- Lack of consumer demand 03
- Cost of system/Unfavorable economics 04
- Lack of contractor certification..... 05
- Firm not in position to provide these services..... 06
- Don't know [DO NOT READ]..... 97 X
- Refused [DO NOT READ] 98 X

«Q40_01 »

«Q40_02 »
 «Q40_03 »
 «Q40_04 »
 «Q40_05 »
 «Q40_06 »

53:

Q41

I am going to read you a list of reasons that might prevent consumers from choosing energy efficient products and services. [READ ENTIRE LIST FIRST, THEN ASK FOR MOST IMPORTANT ITEMS][ACCEPT MULTIPLE RESPONSES] Could you tell me which ones you think are the primary obstacles that might prevent customers from choosing energy efficient products and services?

(1/ 241 - 243 - 245 - 247 - 249 - 251)

- Initial cost 01
- Unfavorable economics 02
- Equipment reliability or performance issues 03
- Lack of information 04
- Efficiency not primary selection criteria 05
- Other[SPECIFY]..... 94 O
- Don't know [DO NOT READ]..... 97 X
- Refused [DO NOT READ] 98 X

«Q41_01 »
 «Q41_02 »
 «Q41_03 »
 «Q41_04 »
 «Q41_05 »
 «Q41_06 »
 «O_Q41 »

54:

Q42

In your opinion, what kinds of information would be most useful in helping you to promote energy efficient practices with regard to HVAC, duct systems and home weatherization [ACCEPT MULTIPLE RESPONSES] [READ LIST AND CHOOSE ALL THAT APPLY]

(1/ 253 - 255 - 257 - 259 - 261 - 263 - 265 - 267)

- Market studies 01
- Marketing materials 02
- Information about health impacts..... 03
- Information about safety affects..... 04
- Information on utility bill affects and estimated payback period 05
- Technical information 06
- Consumer Education 07
- OTHER: Specify 94 O
- DK 97 X
- Refused 98 X

«Q42_01 »
 «Q42_02 »
 «Q42_03 »
 «Q42_04 »
 «Q42_05 »

«Q42_06 »
 «Q42_07 »
 «Q42_08 »
 «O_Q42 »

55:

Q43

READ LIST

In terms of maintaining your firm's competitive position, how important is offering system tune-ups and efficiency testing to your residential customers? Would you say it is...[READ LIST]?

(1 / 269)

- Very important 04
- Somewhat important 03
- Not very important 02
- Not at all important 01
- DK [DO NOT READ] 97
- Refused [DO NOT READ] 98

«Q43 »

57:

Q44A

Are you aware of any programs which are designed to promote...
 Gas heating safety and efficiency levels?

(1 / 273)

- Yes 01
- No 02 => Q44B
- DK 97 => Q44B
- Refused 98 => Q44B

«Q44A »

58:

Q44A1

Program name?

(1 / 275)

- SPECIFY 94 O
- DK 97
- Refused 98

«Q44A1 »

«O_Q44A1 »

59:

Q44A2

Utility sponsor?

(1 / 277)

- SPECIFY 94 O
- DK 97
- Refused 98

«Q44A2 »

«O_Q44A2 »

60: **Q44A3**
 Program type (rebate, loan, etc.)? (1/ 279)

SPECIFY 94 O
 DK 97
 Refused 98

«Q44A3 »
 «O_Q44A3 »

61: **Q44B**
 Are you aware of any programs which are designed to promote...
 Heat pump efficiency levels? (1/ 281)

Yes 01
 No 02 => Q44C
 DK 97 => Q44C
 Refused 98 => Q44C

«Q44B »

62: **Q44B1**
 Program name? (1/ 283)

SPECIFY 94 O
 DK 97
 Refused 98

«Q44B1 »
 «O_Q44B1 »

63: **Q44B2**
 Utility sponsor? (1/ 285)

SPECIFY 94 O
 DK 97
 Refused 98

«Q44B2 »
 «O_Q44B2 »

64: **Q44B3**
 Program type (rebate, loan, etc.)? (1/ 287)

SPECIFY 94 O
 DK 97
 Refused 98

«Q44B3 »
 «O_Q44B3 »

65: **Q44C**

Are you aware of any programs which are designed to promote...
Air conditioning efficiency levels

(1 / 289)

- Yes 01
 - No 02 => Q44D
 - DK 97 => Q44D
 - Refused 98 => Q44D
- «Q44C »

66: **Q44C1**

Program name?

(1 / 291)

- SPECIFY 94 O
 - DK 97
 - Refused 98
- «Q44C1 »
«O_Q44C1 »

67: **Q44C2**

Utility sponsor?

(1 / 293)

- SPECIFY 94 O
 - DK 97
 - Refused 98
- «Q44C2 »
«O_Q44C2 »

68: **Q44C3**

Program type (rebate, loan, etc.)?

(1 / 295)

- SPECIFY 94 O
 - DK 97
 - Refused 98
- «Q44C3 »
«O_Q44C3 »

69: **Q44D**

Are you aware of any programs which are designed to promote...
Duct system efficiency levels?

(1 / 297)

- Yes 01
 - No 02 => Q44E
 - DK 97 => Q44E
 - Refused 98 => Q44E
- «Q44D »

70: **Q44D1**
 Program name? (1/ 299)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44D1 »
 «O_Q44D1 »

71: **Q44D2**
 Utility sponsor? (1/ 301)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44D2 »
 «O_Q44D2 »

72: **Q44D3**
 Program type (rebate, loan, etc.)? (1/ 303)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44D3 »
 «O_Q44D3 »

73: **Q44E**
 Are you aware of any programs which are designed to promote...
 Home weatherization? (1/ 305)
 Yes 01
 No 02 => Q44F
 DK 97 => Q44F
 Refused 98 => Q44F
 «Q44E »

74: **Q44E1**
 Program name? (1/ 307)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44E1 »
 «O_Q44E1 »

75: **Q44E2**
 Utility sponsor? (1 / 309)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44E2 »
 «O_Q44E2 »

76: **Q44E3**
 Program type (rebate, loan, etc.)? (1 / 311)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44E3 »
 «O_Q44E3 »

77: **Q44F**
 Are you aware of any programs which are designed to promote...
 Performance testing? (1 / 313)
 Yes 01
 No 02 => Q46
 DK 97 => Q46
 Refused 98 => Q46
 «Q44F »

78: **Q44F1**
 Program name? (1 / 315)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44F1 »
 «O_Q44F1 »

79: **Q44F2**
 Utility sponsor? (1 / 317)
 SPECIFY 94 O
 DK 97
 Refused 98
 «Q44F2 »
 «O_Q44F2 »

80:

Q44F3

Program type (rebate, loan, etc.)?

(1/ 319)

- SPECIFY 94 O
- DK 97
- Refused 98
- «Q44F3 »
- «O_Q44F3 »

56:

Q45

Has your company ever been involved in any energy efficiency programs?

(1/ 271)

- Yes 01
- No 02
- DK 97
- Refused 98
- «Q45 »

85:

Q46

In general, how difficult or easy is it to sell a high efficiency HVAC unit or duct system compared to a standard one in the residential market? Would you say it is... [READ LIST]?

(1/ 329)

- Much more difficult 05
- Somewhat more difficult 04
- About the same 03
- Somewhat less difficult 02
- Much less difficult 01
- DK 97
- Refused 98
- «Q46 »

86:

Q47

Now I would like to ask you a few questions about technician training and certification and the development of a labeling system to certify performance and efficiency of HVAC systems, duct systems and home weatherization. Are you currently aware of any program which train and certify HVAC, duct and weatherization contractors?

(1/ 331)

- Yes 01
- No 02
- DK 97
- Refused 98
- «Q47 »

87:

Q48

If training and certification were offered by an independent industry association, would you be interested in participating? On a scale of 1 to 5, where 5 implies that you would be extremely interested and 1 implies that you are not at all interested, please rate how interested you would be in participating in a training and certification program.

(1/ 333)

Extremely interested 05
 4 04
 3 03
 2 02
 Not at all interested 01
 DK 97
 Refused 98

«Q48 »

88:

Q49

Would you be willing to pay to participate in such a training and certification program?

(1/ 335)

Yes 01
 No 02
 DK 97
 Refused 98

«Q49 »

89:

Q50

Certification labels certify that minimum standards have been met for system performance, safety and efficiency. In terms of maintaining your firm's competitive position, how important would you say offering certification labels for HVAC and duct systems would be on a scale of 1 to 5, with 1 being not important at all and 5 being very important?

(1/ 337)

Very important 05
 4 04
 3 03
 2 02
 Not important at all 01
 DK 97
 Refused 98

«Q50 »

90:

Q51A

On a scale of 1 to 5, where 5 means extremely useful and 1 means not at all useful, how useful would you say contractor certification would be as a marketing tool to Residential Consumers?

(1/ 339)

Extremely useful 05
 4 04
 3 03
 2 02
 Not at all useful..... 01
 DK 97
 Refused 98

«Q51A »

91:

Q51B

Building Contractors?

(1/ 341)

Extremely useful 05
 4 04
 3 03
 2 02
 Not at all useful..... 01
 DK 97
 Refused 98

«Q51B »

92:

Q51C

=> GEND if 1>0

Property Managers?

(1/ 343)

Extremely useful 05
 4 04
 3 03
 2 02
 Not at all useful..... 01
 DK 97
 Refused 98

«Q51C »

93:

Q52

According to our records, you participated in the Performance Tested Comfort Systems (PTCS) system training and certification program. Is this correct?

(1/ 345)

Yes 01
 No 02 => GEND
 Don't know/Not sure 97 => GEND
 Refused 98 => GEND

«Q52 »

98:

Q54B2

What is the number sealed for Mobile Homes?

(1/ 364)

\$E 0 20000

DK 99997

Refused 99998

«Q54B2 »

99:

Q54C

=> +1 if NOT (Q54A1==0 AND Q54A2==0 AND Q54B1==0 AND Q54B2==0)

Why ?

(1/ 369)

SPECIFY 94 O

DK 97

Refused 98

«Q54C »

«O_Q54C »

100:

Q55

Did the program affect how you do...[READ LIST - ACCEPT MULTIPLE RESPONSES]

(1/ 371 - 373 - 375 - 377)

Duct installations 01

Duct diagnostics..... 02

Duct sealing 03

Anything else? [SPECIFY] 94 O

Don't know [DO NOT READ]..... 97 X

Refused [DO NOT READ]..... 98 X

«Q55_01 »

«Q55_02 »

«Q55_03 »

«Q55_04 »

«O_Q55 »

101:

Q56

Do you educate residential homeowners about duct efficiency procedures?

(1/ 379)

Yes 01

No 02

DK 97

Refused 98

«Q56 »

102:

Q57

How would you rate the overall value of the PTCS training, on a scale of 1 to 5, with 1 being not at all useful and 5 being very useful?

(1/ 381)

Very useful.....	05
4.....	04
3.....	03
2.....	02
Not at all useful.....	01
DK.....	97
Refused.....	98
«Q57 »	

103:

Q58

How would you rate the overall value of the PTCS contractor certification, on a scale of 1 to 5, with 1 being not at all useful and 5 being very useful?

(1/ 383)

Very useful.....	05
4.....	04
3.....	03
2.....	02
Not at all useful.....	01
DK.....	97
Refused.....	98
«Q58 »	

105:

Q60

Is your firm currently using the marketing materials that are available through the PTCS venture?

(1/ 387)

Yes.....	01	
No.....	02	=> Q62
DK.....	97	=> Q62
Refused.....	98	=> Q62
«Q60 »		

106:

Q61

How useful would you say the marketing materials have been to your firm, on a scale of 1 to 5, with 1 being not at all useful and 5 being very useful?

(1/ 389)

Very useful.....	05
4.....	04
3.....	03
2.....	02
Not at all useful.....	01
DK.....	97
Refused.....	98
«Q61 »	

107:

Q62

Have you or has someone from your firm attended a PTCS marketing workshop?

(1/ 391)

- Yes..... 01
 - No 02 => Q64A
 - DK 97 => Q64A
 - Refused 98 => Q64A
- «Q62 »

108:

Q63

How useful would you say the marketing workshop was in helping you or your firm market duct testing and efficiency services, on a scale of 1 to 5, with 1 being not at all useful and 5 being very useful?

(1/ 393)

- Very useful..... 05
 - 4 04
 - 3 03
 - 2 02
 - Not at all useful..... 01
 - DK 97
 - Refused 98
- «Q63 »

109:

Q64A

In what other ways do you think improved duct installations can be promoted? [PROBE FOR UTILITY PROGRAMS/REBATES, MORTGAGES, INCREASED MARKET DEMAND]

(1/ 395)

- No other ways 00 => Q65
 - SPECIFY 94 O
 - DK 97 => Q65
 - Refused 98 => Q65
- «Q64A »
- «O_Q64A »

112:

Q65

One of the components of the PTCS program is to establish PTCS brand awareness and to have PTCS labels which certify safety and performance levels of equipment. On a scale of 1 to 5, with 5 meaning extremely effective and 1 being not at all effective, how effective would you say the PTCS labeling program been in helping you to sell system safety and performance testing?

(1/ 401)

- Extremely effective 05
 - 4 04
 - 3 03
 - 2 02
 - Not at all effective..... 01
 - DK 97
 - Refused 98
- «Q65 »

113:

Q66

How effective do you think the PTCS labeling program will likely be in the future, on the same scale of 1 to 5 with 5 meaning extremely effective and 1 being not at all effective?

(1/ 403)

Extremely effective 05
 4 04
 3 03
 2 02
 Not at all effective..... 01
 DK 97
 Refused 98

«Q66 »

114:

Q67A

Do you agree with the diagnostic protocols for testing duct systems which are taught by the PTCS training program, on a scale of 1 to 5, where 5 means you completely agree and 1 means that you strongly disagree?

(1/ 405)

Completely agree 05
 4 04
 3 03
 2 02
 Strongly disagree 01
 DK 97
 Refused 98

«Q67A »

115:

Q67B

And why is that?

(1/ 407)

SPECIFY 94 O
 DK 97
 Refused 98

«Q67B »

«O_Q67B »

116:

Q68

How would you suggest to get more contractors to participate in training?

(1/ 409)

SPECIFY 94 O
 DK 97
 Refused 98

«Q68 »

«O_Q68 »

117: **Q69**

Do you have any suggestions on how to improve the program?

(1 / 411)

- SPECIFY 94 O
- DK 97
- Refused 98
- «Q69 »
- «O_Q69 »

118: **Q70**

Do you have any other comments on the program?

(1 / 413)

- SPECIFY 94 O
- DK 97
- Refused 98
- «Q70 »
- «O_Q70 »

119: **GEND**

[INTERVIEWER - DO NOT READ] Record Gender

(1 / 415)

- Male 01
- Female 02
- «GEND »

120: **INT**

Thank you very much for your participation in this survey. [BE AWARE: YOU MAY CONTINUE!]

(1 / 417 - 419 - 421 - 423 - 425 - 427 - 429 - 431 - 433 - 435)

- COMPLETED CO C => END
- SCREENOUT1: DOESN'T PROVIDE HVAC/DUCT/WEATHER SVCS S1 => END
- SCREENOUT2: DOESN'T PROVIDE FULL-TIME SVCS S2 => END
- SCREENOUT3: DOES LESS THAN 1/4 W/RESIDENTIAL CUSTOMERS S3 => END
- NO ANSWER ONLY! (CallBack in 10 Minutes or so) NA R => END
- BUSY SIGNAL (CallBack in 30 Minutes or so) BS R => END
- CALLBACK - 1 HOUR H1 R => END
- CALLBACK - 2 HOURS H2 R => END
- BACK TOMORROW D1 R => END
- BACK IN 2 DAYS / WATTS D2 R => END
- BACK IN 7 DAYS D7 R => END
- GENERAL CALL BACK CB R => CB
- REFUSAL RE => END
- TERMINATE TR => END
- LANGUAGE/DEAF LG => END
- WRONG NUMBERS WN => END
- DISCONNECTED DS => END
- FAX/MODEM FX => END
- DUPLICATE DP => END

«INT_01 »

«INT_02 »
 «INT_03 »
 «INT_04 »
 «INT_05 »
 «INT_06 »
 «INT_07 »
 «INT_08 »
 «INT_09 »
 «INT_10 »

121: **CB**
Today is: \$D It is \$H Questionnaire:\$Q
 <NAME > REMEMBER TO USE MILITARY TIME 24 HOUR CLOCK FOR THE
 AFTERNOON AND CHECK TIME. PHONE:<PHONE > (1/ 437)
 \$CH
 «CB »

122: **CLOS1**
 => END if 1>0 (1/ 447)
 «CLOS1 »

123: **TZONE**
 TIME ZONE (1/ 448)
 Newfoundland..... 1
 Atlantic 2
 East E
 Central 4
 Rockies 5
 Pacific 6
 Alaska 7
 Hawaii..... 8
 «TZONE »

124: **SMPID**
 SAMPLE ID (1/ 449)
 «SMPID »

125: **COMP**
 COMPANY FROM SAMPLE (1/ 453)
 «COMP »

126: **ADDR**
ADDRESS FROM SAMPLE (1/ 503)
«ADDR »

127: **CITY**
CITY FROM SAMPLE (1/ 533)
«CITY »

128: **STATE**
STATE FROM SAMPLE (1/ 558)
«STATE »

129: **ZIP**
ZIP CODE FROM SAMPLE (1/ 560)
«ZIP »

130: **FNAME**
NAME FROM SAMPLE (1/ 570)
«FNAME »

131: **TITLE**
TITLE FROM SAMPLE (1/ 600)
«TITLE »

132: **SIC**
SIC CODE FROM SAMPLE (1/ 630)
«SIC »

133: **EMPL**
EMPLOYEE SIZE FROM SAMPLE (1/ 639)
«EMPL »

134: **TYPE**
 TYPE OF CONTRACTOR FROM SAMPLE (1/ 651)
 RARE..... 1
 SMALL..... 2
 LARGE..... 3
 «TYPE »

135: **F5**
 ENTER A COMMENT (1/ 652)
 COMMENT ANYONE? 1 O => INT
 NO COMMENT 2 => INT
 «F5 »
 «O_F5 »

136: **NAME**
 And what is your name so we can ask to speak with you when we call back? (1/ 653)
 «NAME »

137: **CLOS2**
 Thank you again for your time today. We will be calling back in about 6-8 weeks. (1/ 683)
 end 1 D => END
 «CLOS2 »

138: **PHONE**
 PHONE (FROM SURVEY SAMPLING) (1/ 684)
 «PHONE »