EMI CONSULTING

California HVAC Quality Installation/Quality Maintenance Customer Decision-Making Study

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FINAL REPORT

Presented To:

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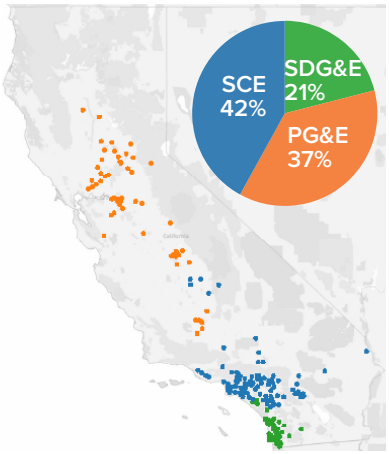
California HVAC QI/QM Customer Decision-Making Study

RESIDENTIAL RESPONDENT SUMMARY

We surveyed **350** residential customers, including **250 QI/QM program participants** and **100 nonparticipating customers** from the three California electric IOU service territories.



Respondent Profile

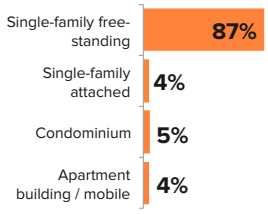
DECISION-MAKERS

100% of the respondents we talked to were responsible for making decisions about their HVAC equipment.

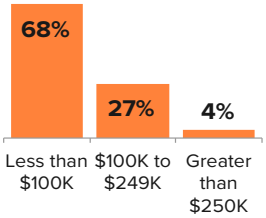
HOME OWNERSHIP

93% owned their home
6% rented and paid their utility bills
1% rented and did not pay utility bills

HOUSING TYPE



HOUSEHOLD INCOME

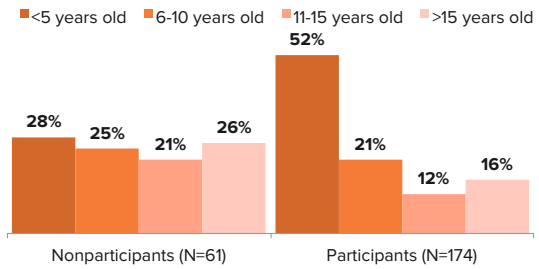


HVAC Equipment Profile

How many HVAC units are in customers' homes?

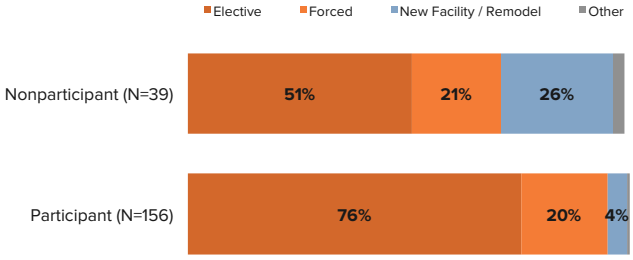
71% of respondents reported having one HVAC unit
24% had two units
5% had three or more units

What is the average age of customers' HVAC units?



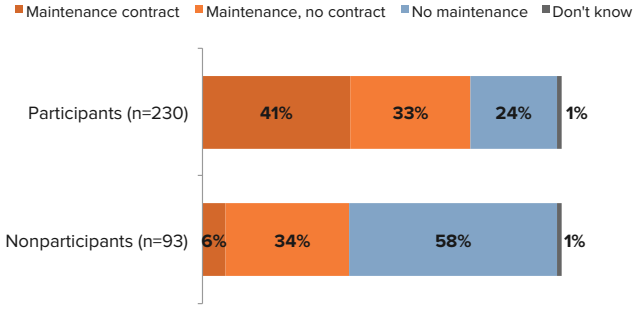
56% of all residential respondents had purchased HVAC equipment for their homes. Their reasons for doing so were classified into *elective*, *forced* (i.e., equipment failed completely), and *new facility/remodel* work.

For customers who had purchased HVAC equipment, why did they do so?



Maintenance Practices

Do residential customers have regular, preventative maintenance performed on their HVAC equipment? And if so, do they have a contract for this work?

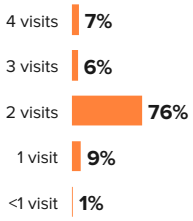


58% of all program nonparticipants report not having regular maintenance performed on their home HVAC systems.

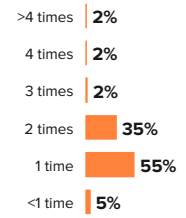
When residential customers have maintenance performed, who is doing this work?

92% use a professional HVAC contractor or technician
8% use a nonprofessional or a mix of professional and non professional

For customers with a maintenance contract, how many annual visits are included?



For customers performing maintenance *without* a contract, how many times per year is it performed?



Overview

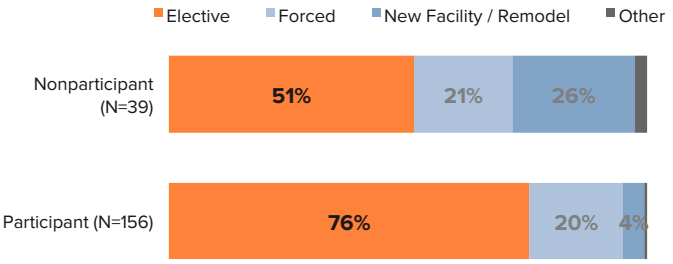
Residential HVAC Installation Decision-Making

We surveyed 350 residential customers on how they make decisions regarding HVAC installations. The results shown here present an overview of these processes organized by the **five-step decision-making model.**

1 Problem/Need Recognition

Residential customers do not necessarily "run it until it breaks." The majority of respondents indicated elective purchase/replacement.

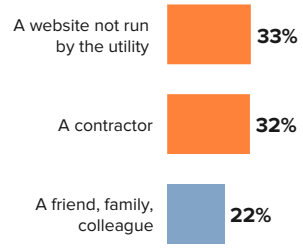
Why did residential customers purchase HVAC equipment?



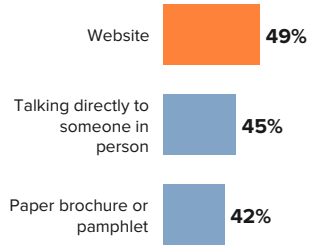
2 Information Search

Residential customers frequently rely on web sources and contractors. Customers commonly cited a website as their preferred format for obtaining information about HVAC installation.

Where do customers go for information about installation? (top 3)



How would customers prefer to receive more information? (top 3)



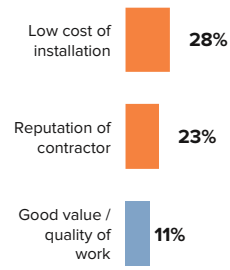
3/4 Evaluation of Alternatives & Purchase Decision

Customers are most sensitive to the up-front cost of an HVAC installation. However, they are also receptive to cost savings on their monthly utility bills and improvements in system reliability.

What are the relative weights of decision factors for HVAC installation purchases?

- 30% up-front cost
- 22% monthly cost savings
- 21% system reliability
- 15% system longevity
- 12% environmental impacts

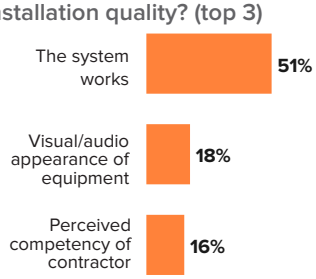
What influences customers' selection of a contractor?



5 Post-Purchase Evaluation

Customers do not generally use sophisticated techniques to assess quality of HVAC installation. Instead, they typically ask "Am I having any problems with the equipment?" or "Does my unit sound OK?"

How do customers evaluate installation quality? (top 3)



Only 8% of respondents said they would use some sort of diagnostic testing to assess installation quality.

Conclusions/Recommendations

KEY THEME #1

Many residential customers appear overwhelmed by the technical complexity of HVAC systems, with respondents reporting they use simplistic, non-technical methods to evaluate the quality of their installation.

"I did research to understand [HVAC systems] … it was very difficult to understand all of the intricacies of it."

- Program participant

Of those customers wanting more information, **65%** of nonparticipants and **34%** of participants wanted a general overview of basic HVAC operating principles.

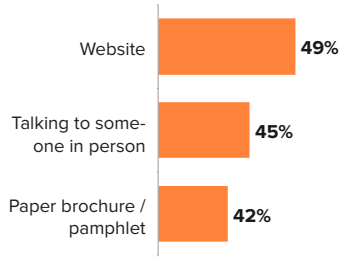
Recommendation #1

Provide basic information about how HVAC units work and the importance of proper installation (and maintenance) in an easy-to-understand "infographic" format.

KEY THEME #2

Residential customers are highly dependent on Internet sources and contractors when it comes to obtaining information about HVAC equipment.

How customers would prefer to receive additional information regarding proper HVAC installation (top 3)



"Hearing [the contractor] explain the [energy efficiency rating] to me, I felt he was looking out for us instead of his own pocket."

- Program participant

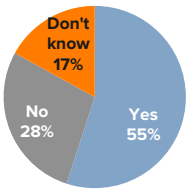
Recommendation #2

Utilize the Internet to provide better information regarding what QI is and how it is different from typical installations. An expanded Internet presence would be helpful in generating more interest for QI and QI programs. This may also be helpful in convincing customers that QI is something worth asking for.

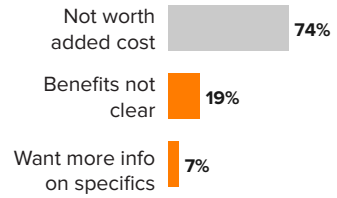
KEY THEME #3

Residential customers are receptive to the idea of QI but could use more information on the benefits.

Many believe that premium installation offers benefits above-and-beyond a typical installation — yet 17% were not sure.



Why nonparticipants might not pay extra for QI (top 3)



Recommendation #3

Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits. Where this is not possible, using case studies may be helpful. It it critical that information is not overstated.

KEY THEME #4

Residential customers are sensitive to the up-front cost of HVAC installations. However, emphasizing monthly utility bill savings and system reliability improvements would likely resonate with customers.

Decision weights (top three):

- **30%** up-front cost
- **22%** monthly cost savings
- **21%** system reliability

Current practices appear to be working — 90% of program participants who had received cost savings estimates thought these estimates turned out to be accurate

Recommendation #4

Branding efforts may benefit by focusing on monthly cost savings and reliability improvements (assuming that QI provides these benefits). Promoting the provision of easy-to-understand cost savings estimates of premium installation to customers could help strengthen the value proposition.

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California HVAC QI/QM Customer Decision-Making Study

Residential HVAC Maintenance Decision-Making

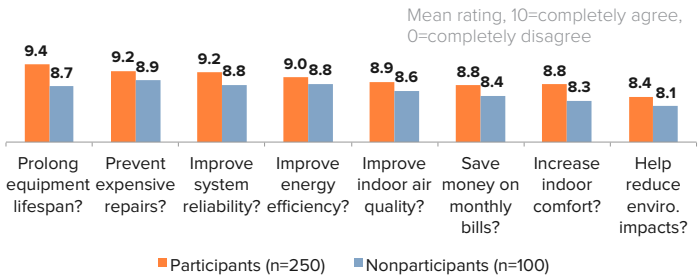
Overview

We surveyed 350 residential customers on how they make decisions regarding HVAC maintenance. The results shown here present an overview of these processes organized by the **five-step decision-making model.**

1 Problem/Need Recognition

Residential customers generally agree that regular maintenance can prolong the life of their HVAC equipment and may help prevent expensive repairs. However, they are less decisive in stating that regular maintenance can help save money on monthly utility bills, can increase indoor comfort, reduce environmental impacts.

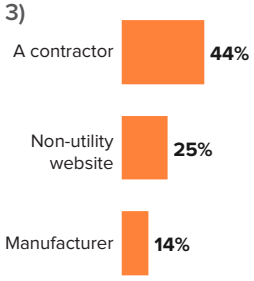
Do residential customers believe there are benefits to regular, preventative maintenance on their HVAC systems?



2 Information Search

Residential customers rely most heavily on contractors for HVAC maintenance information. Customers may also consult the Internet or a manufacturer.

Where do customers get information on maintenance? (top 3)

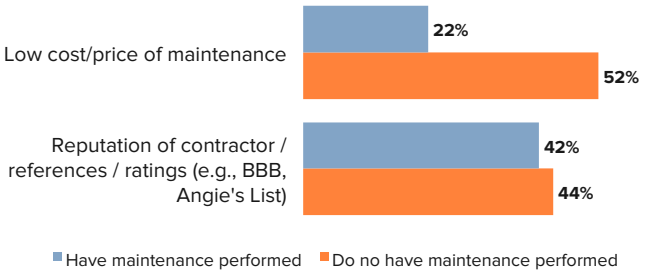


44% of customers mentioned a contractor as a source of information for maintenance – this is higher than the 32% who mentioned a contractor for installation information.

3/4 Evaluation of Alternatives & Purchase Decision

Price is a critical barrier for many customers, particularly for customers who do not already have maintenance performed. The contractor's reputation is also important.

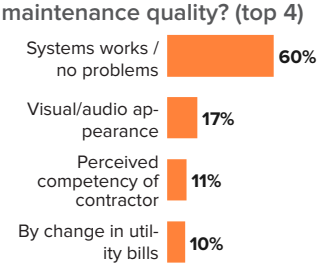
What affects selection of a contractor? (top two mentions)



5 Post-Purchase Evaluation

Residential customers frequently judge their maintenance by the appearance, demeanor, and "perceived competency" of the contractor.

How do customers evaluate maintenance quality? (top 4)



Only 10% of customers mentioned judging the quality of maintenance by noticing a change in their monthly utility bills.

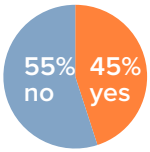
Conclusions/Recommendations

KEY THEME #1

Many residential customers do not recognize the benefits of having regular, preventative maintenance performed on their HVAC systems.

Only 45% of nonparticipants have regular preventative maintenance performed on their HVAC equipment.

Perform regular preventative maintenance? (nonparticipants only)



Decision weights: (top four)

32% contract cost

13% monthly cost savings

13% system reliability

9% system longevity

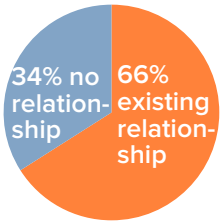
Recommendation #1

Provide basic information about the benefits of preventative maintenance procedures in an easy-to-understand "infographic" format, making the benefits of maintenance *concrete* by focusing on monthly cost savings, system longevity, and system reliability. Highlighting differences between QM and non-QM services is important.

KEY THEME #2

Residential customers have relationships with contractors and may be unwilling to switch providers for a service like QM.

66% of customers report having a contractor that they typically work with.



25% of nonparticipants who have regular preventative maintenance cited an **existing relationship** was important to their selection of a maintenance contractor.

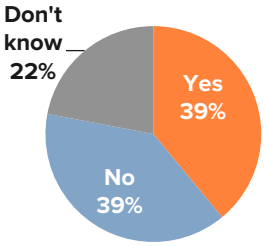
Recommendation #2

Increase outreach efforts to contractors and leverage IOU marketing channels to make customers aware of QM as an option for obtaining maintenance services. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QM.

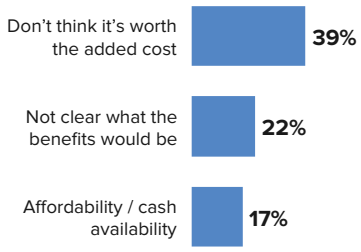
KEY THEME #3

Residential customers are extremely price-sensitive to the cost of a maintenance contract. (See Methods chapter in report for further discussion of price sensitivity as measured by the discrete choice study.)

Do nonparticipants believe that premium maintenance services offer benefits above and beyond typical maintenance?



Why nonparticipants might not pay extra for QM (top 3)



Recommendation #3

If possible, emphasize that price differences between QM and non-QM services are minimal. Additionally, if supported by empirical evidence, efforts may focus on the fact that the per-visit cost may be less for QM contracts than for non-QM contracts.

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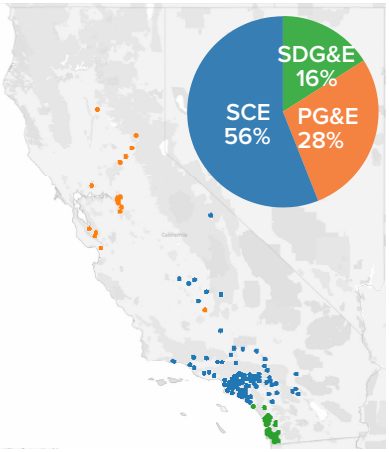
California HVAC QI/QM Customer Decision-Making Study

COMMERCIAL RESPONDENT SUMMARY

We surveyed **250** commercial customers, including **75 QI/QM program participants** and **175 nonparticipating customers** from the three California electric IOU service territories.



Respondent Profile

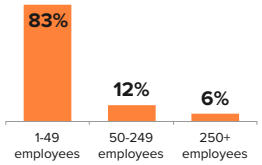
DECISION-MAKERS

100% of the respondents we talked to were responsible for making decisions about their HVAC equipment for their organization.

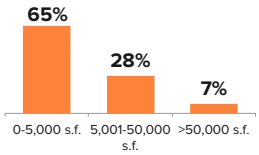
BUILDING OWNERSHIP

53% owned their building
45% rented/leased and paid their utility bills
2% rented/leased and did not pay utility bills

TOTAL # EMPLOYEES IN ORG.



SIZE OF TYPICAL FACILITY

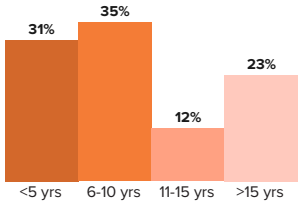


HVAC Equipment Profile

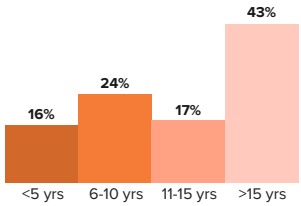
THE AVERAGE DECISION-MAKER

The average commercial respondent is responsible for **11.3** locations (mean) with a total of **36.1** HVAC units (mean).

What is the average age of commercial customers' HVAC equipment?

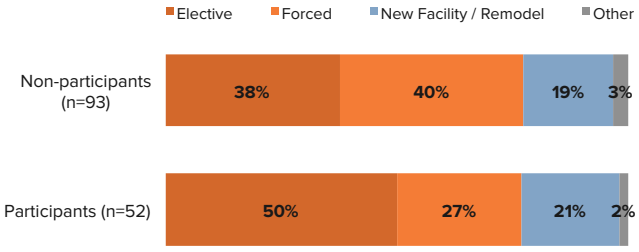


What is the approximate age of commercial customers' oldest equipment?

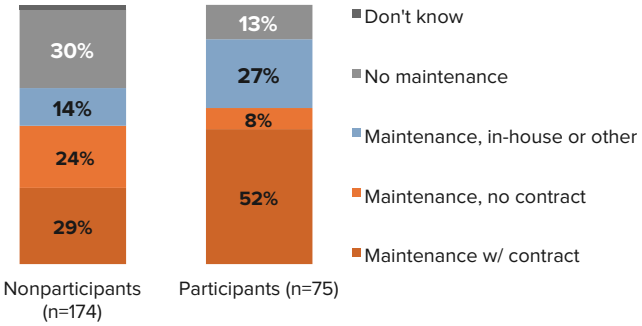


59% of all commercial respondents had purchased HVAC equipment for their organizations. Their reasons for doing so were classified into *elective*, *forced* (i.e., equipment failed completely), and *new facility/remodel* work.

For customers who had purchased HVAC equipment, why did they do so?



Do commercial customers have regular, preventative maintenance performed on their HVAC equipment? And if so, do they have a contract?

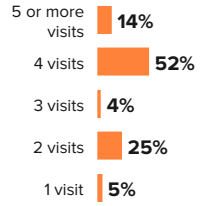


Maintenance Practices

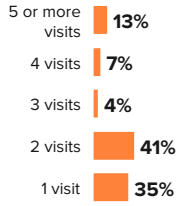
For commercial customers performing maintenance, who is doing the work?

75% use a professional HVAC contractor or technician
18% use an in-house or on-staff professional
4% use a a nonprofessional
3% use some combination of the above

For customers with a maintenance contract, how many annual visits are included?



For customers performing maintenance *without* a contract, how many times per year is it performed?



Commercial HVAC Installation Decision-Making

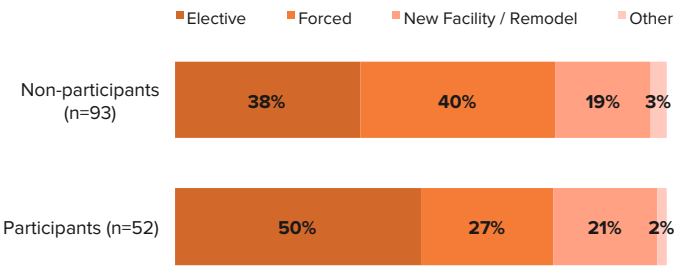
Overview

We surveyed 250 commercial customers on how they make decisions regarding HVAC installation. The results shown here present an overview of these processes organized by the **five-step decision-making model.**

1 Problem/Need Recognition

There are two types of commercial customers: (1) those that tend to run their HVAC equipment to failure (and then need to replace it), and (2) those that need their HVAC equipment to operate reliably at all times.

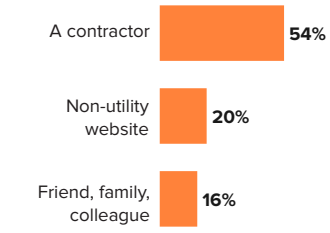
Why do commercial customers purchase HVAC equipment?



2 Information Search

Contractors are the primary information source for many commercial customers.

Where do commercial customers get information about HVAC installation? (top 3)



"A contractor" was mentioned over **2.5 times** more often than any other category of information sources.

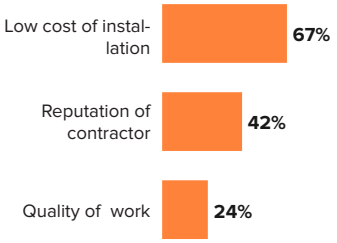
3/4 Evaluation of Alternatives & Purchase Decision

Commercial customers care most about the reliability of their HVAC systems, as well as the up-front cost. But when choosing a contractor, it is price and reputation that matter most.

What are the relative weights of decision factors for HVAC installation purchases?

- **30%** reliability
- **23%** up-front cost
- **19%** longevity
- **17%** monthly cost savings
- **11%** environ. impacts

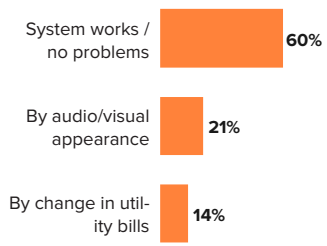
What would influence selection of a contractor? (top 3)



5 Post-Purchase Evaluation

Though more sophisticated than their residential counterparts, many commercial customers still use simplistic, non-technical methods to assess the quality of HVAC installation.

How do customers evaluate installation quality? (top 3)



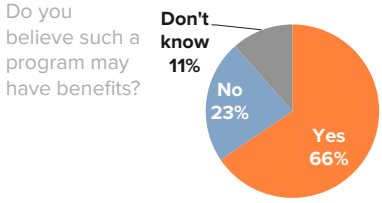
Only 5% of commercial customers mentioned compliance with building code or manufacturer specifications.

Conclusions/Recommendations

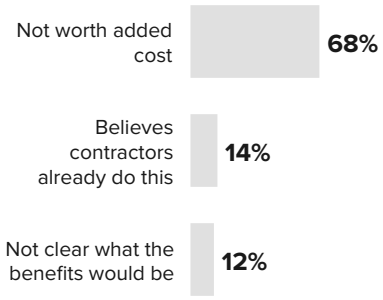
KEY THEME #1

Commercial customers are receptive to the idea of QI but could use more information on the benefits.

66% of program nonparticipants believe premium installation might have benefits above-and-beyond typical installations.



Of those customers not willing to pay extra for QI, the top reasons cited were:



Recommendation #1

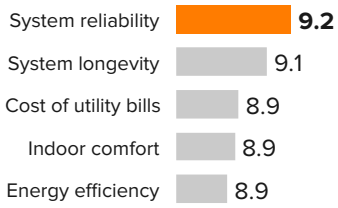
Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits of premium, standards-based installation. However, it is critical that this information must not be overstated. If this information cannot be provided in this form, efforts should instead be made to provide concrete examples of success through case studies of real projects.

KEY THEME #2

Commercial customers are particularly sensitive to the reliability of their HVAC systems.

System reliability accounted for 30% of the overall decision weight in our modeling, more than any other attribute tested.

Customers' top five considerations regarding HVAC equipment (rated on a 0 – 10 scale with 10 = most important)



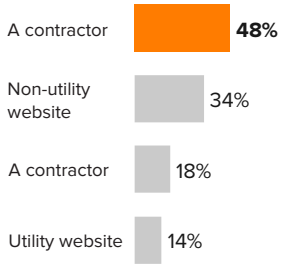
Recommendation #2

When promoting the benefits of premium, standards-based installation, messaging to commercial customers could focus on the increased reliability resulting from these services (assuming that increased reliability is in fact a benefit attributable to QI). Additionally, this messaging could benefit from providing information that is more specific or concrete than just "greater reliability."

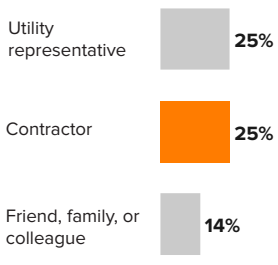
KEY THEME #3

Commercial customers are highly reliant on contractors for information about HVAC installations.

"A contractor" was mentioned by 48% of respondents as a source they would consult for more information on proper HVAC installation (or maintenance).



25% of program participants had heard of the program from a contractor — as many as heard from a utility representative.



Recommendation #3

Increase outreach efforts to contractors. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QI.

Overview

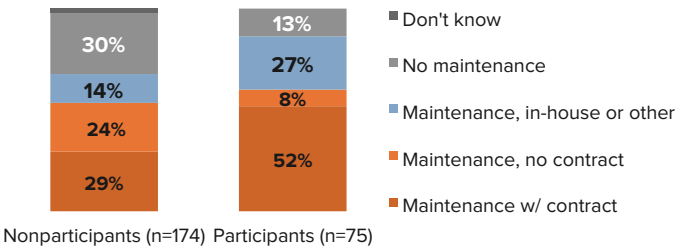
Commercial HVAC Maintenance Decision-Making

We surveyed 250 commercial customers on how they make decisions regarding HVAC maintenance. The results shown here present an overview of these processes organized by the **five-step decision-making model.**

1 Problem/Need Recognition

Many commercial customers understand the need for regular preventative maintenance, though many who have maintenance performed do so without a maintenance contract.

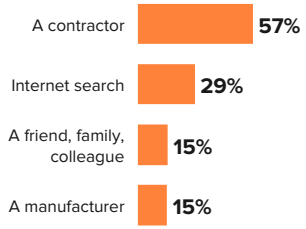
Do commercial customers have regular maintenance performed? And if so, do they have a contract?



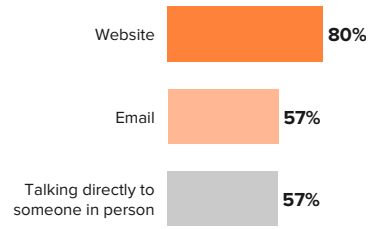
2 Information Search

Contractors and the Internet are important sources of information for commercial customers. They also tend to rely more on manufacturers than do residential customers.

How do commercial customers get information about HVAC maintenance? (top four)



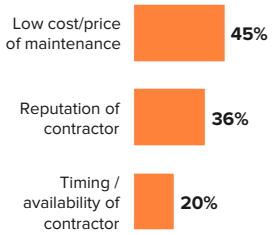
How would commercial customers *prefer* to get more information? (top three)



3/4 Evaluation of Alternatives & Purchase Decision

Up-front cost and contractor reputation are critical factors in the selection process. Many customers already have a specific contractor they've worked with in the past.

What would influence customers' selection of a contractor? (top three mentions)



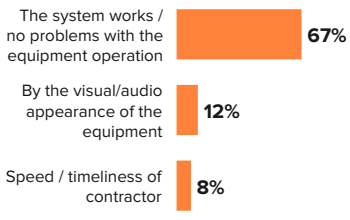
66% of commercial customers said they had a specific contractor with whom they've worked with in the past.

5 Post-Purchase Evaluation

While a subset of commercial customers appear to be well-informed regarding HVAC maintenance, many customers still use simple, non-technical methods to assess the quality of their maintenance.

12% of commercial customers said they would judge maintenance quality by either looking at invoices or observing changes in their utility bills.

How do customers evaluate maintenance quality? (top three mentions)



Conclusions/Recommendations

KEY THEME #1

Overall, cost and reliability matter to everyone. However, there is a segment of commercial customers for which reliability matters as much as cost; there is another segment for which cost matters most.

Decision weights: (all, n=337)	Cost segment, n=88	Reliability segment, n=249
23% contract cost	35% contract cost	19% contract cost
19% reliability	21% reliability	19% reliability
11% monthly cost savings	11% monthly cost savings	11% monthly cost savings
11% contract length	9% contract length	12% contract length
10% longevity	7% longevity	10% longevity
9% visits per year	5% visits per year	11% visits per year
9% indoor air quality	5% indoor air quality	10% indoor air quality
8% environmental	6% environmental	9% environmental

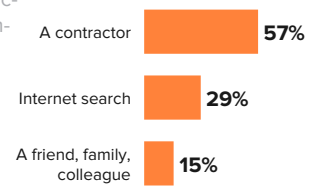
Recommendation #1

Though cost matters, most commercial customers are also sensitive to improvements in system reliability. Messaging to these customers should focus on the increased reliability resulting from QM services (assuming that increased reliability is in fact a benefit attributable to QM). This is especially true for the segment of customers for which reliability matters as much as cost.

KEY THEME #2

Contractors are the most important source of HVAC maintenance information for many commercial customers. Additionally, many customers have an existing relationship with a contractor — and may be hesitant to switch.

Top 3 sources customers would consult



66% of commercial customers said they had a specific contractor with whom they've worked with in the past.

Recommendation #2

Expand the contractor base by recruiting currently nonparticipating contractors. Ensure participating contractors have the resources, support, and information they need to effectively promote the program.

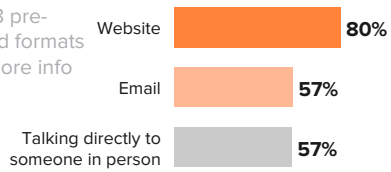
KEY THEME #3

There was very little indication that respondents associated the term "Quality Maintenance" with the maintenance contracts they had purchased, or with IOU programs.

"I've heard of a lot of [IOU] programs but not 'Quality Maintenance.'"

- Program participant

Top 3 preferred formats for more info



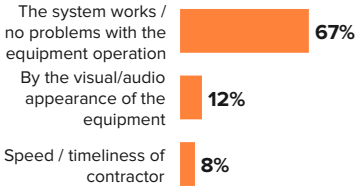
Recommendation #3

Be consistent when referring to QM programs and services. If a program providing QM services does not have "Quality Maintenance" in the name, make sure that the two are closely associated in marketing and branding efforts (assuming that this term will continue to be used). This particularly applies to QM references on the Internet.

KEY THEME #4

Judging the quality of the maintenance received is a barrier to stimulating greater demand by commercial customers for QM programs.

Top mentions for judging the *quality* of maintenance of HVAC systems



Only 6% of respondents mentioned they would judge maintenance quality by a change in their utility bills.

Recommendation #4

Differentiating QM from non-QM is important. Consider providing information on case studies of QM projects and/or short Internet video clips that show maintenance being performed on HVAC equipment. There may also be value in emphasizing more tangible aspects associated with QM contracts, including the number of visits per year or perks such as priority service.

1. INTRODUCTION

This report presents the results of the California Heating, Ventilation, and Air Conditioning (HVAC) Quality Installation/Quality Maintenance Customer Decision-Making (CDM) Study conducted by EMI Consulting on behalf of the California investor-owned utilities (IOUs), including Southern California Edison (SCE), the Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), and Southern California Gas (SoCalGas). While a substantial amount of research has been conducted to understand the technical and supply-side concerns of Quality Installation (QI) and Quality Maintenance (QM) programs, very little work has focused on the demand side (i.e., understanding the *customer perspective)*. The goal of this study was to better understand this perspective and to help inform efforts to help stimulate greater demand for HVAC QI/QM programs moving forward.

Several publications have indicated the potential for significant energy savings associated with HVAC systems in California — especially QI/QM. This is evidenced by the significant work that has been done in association with *The California Energy Efficiency Strategic Plan* (The Strategic Plan),[1] as well as supporting work presented in *The Strategic Plan to Reduce the Energy Impact of Air Conditioners*,[2] and *The Recommended Strategic Plan to Transform the Existing HVAC Industry and Achieve Additional Peak Savings, Sustainable Profitability, and Increased Customer Comfort* (the HVAC Conveners Report).[3]

The HVAC Action Plan was developed to operationalize the goals set forth in the higher level, more policy-oriented Strategic Plan. The *HVAC Action Plan* presents four main goals:

> **Goal 1:** Code compliance
> **Goal 2:** Quality HVAC installation and maintenance
> **Goal 3:** Whole-building design
> **Goal 4:** New HVAC technologies and system diagnostics

However, of the 20 specific strategies falling under these four goals, the vast majority are aimed at ensuring the technologies, skills, and accreditations are available to contractors/technicians, developing the regulatory infrastructure (e.g. codes, permitting, compliance), and developing appropriate technologies. Notably, only two of the strategies are aimed specifically at the customer, or demand side of the market. These include:

> **Strategy 2-1:** Create a statewide quality installation and maintenance (QI/QM) brand that will be attached to systems/installations/contractors that meet quality standards
> **Strategy 2-2:** Launch a customer marketing and education campaign to support the brand and stimulate market demand

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[1] CPUC, The California Efficiency Strategic Plan (Sep 2008), http://www.engage360.com/images/stories/ceesp/caenergyefficiencystrategicplan_jan2011.pdf
[2] California Energy Commission, Strategic Plan to Reduce the Energy Impact of Air Conditioners (Jun 2008), http://www.energy.ca.gov/2008publications/CEC-400-2008-010/CEC-400-2008-010.PDF
[3] Mike Messenger, The HVAC Convener's Report (Jan 2008), http://www.performancealliance.org/LinkClick.aspx?fileticket=n5AaFTvGHIU%3d&tabid=212&mid=700

Together these two strategies indicate that branding, marketing, and education are all critical to the success of QI/QM programs. While the main goal of this study was to develop an in-depth understanding of how residential and commercial customers in California make purchasing decisions related to HVAC installation and maintenance, the results can also inform future branding, marketing, and education efforts to transform the HVAC market within California.

1.1 Research Objectives

The objectives of this study were to:

1. Characterize the barriers and drivers behind QI/QM customer purchasing decision-making;
2. Describe possible strategies used by customers to guide their HVAC decisions;
3. Identify how the benefits of HVAC industry standards-based QI/QM are perceived by end-purchaser customers and how these perceptions align (or don't align) with contractor's views of the customer and customer decision-making;
4. Identify branding and other strategies that might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QI/QM services;
5. Characterize the role that educational materials might play in the decision-making process; and,
6. Assess how logic models, along with a customer decision-making market model, can be used to develop and test how programs and the QI/QM market can be positively impacted.

1.2 Research Framework

Drawing on work from fields such as marketing, psychology, economics and sociology, EMI Consulting established a conceptual framework for this study based upon a common five-step customer decision-making model. This framework is discussed below and shown in Figure 1-1.

Figure 1-1. The Basic Five-step Customer Decision-Making Model

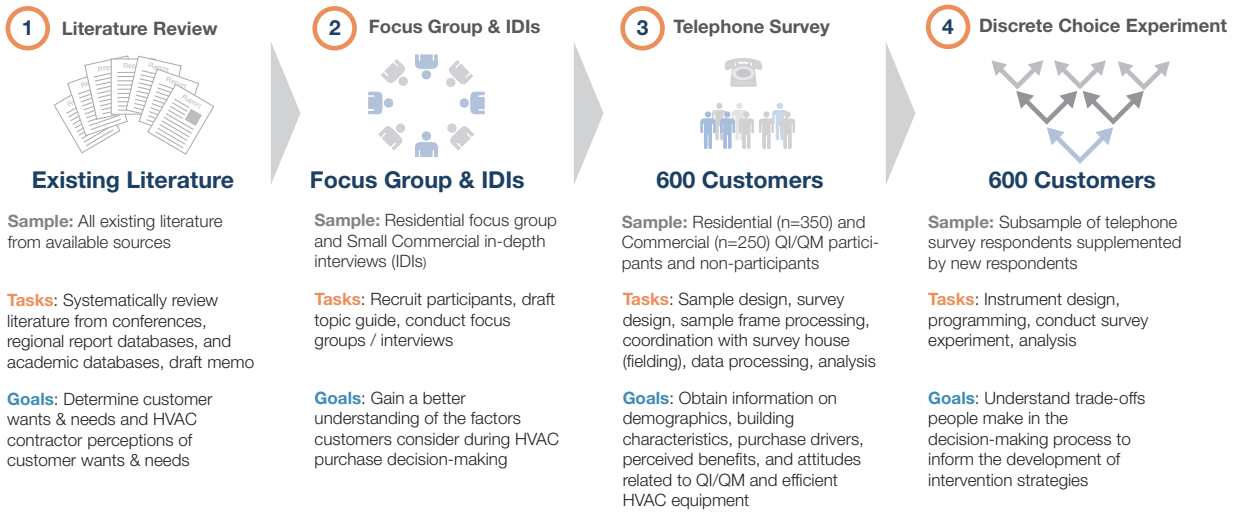
- **Step 1. Problem /Need Recognition.** During this first step in the process, a customer identifies he or she has a problem (e.g. “My HVAC unit no longer is working” or “My air conditioner no longer cools as effectively as it used to”) or recognizes a need (e.g. “It is so hot and I am unable to sleep at night. It is time to install air conditioning”). Traditionally, this step is followed by an information search to help guide his or her decision.
- **Step 2. Information Search.** The objective of the Information Search step is to reduce uncertainty and to gain knowledge about the purchase decision. Often, customers retrieve information from long-term memory such as “John down the street installed an air conditioner last year, I should go down and ask him about his experience” or “I only want to purchase an American-made product.” Customers also often gather information from external sources, such as the Internet, contractors, stores, educational material, marketing material, etc. Following this information search, customers often move into the Evaluate Alternatives phase.
- **Step 3. Evaluate Alternatives.** Once uncertainty is reduced and customers have knowledge to support a purchase decision, customers will Evaluate Alternatives. Given that an HVAC installation purchase is a complex purchase, if motivated, customers may use multiple sources of information and strategies to guide the decision-making process such as product characteristics, brand preferences, cost, trust of information provider (contractor, store, brand, etc.) or minimum standards for each attribute (e.g. it must be at least 15 SEER, 4 tons, etc.). On the other hand, customers may be very intimidated by the product purchase and choose a very simplistic decision-making strategy (e.g. “I will look up HVAC contractors in the yellow pages and solicit three estimates. I will then go with the least-cost alternative”).
- **Step 4. Purchase.** The Evaluation of Alternatives results in an actual purchase of the product and/or service. For the purposes of this study, this step was combined with Step #3 (Evaluate Alternatives) in order to simplify the overall process.
- **Step 5. Post-purchase Evaluation.** Following the purchase, customers make a post-purchase evaluation and assess if the actual product performance matches the pre-purchase expectations.

EMI Consulting used this framework to guide our research by helping to partition the issues that we explored into concise topical areas, which in turn allowed us to dissect the broader decision-making process and more fully understand how people go about making HVAC-related decisions.

2. METHODS

To fulfill the research objectives, EMI Consulting designed the HVAC QI/QM CDM Study as a multi-staged study consisting of four main tasks, including: (1) a literature review, (2) qualitative research consisting of a focus group with residential customers and in-depth interviews with small commercial customers, (3) an in-depth telephone survey, and (4) a discrete choice study. Figure 2-1 shows a graphical representation of the tasks EMI Consulting undertook to conduct this study. The design was iterative, with each task leading into and informing the next. The following sections describe the approaches of each of the tasks.

Figure 2-1. HVAC QI/QM Customer Decision-Making Study Research Design



2.1 Literature Review

Before we began our research, it was important for the project team to conduct a review of the existing literature on HVAC customer decision-making. While our preliminary research confirmed our hypothesis that very little research has been done on decision-making drivers by HVAC customers, we wanted to thoroughly review the research that *had* been conducted, both pertaining to the supply-side of the HVAC market and the demand side. EMI Consulting searched relevant HVAC and evaluation conference proceedings (i.e., multiple years of ASHRAE, ACCA, ACEEE, AESP, and IEPEC), regional report databases (CALMAC and NEEA), Google Scholar, and JSTOR for appropriate articles. Our search terms included:[4]

- HVAC market
- HVAC customer benefits
- HVAC purchasing decisions

[4] Given the iterative nature of our search and the small number of articles that were found we chose not to use "quality installation" and "quality maintenance" as search terms. These terms were not commonly found in the literature and would have limited the results dramatically.

- HVAC customer decision making
- HVAC contractor selling
- HVAC efficiency selling and
- HVAC marketing efficiency[5]

We used the search results in an iterative process. Our initial keyword searches produced a total of 12 sources, only four of which were relevant to customer decision-making behaviors. We then reviewed the literature cited in each of the articles to ensure we captured all relevant articles.

The literature review is included in this report as Appendix A1.

2.2 Qualitative Research - Focus Group (Residential QI Participants) and In-Depth Interviews (Small Commercial QM Participants)

The goal of the focus groups and IDIs was to ensure the research team possessed a sound understanding of the issues and the language used to discuss these issues to inform the development of a high quality telephone survey. To drive these efforts, we developed the following objectives:

1. Gauge the level of understanding and familiarity among residential and small commercial customers with regards to QI/QM and other HVAC-related concepts
2. Determine the language and key concepts that customers use to discuss energy efficiency and HVAC QI/QM
3. Characterize what customers understand and believe regarding HVAC QI/QM
4. Understand the customer value propositions regarding the purchase of QI/QM
5. Understand the potential barriers to purchasing QI/QM
6. Characterize the drivers behind QI/QM/high efficiency customer purchasing decision-making at each of the five stages
7. Identify and test branding strategies that might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QI/QM services
8. Characterize the role of educational materials in the decision-making process.

The following sections provide details on how these two qualitative research efforts were conducted.

Focus Group – Residential QI Participants

For the residential focus group, a list of potential participants was derived from SCE QI program participant data. To reduce burden on the participants, the list of eligible recruits was limited to those zip codes within a 30-mile radius of the focus group facility in Riverside, California. In consultation with the project team,[6] EMI Consulting developed a screening and recruitment tool (included in Appendix B) to ensure the participant selection process targeted residential

[5] When we searched for "HVAC," "HVAC customers," and "HVAC contractors," the results were too broad for our purposes and we narrowed our search terms down to the list here.
[6] The Project Team included representatives from SCE, PG&E, SDG&E, SoCalGas, as well as the CPUC-ED.

customers who had recently installed new equipment through SCE's QI program. EMI Consulting also developed a moderator guide (included as Appendix C) in consultation with the project team to guide the session. The moderator used this guide during the focus group session to ensure the discussions stayed on topic while at the same time allowing participants to converse and explore other issues that could have been missed with a more structured instrument.

EMI Consulting staff conducted the focus groups at the Athena Research Group facility in Riverside, California, on May 21, 2014. A total of eight residential customers attended the focus group. Following the event, the research facility provided a video recording and transcription of the session. EMI Consulting provided participants in the focus group with a $100 incentive for their participation.

In-Depth Interviews – Small Commercial QM Participants

For the commercial customer in-depth interviews (IDIs), EMI Consulting developed a call list of potential participants from SCE QI program participant data. In consultation with the project team, the research team first developed a screening and recruitment tool to ensure the participant selection process targeted the ideal candidates, and subsequently recruited the IDI participants according to these requirements (included in Appendix C). The research team also developed a telephone interview guide (based closely on the focus group guide) in consultation with the project team to conduct the IDIs (included in Appendix C).

A total of 10 IDIs were conducted during June of 2014 by EMI Consulting staff. The IDIs typically lasted anywhere from 20 minutes to 35 minutes. All interviews except one were recorded and notes were transcribed immediately following each interview. As with the focus group analysis, EMI Consulting team analyzed the in-depth interviews with small-commercial customers and organized the findings according to the customer decision-making model.

2.3 Telephone Survey and Discrete Choice Web Study

In this section we describe the data sources, data processing, and sample design for the telephone survey and web-based discrete choice study.

Data Sources

The research team utilized IOU QI/QM program[7] participant data as the basis for the development of the participant sample frame for this study. EMI Consulting requested and received QI and QM program participation data for the years 2012 and 2013 from SCE and SDG&E; PG&E indicated they did not have any QI programs in 2012-2013 and thus only provided QM program data.[8] EMI Consulting also requested and received customer general population files from SCE, PG&E, and SDG&E to develop the non-participant samples. Instead of providing

[7] Programs included AC Quality Care/AC Quality Installation/Commercial HVAC Quality Maintenance Program (PG&E), Quality Installation/Quality Maintenance/HVAC Optimization (SCE), AC Quality Care/Premium Efficiency (SDG&E).
[8] SoCalGas decided not to provide customer data for this study as their service territory overlaps with the service territories of other IOUs that did provide data. A question asking respondents who their natural gas provider is was added to the surveys so that we could report how many SoCalGas customers responded.

the entire customer population, the IOUs provided random samples of 2,000 residential accounts and 2,000 small commercial accounts.[9]

Data Processing

The "customer" is the unit of analysis for this study – that is, we aimed to develop participant and non-participant sample frames that represented the population of individuals or organizations that comprise the market for HVAC services in California. This is complicated by the fact that the IOUs generally view customers in terms of accounts, not customers, and their data is arranged accordingly. In many cases multiple accounts – and sometimes *hundreds* of accounts – were tied to a single customer, especially for commercial customers. For the purposes of this study, EMI Consulting used unique phone numbers to define a single customer (i.e., the unit of observation), though in the few cases where phone numbers were not present, addresses were used to define customers.[10] This approach comes closest to representing the true population of customers, and also ensures we did not contact the same person multiple times in the course of conducting the surveys.

The tasks involved in processing these data files consisted of: (1) developing the participant sample files, (2) developing the non-participant sample files, (3) merging and de-duplicating the individual IOU participant and non-participant files, and (4) merging and de-duplicating the IOU files.

Task 1: Developing the Participant Sample Files

This task involved processing the program participant data files for each IOU to derive files of unique *phone numbers* (unit of observation for the study) to represent the participant sample frame. In addition to de-duplicating the files by phone number (or address), this also included removing cases that had no phone number, had no discernable sector (residential or commercial), or were inactive accounts. In the case of the SCE program participant data, this task also involved removing customers that were contacted for either the residential focus group or commercial in-depth interviews that were part of earlier stages of research conducted for this study. It is important to note that because of the structure of data provided, inconsistencies in the data, and the fact that we collapsed cases to derive unique phone numbers, we were unable to reliably distinguish between QI and QM participants. Instead we simply coded the processed cases as participants for the purposes of sampling.

Task 2: Developing the Non-Participant Sample Files

This involved processing the general population data files for each IOU in the same way as described in Task 1 in order to derive files of unique phone numbers to represent the non-participants.

Task 3: Merging and De-Duplicating the Individual IOU Participant and Non-Participant Files

Because the general population data files provided by the IOUs were randomly drawn from the comprehensive customer populations, we needed to ensure that none of the customers showing

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[9] SCE provided random samples of 4,000 residential accounts and 4,000 small commercial accounts, but only 2,000 cases from each were used to develop the sample frame.

[10] Addresses are not the ideal means of defining customers because, like with account numbers, multiple addresses can be associated with a single customer. However, when phone numbers are not present, addresses are the second best alternative. Ultimately, cases without phone numbers are included for the purposes of computing the total size of the population, but are removed from the data for the purposes of compiling the final sample frame.

up in the program participant files also showed up in the general population data. This task involved merging the processed participant and non-participant files and then de-duplicating by phone number. Because there were fewer participant cases than non-participant cases, if a phone number appeared twice, the case associated with a participant was retained.

Task 4: Merging and De-Duplicating the IOU Files

Because some customers, especially commercial customers, can have facilities throughout the state – and thus, in multiple IOU service territories – we also needed to ensure none of the customers appeared in more than one IOU file. This task involved merging all the individual IOU files from Task 3 and de-duplicating by phone number. If both cases were participants or both were non-participants, the decision was made to retain the case associated with the IOU that represented the smaller number of cases. The fewest cases were associated with SDG&E, then PG&E, then SCE. The resulting file was the final sample frame for the study.

Sample Design

The sample design for the telephone surveys was aimed at attaining an adequate level of relative precision at the residential and commercial levels as well as the participant and non-participant levels to draw robust conclusions. Table 2-1 shows the estimated levels of relative precision at the 90% level of confidence (L.O.C) based on the sector and participation status.[11]

Table 2-1. Relative Precision Based by Sector and Participation Status

Sector	Program Non-Participants			Program Participants			Sector Total	
	Pop'n.	Surveys	Rel. Precision (90% L.O.C.)	Pop'n.	Surveys	Rel. Precision (90% L.O.C.)	Surveys	Rel. Precision (90% L.O.C.)
Residential	10,600,000	100	+/- 8.2%	9,731	250	+/- 5.1%	350	+/- 4.4%
Commercial	446,000	175	+/- 6.2%	1,718	75	+/- 9.3%	250	+/- 5.2%
TOTAL	**11,046,000**	**275**	**+/- 5.0%**	**11,449**	**325**	**+/- 4.5%**	**600**	**+/- 3.4%**

Blackstone, the survey house used for this study, completed 350 phone surveys with residential customers (+/- 4.4% relative precision at the 90% L.O.C.) and 250 surveys with commercial customers (+/-5.2% relative precision at 90% L.O.C.). Of these total completes, 100 phone surveys were completed with residential program non-participants (+/- 8.2% relative precision at 90% L.O.C.) and 250 completed with residential program participants (+/- 5.1% relative precision at 90% L.O.C.); 175 surveys were completed with commercial program non-participants (+/- 6.2% relative precision at 90% L.O.C.) and 75 completed with commercial program participants (+/- 9.3% relative precision at 90% L.O.C.).

[11] It is worth noting that the analysis team did not generally find systematic differences between program participants and non-participants when analyzing the survey results, and thus, attention is not placed on distinguishing these two subgroups throughout the report. However, we do report notable differences between these subgroups where applicable.

Though results throughout the report are not presented by IOU,[12] the tables below summarize the population sizes and number of respondents by IOU for the different subgroups.

Table 2-2. Residential Program Participants by IOU

IOU	Population	% of Population	Survey Completes	% OF TOTAL
PG&E	4,278	44.0%	107	42.8%
SCE	4,274	43.9%	97	38.8%
SDG&E	1,179	12.1%	46	18.4%
TOTAL	**9,731**	**100.0%**	**250**	**100.0%**

Note. 52% of residential program participants indicated SoCalGas was their gas provider.

Table 2-3. Commercial Program Participants by IOU

IOU	Population	% of Population	Survey Completes	% OF TOTAL
PG&E	359	20.9%	23	30.7%
SCE	1,343	78.2%	52	69.3%
SDG&E	16	0.9%	0	0.0%
TOTAL	**1,718**	**100.0%**	**75**	**100.0%**

Note. 65% of commercial program participants indicated SoCalGas was their gas provider.

Table 2-4. Residential Program Non-Participants by IOU

IOU	Population	% of Population	Survey Completes	% OF TOTAL
PG&E	5,100,000	48.1%	24	24.0%
SCE	4,200,000	39.6%	50	50.0%
SDG&E	1,300,000	12.3%	26	26.0%
TOTAL	**10,600,000**	**100.0%**	**100**	**100.0%**

Note. 69% of residential non-participants indicated SoCalGas was their gas provider.

Table 2-5. Commercial Program Non-Participants by IOU

IOU	Population	% of Population	Survey Completes	% OF TOTAL
PG&E	236,000	52.9%	46	26.3%
SCE	150,000	33.6%	87	49.7%
SDG&E	60,000	13.5%	42	24.0%
TOTAL	**446,000**	**100.0%**	**175**	**100.0%**

Note. 54% of commercial non-participants indicated SoCalGas was their gas provider.

[12] Results are presented at the sector levels because due to budget constraints, the sample design was not targeted at attaining any specific level of relative precision at the IOU level. However, it is worth noting that there were no substantive differences across the responses by IOU, meaning customer preferences and experiences are rather similar.

The telephone survey call dispositions were compiled after fielding the survey and are shown in Table 2-6. Overall the completion rate for the survey was 6.3%.

Table 2-6. Call Dispositions

Call Disposition	Count	Percent
Complete	600	6.3%
Call dropped	278	2.9%
Answering machine	3,946	41.3%
General callback	553	5.8%
Refusal	1,612	16.9%
Language barrier	298	3.1%
Operator intercept	896	9.4%
Unknown	288	3.0%
Technical difficulty	22	0.2%
Disqualified - person answering the phone refused to forward call to appropriate caller, did not provide callback time, did not provide callback number	561	5.9%
Disqualified - respondent did not own/manage HVAC units in CA	28	0.3%
Disqualified - respondent was not the HVAC decision-maker	470	4.9%
TOTAL	**9,552**	**100.0%**

Customer Decision-Making and Discrete Choice

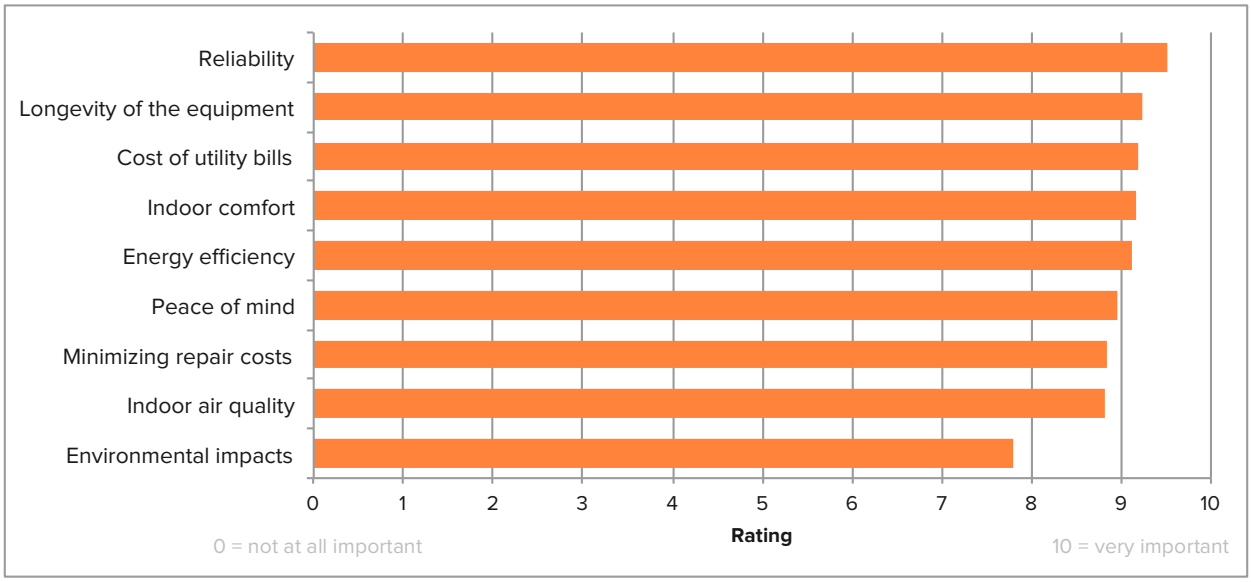
As part of the HVAC QI/QM CDM Study, EMI Consulting conducted a discrete choice analysis. The goal of the discrete choice exercise was to gain a better understanding of the customer decision-making process associated with HVAC QI/QM, which in turn could be used to inform effective marketing strategies and messaging that will better communicate a "brand" for HVAC QI/QM in the marketplace (Research Objective #4 in Section 1.1). Decision-making is a complex process that requires an individual to contemplate and weigh an array of factors before deciding on a final course of action. The more complicated the choices, and the greater the number of factors playing a part in the decision, the more complex the decision-making process becomes.

A traditional approach to assessing the variable effect that different factors might play in peoples' decisions is to ask survey respondents to rate or rank factors. For example, when it comes to their HVAC systems, we may ask respondents to rate (on a 0 to 10 scale, where 0="not at all important" and 10="very important"), how important each of the following factors are:

A. ___ Reliability
B. ___ Longevity of the equipment
C. ___ Cost of utility bills
D. ___ Indoor comfort
E. ___ Energy efficiency
F. ___ Peace of mind
G. ___ Minimizing repair costs
H. ___ Indoor air quality
I. ___ Environmental impacts

While such an approach can add useful high-level insights into what generally seems to matter (or not matter) to customers, it suffers from weaknesses when it comes to informing marketing strategies. Namely, this approach is not effective for *discriminating between factors* in order to determine which factor may be *most* important and actionable. For example, when asked to rate the factors *independently*, respondents tend to rate most things as important. Figure 2-2 illustrates this point with some results from the HVAC QI/QM CDM Study telephone survey, charting the mean scores for each of the items for residential respondents.

Figure 2-2. Telephone Survey Customers' Ratings of Aspects of HVAC Equipment



Note from Figure 2-2 that there is very little variability across the nine factors. The highest score is 9.4 associated with "reliability" and the lowest score is 7.7, associated with "environmental impacts". And with the lowest score being a 7.7 on a 10-point scale, we may conclude that *all* items were rated as relatively important. Looking beyond environmental impacts, none of the other items vary by more than 0.8 points from the highest rated item. Thus, these results suggest that all of these items are relatively important. These results, while interesting, do not provide the insights needed to assess which of these items might be *most effectively* leveraged – or have the most "punch" – in developing marketing efforts to appeal most to customers and solidify a brand. The main reason for this is that traditional survey methods treat these items as *independent*. That is, respondents are not asked to consider the *tradeoffs* they generally make in real-world situations. For example, while reliability is rated highest and the cost of utility bills is somewhat lower, people may be willing to accept somewhat lower reliability if their monthly energy bills were also notably lower.

Discrete choice is a commonly used tool for better understanding how people go about making decisions, providing critical information on the tradeoffs people make and quantifying the value they place on certain aspects of the decision. The fundamental design components of a discrete choice study are attributes and levels.

The *attributes* are the main characteristics, components, concepts, or features in which we are interested. For example, when assessing decision-making associated with purchasing a quality installation of an HVAC unit, the attributes we decided to focus on included: (1) system reliability,

(2) system longevity, (3) environmental impacts, (4) effect on monthly utility bills, and (5) up-front installation cost.[13]

The *levels* in a discrete choice study are the different values of the attributes we decided to assess. For example, for system reliability, levels were constructed based on the risk of downtime during a period of hot weather. Importantly, each of these levels was in comparison to what the customer would get with a "typical," non-program installation. In implementing the discrete choice exercise, these attributes and levels are combined as *choice sets* or options from which respondents are asked to select.

Two important caveats are warranted regarding the use and interpretation of the discrete choice study results:

- **It is critical to acknowledge the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute.** For example, consider two different sets of levels for the attribute "monthly cost savings." The first set contains the levels "no change from baseline," "15% savings," and "30% savings." The second set contains the levels "no change from baseline," "50% savings," and "80% savings." All other attributes remaining unchanged, "monthly cost savings" would become more important in relation to other attributes if the second set of levels (featuring 50% and 80% savings) were used instead of the first set. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered.
- **We also caution that to a degree, the variation and uncertainty regarding many of these levels carries through to the discrete choice survey.** The research team utilized a number of sources on QI/QM and on general HVAC equipment operation to help inform the values for individual levels in the discrete choice study. We took great care to make sure that the set of levels chosen for each attribute was as realistic as possible *given the best information available at the time*. In addition to referencing the standards themselves, some of these sources are shown in Table 2-7. However, in many cases we had to rely on incomplete or highly uncertain values in the published literature, particularly given the scarcity of empirical data supporting operational improvements associated with QI/QM. What this means is that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.

[13] These attributes were chosen because they covered the spectrum of decision criteria for installation decisions in the telephone survey.

Table 2-7. Additional Sources of Information Used to Help Inform Levels in Discrete Choice Study

Attribute	Module	Source(s)
System reliability	Installation and maintenance	Consumer Reports, "Annual Reliability Survey." (Based on 21,132 natural-gas furnaces bought between 2008 and early 2014). New Buildings Institute, "Review of Recent Commercial Roof Top Unit Field Studies in the Pacific NW and California." (2004)
System longevity	Installation and maintenance	National Association of Home Builders / Bank of America Home Equity, "Study of Life Expectancy of Home Components" (2007) CDW Engineering, "Average Life Expectancies." Link.
Environmental impacts	Installation and maintenance	Hart, Callahan, Anderson, and Johanning, "Unitary HVAC Premium Ventilation Upgrade." 2011 ASHRAE Winter Conference Technical Program.
Monthly cost savings	Installation and maintenance	Energy Star Quality Installation (info site). Link.
Up-front installation cost	Installation only	ACCA, "Commercial Quality HVAC Installation." Link.
Indoor air quality	Maintenance only	Lawrence Berkeley National Laboratory, "Indoor Air Quality Scientific Findings Resource Bank." Link.
Contract cost	Maintenance only	Engineering judgment
Contract length	Maintenance only	IOU program information
Visits per year	Maintenance only	IOU program information and contractor websites

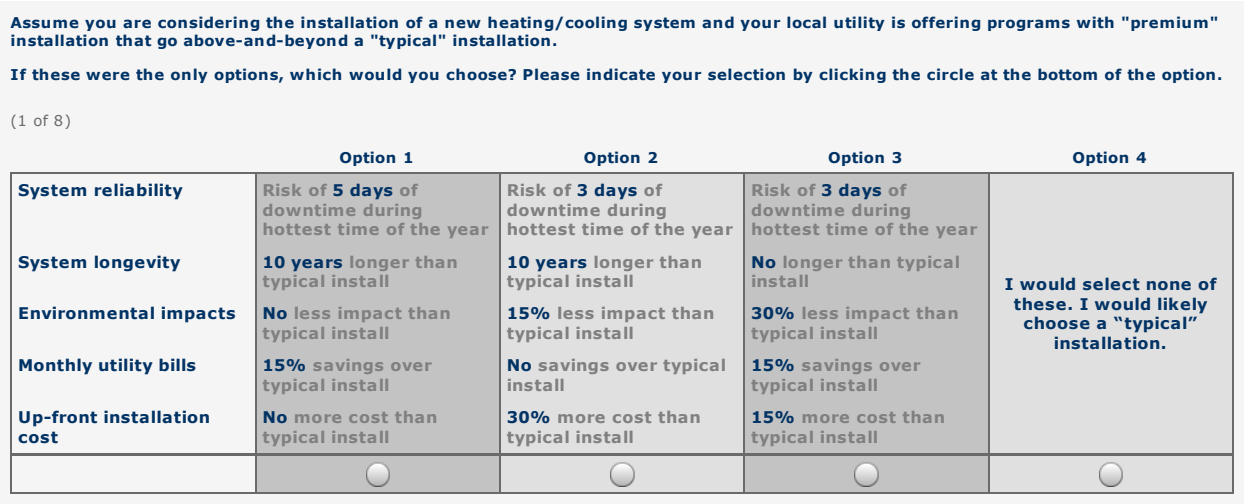
The attributes and levels used in the discrete choice modules are shown below in Table 2-8.

Table 2-8: Attributes and Levels Used for the Web-based Discrete Choice Study

ATTRIBUTES	INSTALLATION LEVELS	MAINTENANCE LEVELS
System reliability	Risk of 1 day of downtime during hottest time of year	Risk of 1 day of downtime during hottest time of year
	Risk of 3 days of downtime during hottest time of year	Risk of 3 days of downtime during hottest time of year
	Risk of 5 days of downtime during hottest time of year	Risk of 5 days of downtime during hottest time of year
System longevity	No longer than typical install	No longer than typical maintenance
	5 years longer	5 years longer
	10 years longer	10 years longer
Environmental impacts	No less impact than typical install	No less impact than typical maintenance
	15% less impact than typical install	15% less impact than typical maintenance
	30% less impact than typical install	30% less impact than typical maintenance
Monthly cost savings	No savings over typical install	No savings over typical maintenance
	15% savings over typical install	15% savings over typical maintenance
	30% savings over typical install	30% savings over typical maintenance
Up-front installation cost	No more costly than typical install	-
	15% more costly than typical install	-
	30% more costly than typical install	-
Indoor air quality	-	No better than typical maintenance
	-	15% better than typical maintenance
	-	30% better than typical maintenance
Contract cost	-	0% more than typical maintenance contract
	-	50% more than typical maintenance contract
	-	100% more than typical maintenance contract
Contract length	-	1 year
	-	3 years
	-	5 years
Visits per year	-	2 visits
	-	4 visits
	-	6 visits

In conducting the survey, respondents were presented with a list of several variations of the question shown in Figure 2-3, each presenting the same attributes, but with different combinations of levels. After data collection was complete, statistical modeling techniques were used to assign preference scores (or more formally, “part-worth utilities”) to each of the attribute levels, and importance scores for each of the attributes. These part-worth utilities and importance scores were then used to quantify and better understand what combinations of attributes and levels are most appealing to customers and provide critical insights into the tradeoffs people make.

Figure 2-3: Screenshot from Web-based Discrete Choice Study Installation Module



Assume you are considering the installation of a new heating/cooling system and your local utility is offering programs with "premium" installation that go above-and-beyond a "typical" installation.

If these were the only options, which would you choose? Please indicate your selection by clicking the circle at the bottom of the option.

(1 of 8)

	Option 1	Option 2	Option 3	Option 4
System reliability	Risk of **5 days** of downtime during hottest time of the year	Risk of **3 days** of downtime during hottest time of the year	Risk of **3 days** of downtime during hottest time of the year	
System longevity	**10 years** longer than typical install	**10 years** longer than typical install	**No** longer than typical install	**I would select none of these. I would likely choose a "typical" installation.**
Environmental impacts	**No** less impact than typical install	**15%** less impact than typical install	**30%** less impact than typical install	
Monthly utility bills	**15%** savings over typical install	**No** savings over typical install	**15%** savings over typical install	
Up-front installation cost	**No** more cost than typical install	**30%** more cost than typical install	**15%** more cost than typical install	
	○	○	○	○

Discrete choice experiments fall under the broader family of conjoint studies. To conduct the discrete choice experiments for this study, EMI Consulting used Sawtooth Software's online Choice Based Conjoint (CBC) package. Sawtooth offers a wide range of conjoint packages using different approaches, but CBC was the most appropriate option for this study because it operationalizes the decision making (i.e., making a *discrete* choice between competing options) in a way that most closely mimics the way the customer will likely be making the decision in the actual marketplace.

For the discrete choice study, the research team utilized multiple sources to obtain the requisite number of completes for the residential and commercial modules. Though we attempted to recruit customers that responded to the telephone survey to complete the discrete choice study, we also supplemented these responses with additional respondents in order to derive robust sample sizes. We recruited these additional respondents using third party email lists[14] and through the survey panel company Survey Sampling International (SSI). Respondents were pre-screened for geographic location and commercial decision-making status. We then additionally screened respondents for ownership of HVAC equipment, decision-making status for HVAC equipment, and electric utility provider. Table 2-9 provides a summary of source data for respondents in the discrete choice study, including both residential and commercial modules.

Table 2-9: Source for Web-based Discrete Choice Study Respondents

Source	Residential (n=317)	Commercial (n=337)
SSI	65.6%	71.5%
Email list	3.5%	5.6%
Telephone survey	30.9%	22.8%

Discrete-choice survey responses by IOU are shown below separately for residential and commercial respondents in Table 2-10 and Table 2-11.

[14] Lists purchased through Hoover's and other vendors.

Table 2-10: Residential Discrete Choice Study Completes by IOU

IOU	Survey Completes	% OF TOTAL
PG&E	133	42.0%
SCE	134	42.3%
SDG&E	50	15.8%
TOTAL	**317**	**100.00%**

Note. Overall, 177 residential discrete choice study respondents (56%) indicated their gas provider was SoCalGas.

Table 2-11: Commercial Discrete Choice Study Responses by IOU

IOU	Responses	% OF RESPONDENTS (n=337)
PG&E	151	44.8%
SCE	167	49.6%
SDG&E	68	20.2%
Other	1	0.3%
TOTAL	**387** [a]	**100%**

Note. Commercial respondents with multiple properties could indicate their properties were situated in different IOU service territories. Overall, 233 commercial discrete choice respondents (69%) indicated that SoCalGas provided gas for at least one of their business locations.

3. RESIDENTIAL AND COMMERCIAL CUSTOMER PROFILES

3.1 Overview

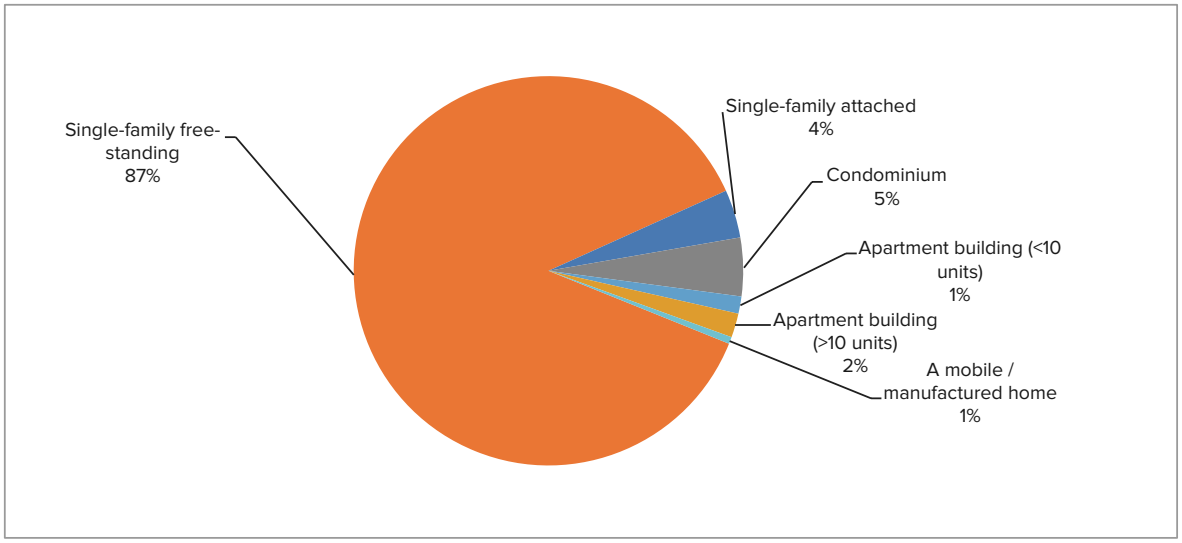
To more thoroughly characterize residential customers' preferences and strategies for purchasing HVAC installation services, EMI Consulting conducted two related surveys with this population: (1) a telephone survey (residential *n*=350, commercial *n*=250) and (2) a web-based discrete choice survey (residential *n*=317, commercial *n*=337).

In the first part of this chapter we present demographic information and HVAC equipment information for residential survey respondents. We then present firmographic information and HVAC equipment information for the commercial survey respondents.

3.2 Residential Respondent Demographics

A total of 350 residential respondents completed the telephone survey. Figure 3-1 shows that a majority (87%) of residential respondents reported making decisions for a single-family freestanding home.[15] An additional 9% reported making these decisions for a single-family attached home or condominium.

Figure 3-1: Type of Residence

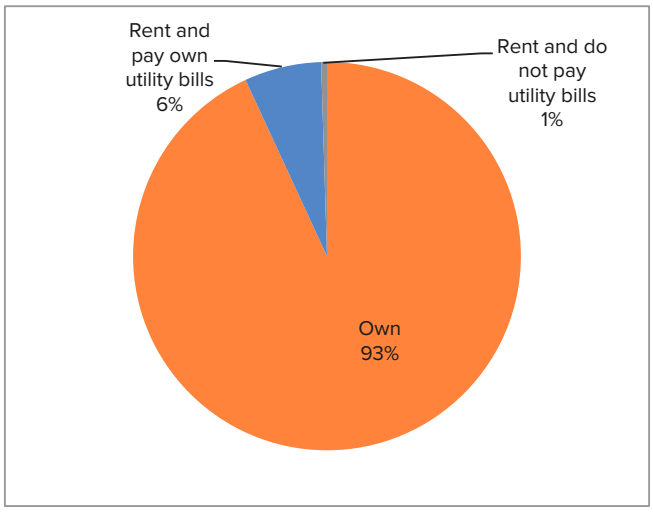


(n=350)

[15] The US Census estimated the percentage of home types in 2009 to be: single-family detached (58.0%), single-family detached (7.1%), buildings with 2-9 units (14.3%), buildings with 10 or more units (17.0%), mobile homes (3.9%), and other (0.1%). Available at: https://www.census.gov/compendia/statab/cats/construction_housing/housing_units_and_characteristics.html

An overwhelming majority (93%) of residential respondents reported that they own their home and are responsible for paying the utility bills (Figure 3-2). Of the roughly 7% of respondents who reported renting their home, most (92%) reported that they pay their own utility bills. Overall, less than 1% of the entire respondent pool indicated that they were not responsible for paying their utility bill because it was included as part of their lease.

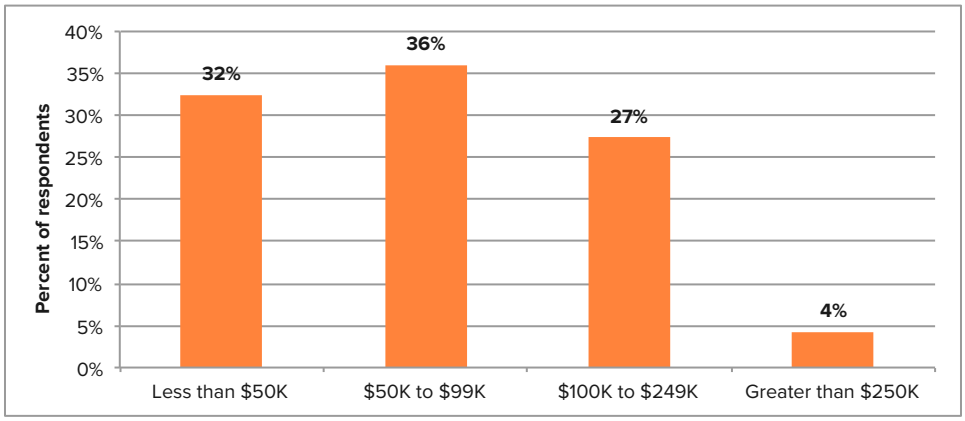
Figure 3-2: Ownership and Bill-paying Responsibilities



(n=350)

Figure 3-3 shows that respondents reported household incomes that are generally in line with the California population as a whole,[16] with respondents most commonly reporting a value in the range of $50,000 to $99,000 per year. Less than 5% of respondents indicated an annual household income greater than $250,000; about one-third indicated less than $50,000.

Figure 3-3: Household Income Distribution



(n=311)

[16] The median income for California homes reported by the U.S. Census Bureau for 2008-2012 was $61,400. Source: http://quickfacts.census.gov/qfd/states/06000.html

A majority of residential respondents who were electric customers of SCE and SDG&E reported that their gas utility provider was Southern California Gas (approximately 88% and 77%, respectively); this same value for PG&E electric customers was much lower (approximately 23%, not shown in figure).[17]

Demographics of Residential Discrete Choice Study Respondents

Table 3-1 provides a summary of demographic data for residential respondents in the discrete choice study, including respondents recruited from the telephone survey and respondents recruited through email lists and panels.

Table 3-1: Demographic Data for Residential Discrete Choice Study Respondents [a]

Respondent's electric utility provider		**Source**	
- SCE:	42.3%	- Telephone survey:	30.9%
- PG&E:	42.0%	- Panel:	65.6%
- SDG&E:	15.8%	- Email:	3.5%
Number of heating/cooling units		**Household income**	
- 1 unit:	65.6%	- Less than $50K:	19.2%
- 2 units:	24.0%	- $50K-$99K	36.3%
- 3 units:	6.6%	- $100K-$249K:	36.0%
- 4+ units:	3.8%	- $250K+:	3.8%
Periodic maintenance performed?		- Refused/not sure:	4.7%
- yes:	59.9%	**Home type**	
- no:	35.6%	- single-family freestanding:	82.0%
- not sure:	4.5%	- single-family attached:	8.8%
Is maintenance covered under contract?[b]		- condominium/apt/other:	9.2%
- yes:	45.1% (of those who do maint.)	**Home ownership**	
- no:	52.7% (of those who do maint.)	- yes:	97.5%
- not sure:	2.2% (of those who do maint.)	- no:	2.2%
Installed new HVAC equipment in home?		- other:	0.3%
- yes:	55.2%	**Participated in IOU-sponsored program for HVAC equipment in last 3 years?**	
- no:	42.3%	- yes:	38.8%
- not sure:	2.5%	- no:	58.0%
		- not sure:	3.2%

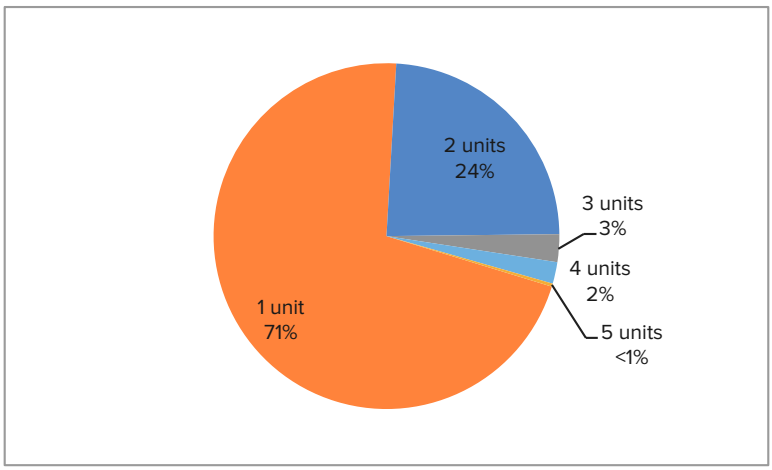
a. There were 317 respondents included in the overall sample.
b. A total of 184 respondents answered this question.

[17] This information was tracked because SoCalGas did not provide customer data for this study.

Residential HVAC Equipment Profile

In this section we provide a brief description of the residential survey respondents' existing HVAC equipment. Figure 3-4 reveals that nearly three-quarters of respondents (71%) indicated they have a single "heating/cooling" unit while just under a quarter (24%) indicated they have two units.[18] The mean number of units across all respondents was 1.4 units (SD=0.66). Respondents reported that the vast majority of these units are used for both heating and cooling (88%, not shown in figure).

Figure 3-4: Number of Heating/Cooling Units Per Household



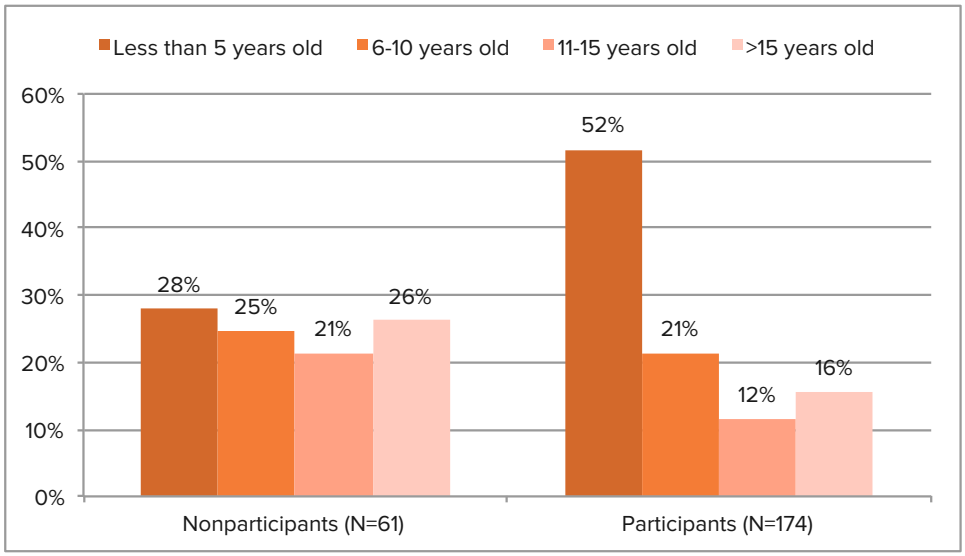
(n=347)

Figure 3-5 shows the reported age distribution for both program participants' and nonparticipants' HVAC equipment.[19] There appears to be a substantial number of older HVAC units in the installed base of the residential market that can likely be replaced, reflecting substantial opportunity for programs to affect energy and demand savings. Nearly half (47%) of the nonparticipant customers reported the average age of their HVAC equipment was 11 years or older; over one-quarter (26%) 15 years or older. Just over half (52%) of program participants indicated the average age of their equipment was less than five years old, over one-quarter (28%) indicated their equipment 11 years or older. These values fall within published estimates for the useful lifespan of residential HVAC equipment.[20]

47% of program nonparticipants indicated the average age of their HVAC equipment to be 11 years or older.

[18] Because focus group findings suggested that residential customers do not always understand the term "HVAC," throughout the survey we referred to HVAC equipment as "heating/cooling units" or "heating/cooling equipment."
[19] Program participants are defined as respondents who participated in either a QI or QM program within the last three years.
[20] Estimates of effective useful lifespans for HVAC equipment very greatly, but these values generally fall within the range of published values in "Study of the Life Expectancy of Home Components" by the National Association of Home Builders and Bank of America (2007). Available from www.nahb.org.

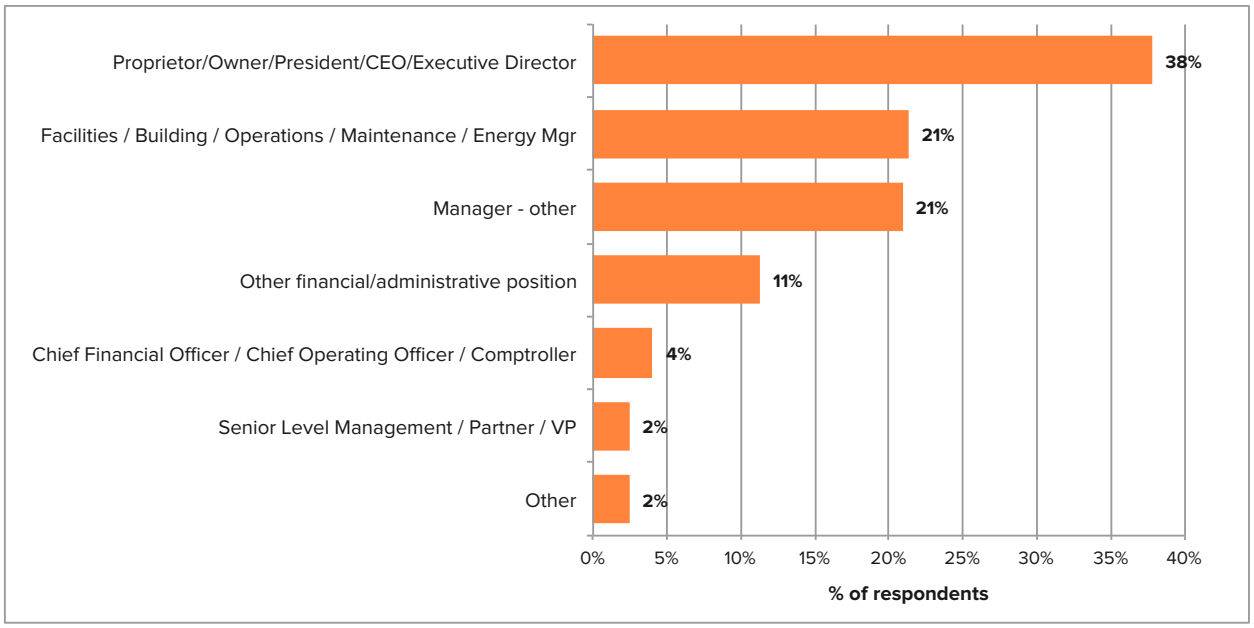
Figure 3-5: Average Age of Residential HVAC Equipment



3.3 Commercial Respondent Firmographics

In the telephone survey, we screened commercial respondents to ensure the people we spoke with were responsible for decision-making regarding HVAC for their organization, as well as to ensure they were responsible for making these decisions for facilities located within the state of California. Survey respondents represented a wide range of roles and positions (Figure 3-6), though most were some type of owner, executive, president, or CEO (38% of respondents) followed by a facilities management or operations-related position (21%) or some other type of manager (21%).

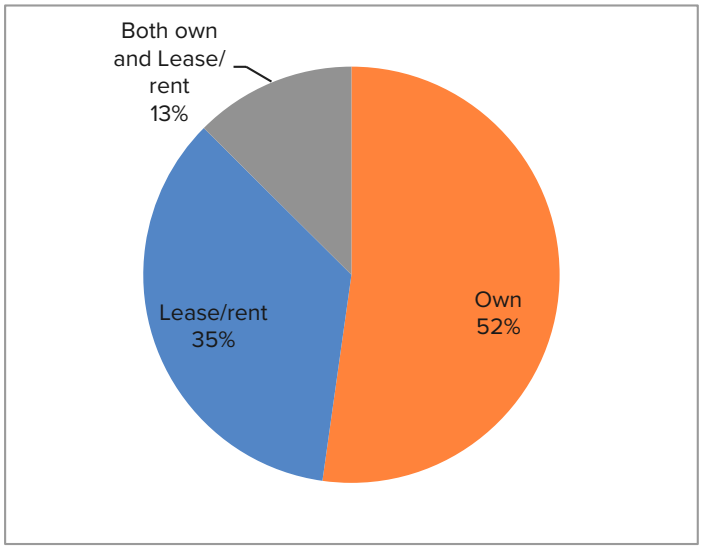
Figure 3-6: Role or Position of Respondents



(n=249)

About half (52%) of commercial respondents owned their facilities, while just over one-third (35%) indicated they either leased or rented. Additionally, 13% indicated that they both owned and leased some of their facilities.

Figure 3-7: Facility Ownership



(n=249)

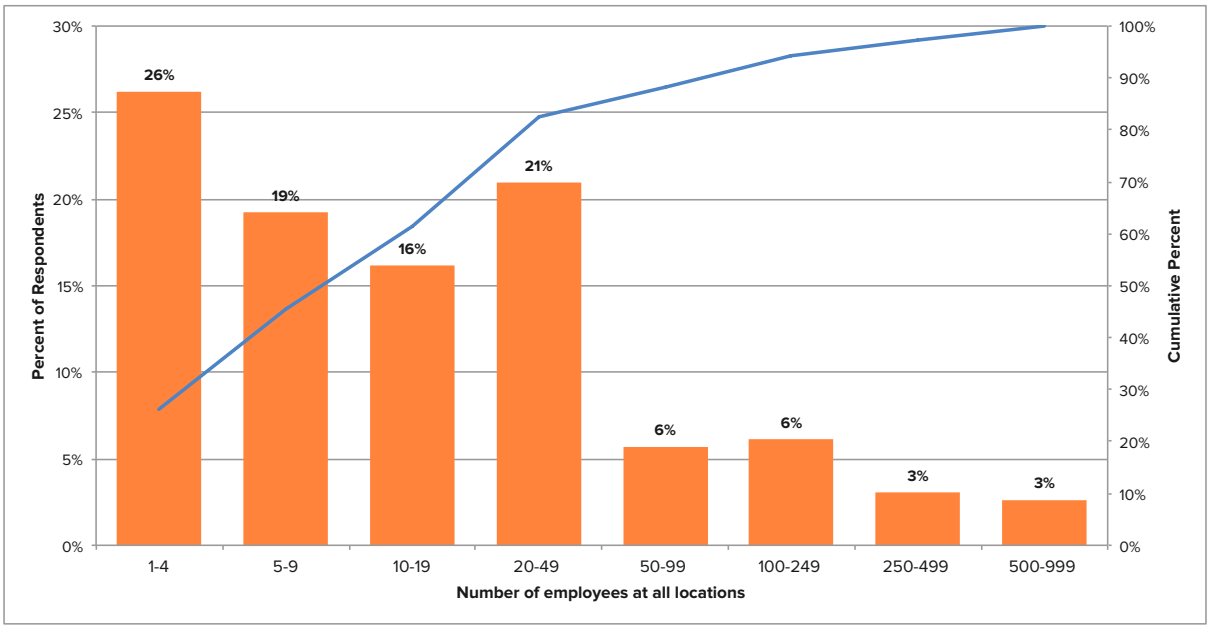
Of the respondents who rented or leased their facilities, almost all of them (97%) indicated that they were responsible for paying their own utility bills, while only 3% indicated this payment was included in their lease (this value is likely higher than in the overall population since these respondents were screened for a decision-making responsibility).

Commercial respondents came from a wide range of company sizes (as measured by the number of employees employed by the entire organization) though a majority of respondents (82%) had 49 employees or fewer (Figure 3-8).[21] On average, respondents were responsible for making decisions for the installation or maintenance of HVAC equipment at 11.3 locations in the state of California. However, over half of respondents (53.6%) were only responsible for a single location.

Over half of commercial survey respondents were only responsible for HVAC equipment at a single business location.

[21] The statistic that 82% of respondents indicated a firm size of 49 people or less is in general agreement with data from US Census Statistics of U.S. Businesses (SUSB) – Business Dynamic Statistics, which showed that in 2011 approximately 94% of private-sector firms in California had 49 or fewer employees.

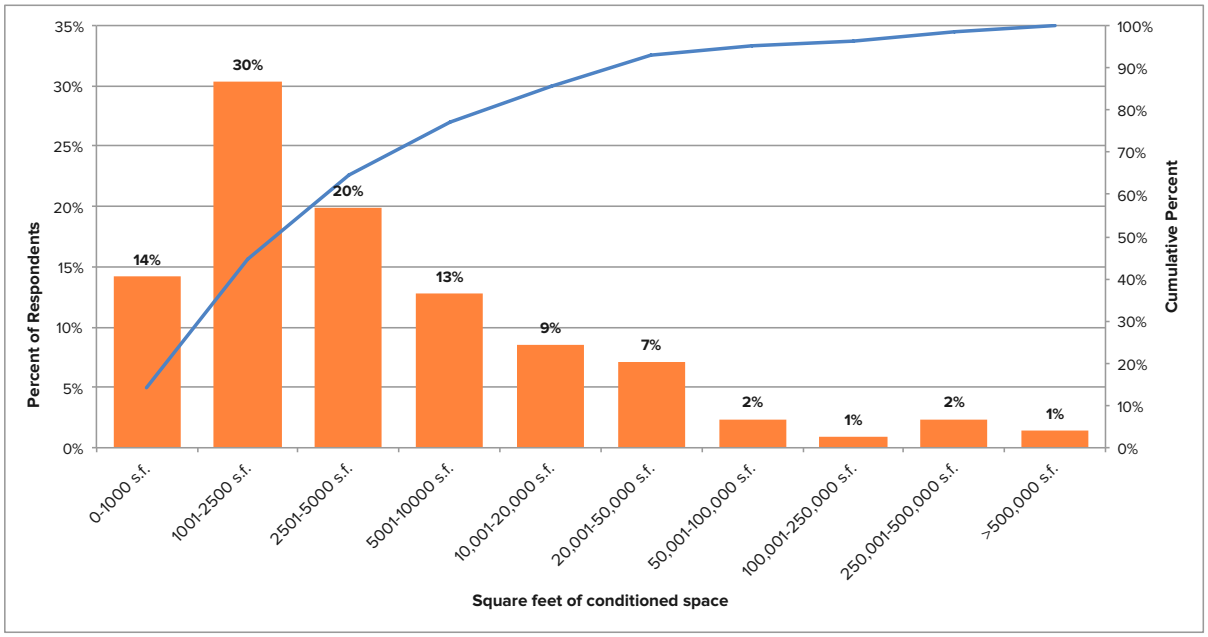
Figure 3-8: Number of Employees at All Locations



(n=229)

Almost two-thirds (64%) of commercial respondents' facilities had less than 5,000 square feet of conditioned space. Nearly a third (30%) indicated their facility had between 1,000 and 2,500 square feet of conditioned space. Figure 3-9 depicts this distribution. Note that for respondents who were responsible for more than one location, we asked them to estimate the square footage in a *typical* facility.

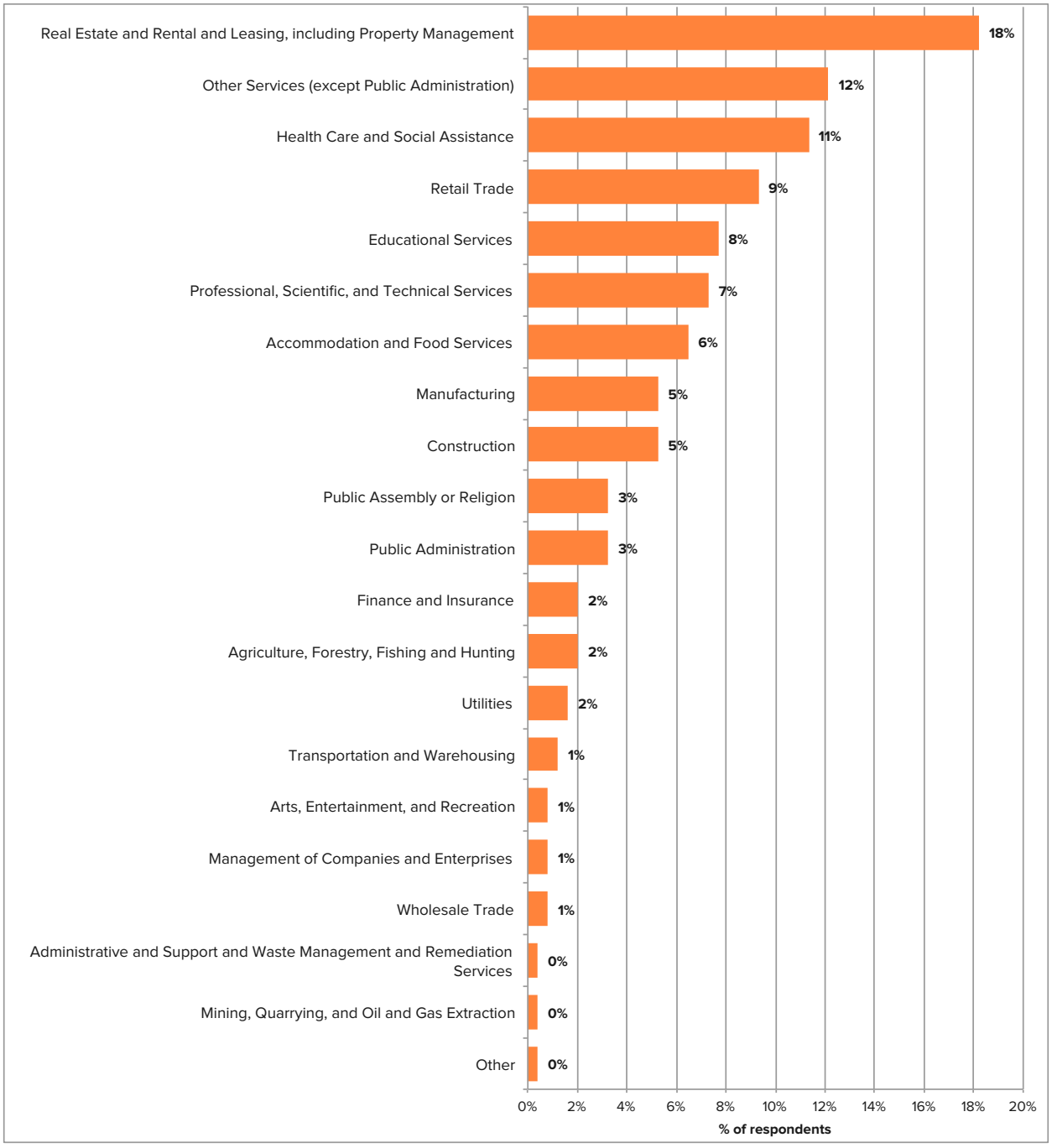
Figure 3-9: Number of Square Feet of Conditioned Space at Typical Facility



(n=211)

Commercial respondents represented a number of different industries, with “real estate rental” and “leasing, including property management,” emerging as the most popular industry category (18% of respondents, shown in Figure 3-10).

Figure 3-10: Industry Classification



(n=247)

Differences Between Firm Types

To account for any possible difference between commercial customers who are responsible for different size facilities, the research team developed a composite proxy variable based on two dimensions of respondents' responsibilities: (1) the number of locations for which a customer was responsible for making HVAC decisions, and (2) the number of HVAC units for which a customer was responsible for making HVAC decisions.[22] Upon examination of the data, the research team determined that there were three basic classes to which customers should be assigned using this composite proxy variable. The first group of customers was responsible for only a single location and had relatively few (using the median value of three or fewer) HVAC units. The second group of customers was also responsible for a single location, but had responsibility for a comparatively greater number of units (more than three units). The third class of customers was responsible for multiple locations, with any number of units. Table 3-2 shows the breakdown of commercial respondents into one of these three Classes using the composite proxy variable.

Table 3-2. Class Assignment of Commercial Respondents Using Composite Class Size Variable

Composite Size Class	Description	n	Percent of total (n = 248)
1	Single location, <=3 units	96	39%
2	Single location, >3 units	37	15%
3	More than one location	115	46%

Note. One decision-maker indicated he was not sure about the number of units for which he was responsible and was not included in this analysis.

After assigning commercial respondents to one of the classes based on the number of locations and the number of units for which they were responsible, the research team looked at any potential firmographic differences between the classes. We found several meaningful and statistically significant differences between the groups, which are detailed in Table 3-3.

- Class 2 customers were the most likely (70%) to own their facilities while Class 1 customers were the least likely (41%); Class 3 customers fell in between the other two classes (55%).
- This same trend was true for the percentage of each class performing regular maintenance on their HVAC equipment (89% of Class 2 customers vs. 78% of Class 3 customers vs. 63% of Class 1 customers).

We then looked at any potential industry classification differences between classes. The only statistically significant difference between classes in terms of industry classification was the higher percentage of Class 2 and Class 3 customers who indicated they belonged to the "Real

[22] We note here that the unit of analysis for this study was the *customer* (or the *decision-maker*) and not the *facility*. We determined that the most effective way to include a size consideration in our analyses was to break out customers by the size and number of facilities for which they are responsible, and to point out where differences existed between these groups. Accordingly we devised a classification system that divides respondents into different classes based on two dimensions: (1) the number of facilities for which they are responsible, and (2) the number of units for which they are responsible (the number of units was closely correlated to the square footage of respondents' individual facilities). This composite classification was based on the notion that a customer making decisions for ten HVAC units at ten *different* locations might be fundamentally different than a customer making decisions for ten HVAC units all contained at *one* location. Thus we felt a weighting scheme based only by size or only by number of units may in fact overlook some of the nuances between these types of customers.

Estate and Rental and Leasing, including Property Management" industry classification, with Class 3 customers the most likely to choose this category (31%).

Table 3-3. Characteristics of the Three Composite Size Classes

Characteristic	Class 1 (n = 96)	Class 2 (n = 37)	Class 3 (n = 115)
	1 location; <=3 units	*1 location; >3 units*	*>1 location*
Percent who own their facility	41%	70% [a]	55%
Percent who have regular preventative maintenance performed	63%	89% [b]	78% [b]
Percent in "Real Estate and Rental and Leasing, including Property Management" industry	3%	16% [c]	31% [c]

[a] Class 2 members were significantly more likely than Class 1 members to own their facility using a two proportions z-test, $p < .05$.
[b] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report having regular preventative maintenance performed on their HVAC equipment using a two proportions z-test, $p < .05$.
[c] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report membership in the industry "Real Estate and Rental and Leasing, including Property Management" using a two proportions z-test, $p < .05$.

In general, throughout the analysis of the survey data, we highlight statistically significant differences between the composite size classes.

Firmographics of Commercial Discrete Choice Study Respondents

Table 3-4 provides a summary of firmographic data for commercial respondents in the discrete choice study, including both participants recruited from the telephone survey and participants recruited through SSI.

Table 3-4: Firmographic Data for Commercial Discrete Choice Study Respondents

Organization's electric utility provider(s)		**Source**	
- SCE:	44.8%	- Telephone survey:	22.8%
- PG&E:	49.6%	- Panel:	71.5%
- SDG&E:	20.2%	- Email:	5.6%
Number of heating/cooling units		**Total number of employees at organization**	
- 1-5 units:	69.0%	- median:	40 employees
- 6-10 units:	11.6%	- mean:	1,010 employees (SD=10,484)
- 11-25 units:	8.3%	**Square feet of conditioned space at typ. facility**	
- 26-100 units:	6.3%	- median:	2,200 s.f.
- >100 units:	4.8%	- mean:	27,115 s.f. (SD=133,584)
New HVAC equipment installed?		**Own or lease facilities?**	
- yes:	71.8%	- own:	54.9%
- no:	26.7%	- lease/rent:	31.1%
- not sure:	1.2%	- both/other:	14.0%
Periodic preventative maintenance performed?		**Participated in IOU-sponsored program for HVAC equipment in last 3 years?**	
- yes:	84.0%	- yes:	43.9%
- no:	14.2%	- no:	54.3%
- not sure:	1.8%	- not sure:	1.8%

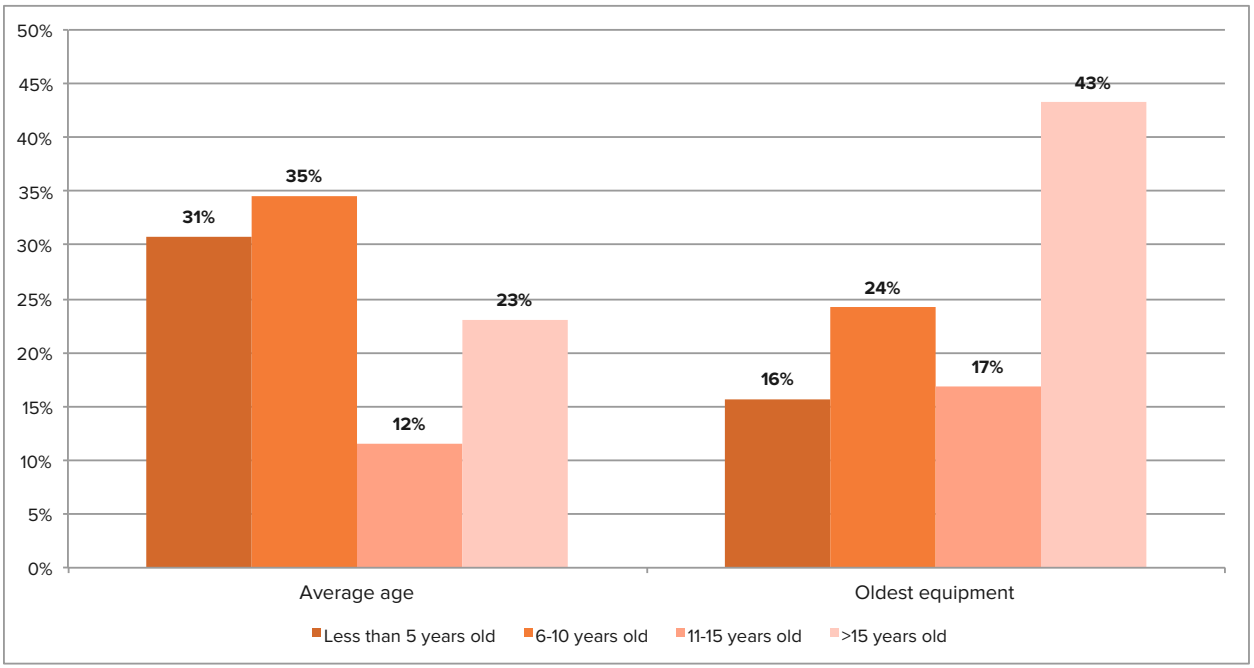
(n=337)

Commercial HVAC Equipment Profile

There was a significant range in the number of heating/cooling units for which commercial respondents were responsible, with a handful of respondents indicating they were responsible for several hundred units (mean=36.1 units, SD=104.9). However, 50% of respondents were responsible for fewer than four units (the median value). Respondents reported that most of these units (80%) were used for both heating and cooling (not shown in figure).

There was also a great range of equipment ages, with 23% of respondents reporting the *average age* of their HVAC equipment to be greater than 15 years and 43% of respondents reporting the *age of their oldest HVAC equipment* to be greater than 15 years.

Figure 3-11: Average Age of Commercial HVAC Equipment and Age of Oldest HVAC Equipment



(n=230)

4. RESIDENTIAL INSTALLATION DECISION-MAKING

This chapter presents the results of three related yet distinct phases of research designed to characterize the decision-making process of residential customers when purchasing HVAC equipment:

- A focus group session conducted with QI program participants
- A telephone survey conducted with both program participants and nonparticipants
- A web-based discrete choice survey conducted with residential customers

The chapter concludes with a synthesis of these results and presents several recommendations to drive greater customer receptiveness to QI offerings in the market.

4.1 QI Participant Focus Group Results

The focus group with residential QI/QM participants was used to form a high-level understanding of the decision-making processes customers use for the installation and maintenance of HVAC equipment, and to help inform the design of the subsequent telephone and web surveys. The focus group findings are summarized below according to the five steps of the decision-making model (as summarized in the Introduction of this report).

Step 1: Problem/Need Recognition

> "We bought a house that was about five years old in 2002, and by 2012 the AC actually sounded worn out."

The participants in the focus group had varied motivations for purchasing their HVAC systems; however, most participants described replacing their systems for *elective* reasons while only three replaced their systems because they were completely non-functional.[23] Interestingly, all focus group participants indicated a *lack of urgency* in pursuing their purchases. Interestingly, none of the participants described their purchase as time sensitive, even in cases where the system stopped working. In fact, two participants experienced system failure and both explained that they were just "toughing it out" until their discomfort outweighed the challenge of purchasing a new system. One possible explanation for this lack of urgency is that many of the focus group participants were either replacing working systems or adding a system that did not previously exist. In the general population telephone survey described in the next section, the research team looked to determine if this lack of urgency is typical to residential customers, or a distinct feature of QI/QM participants' behavior.

When asked about identifying the need to replace or install a new HVAC system, most participants used *sensory language* to describe their experience deciding that their systems were not functioning properly. For example, one participant described his family's system as

[23] All focus group participants had participated in a QI program within the past three years, thus they had all installed new HVAC equipment during that time period.

"sound[ing] worn out," while another participant said system replacement was motivated by her husband, who "didn't like the looks of it … too big and bulky, and he figured it wasn't energy efficient."

Step 2: Information Search

Once the residential customers participating in the focus group session recognized that they needed to purchase a new HVAC system, they reported utilizing a variety of sources to help make decisions regarding their selection of the contractor and the system. However, in many cases it was clear customers relied on mainly the contractor's expertise.

A typical information search included a preliminary research step, which included the selection of a contractor. During this step, customers mentioned the SCE website as a valuable reference source, along with other trusted third-party sources such as Angie's List and Costco. The preliminary research was followed by the actual selection of the size and brand of the HVAC system. Customers relied heavily on recommendations from contractors for the system selection, and about half of the participants reported receiving quotes from multiple contractors.

> "I did research to understand more when I first tried to select a system so I knew what to select. I looked into it and it was very difficult to understand all of the intricacies of it."

Given that many of the residential participants reported being only slightly familiar with the operating principles of their HVAC systems, there appeared to be a fair amount of reliance on the contractor to guide them through the decision-making process. During the focus group sessions, the moderator asked customers about the types of educational or marketing material that may have helped facilitate this process. The recommendation from the group was a simple handout that detailed what to look for and what to expect during the process of obtaining a quote for a quality installation.

Steps 3 & 4: Evaluation of Alternatives and Purchase Decision

> "The reason why I decided to do it at the time was because the contractor that came to my house to give a quote told me he was Edison's installer of the year a year ago, so that gave me some confidence that he could do quality work… To me that was very appealing, because now I have a third party, Edison, who would verify the work for someone like me who doesn't know much about the system or the technical lingo. That gave me peace of mind, so that's why at the time I chose to have it installed."

Focus group participants described the process of evaluating contractors and HVAC systems as driven by their own research including various marketing materials they were able to find. For the most motivated participants, they described an extensive research effort. As one participant explained, he "went through three weeks of super-comparing." Another participant stated they went so far as to look up HVAC manuals in order to better understand what differentiated quality systems and contractors. Meanwhile, the less involved participants described their evaluation of alternatives as limited and driven more by *opportunities* than by extensive research. Some examples described by customers include receiving recommendations from a neighbor, an advertising brochure, or by coming across an HVAC display in Costco.

Regardless of the level of involvement in evaluating alternatives, most participants stated that the perceived level of contractor *thoroughness* and *trustworthiness* drove their ultimate purchase decision. Several respondents mentioned this was determined by personal interaction with the contractor, or by watching them take measurements or notes when bidding the job. The majority of participants were also motivated by the ability of the HVAC system to increase their comfort level. Interestingly, only a few participants mentioned "cost" as the primary motivation for their purchase decision. Even the most motivated customers admitted that they were overwhelmed by the technical complexity of HVAC systems, thus the *appearance* of competence was extremely important to these customers' decisions (one customer described feeling assured of his contractor's competence after watching him conduct a blower test).

> "Hearing [the contractor] explain the [energy efficiency rating] to me, I felt he was looking out for us instead of his own pocket."

Step 5: Post-Purchase Evaluation

Participants described the post-purchase evaluation process much like they did the problem/need recognition and purchase processes: intuitive and based primarily on sensory experience. Because of the widespread lack of knowledge about HVAC equipment among the participants, their intuitive experience of the installation was the best guide for whether or not they received a high quality installation. Several participants described a decrease in the cost of their post-installation energy bills as a mark of the installation's quality. Notably, one of these participants said, "the bill didn't drop as much as I would have thought it would… but what I noticed is the consistency." Despite energy savings not meeting his expectations, this participant was satisfied with his installation because of the consistently comfortable temperature in his home. One participant described being able to feel the difference in airflow between her old and new systems, as well as remarking that when she saw how dirty the ducts in her old system had become she "was surprised it was still working."

> "My installers could have just knocked out the hole and put the receivers, but they patched them up with stucco and they even painted. They tried to match the paint. At the end of the day the air conditioning works great, and at the end of the month the air conditioning was way cheaper."

Similar to the "evaluation of alternatives" phase of the decision-making process where customers described evaluating the quality of contractors by their *perceived* trustworthiness, in the "post-purchase evaluation" stage, customers again relied on *heuristics* to assess the quality of their installation. Focus group participants described how they would assess an installation by the amount of time that the contractor spent doing it and by how the new system looked. While none of the participants were familiar with the term "Quality Installation," a number of participants described being able to "tell" a job was done well by the way the new system looked or performed. Several participants mentioned watching their contractors do the installation, and while they did not technically know what was going on they assumed that if the system looked better and the contractor appeared to be taking time and working hard that the system was well installed.

> "I think to the common people it's probably just the common English language 'quality installation.' It would be a good job. It's not the technical details of it and what it really means."

4.2 Survey Results

To thoroughly characterize residential customers' preferences and strategies for purchasing HVAC installation services, EMI Consulting conducted two related surveys: (1) a telephone survey (n=350) and (2) a web-based discrete choice survey (n=317). Here we present the telephone and discrete choice survey results for residential installation decision-making in the following sections:

- Installation Decision-Making Steps: In this section we use telephone survey data to characterize each stage of the five-step decision-making model discussed previously in this report.
- Receptivity to QI and Perceived Benefits: In this section we present information on customer receptivity to QI value propositions.
- Key Education Needs: Here we discuss topics that residential respondents would find most useful, as well as their preferred formats for receiving this information.
- Estimating Customer Preferences for QI: In this section we present results of the discrete choice survey for residential installation decisions.

Installation Decision-Making Steps

In this section, we describe each step of the five-step decision-making process as it pertains to residential HVAC installation decisions.

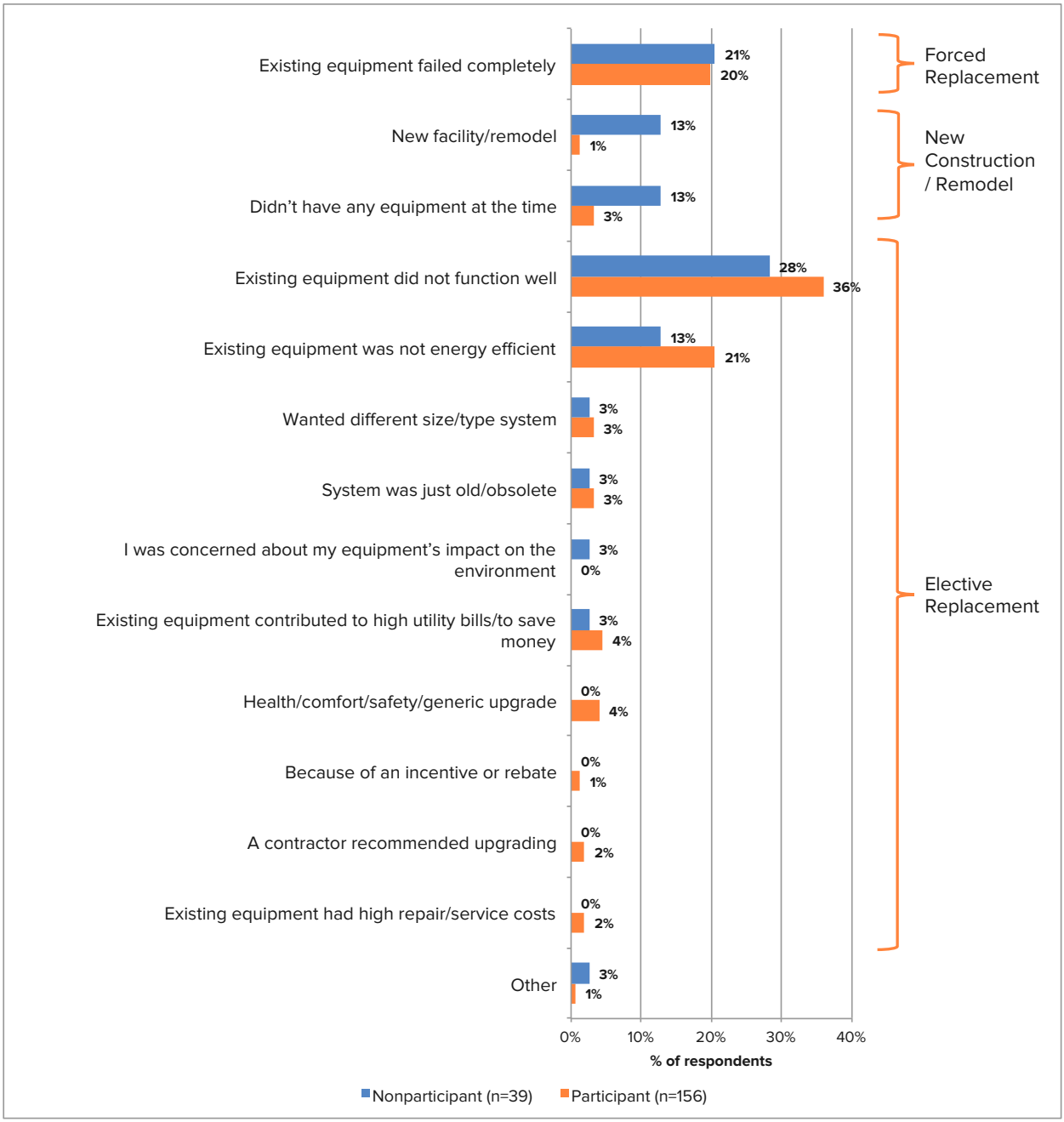
Step 1: Problem/Need Recognition

In the problem/need recognition stage, customers reported purchasing new HVAC equipment because their HVAC system had failed completely or was not operating as desired. Just over half of all respondents (56%) indicated they had installed new HVAC equipment in their home. Figure 3-8 shows that 21% nonparticipants and 20% participants indicated they had replaced their existing equipment because it *failed completely* (a finding that is also supported from the focus group with QI participants). Interestingly, just over one-quarter (26%) of program non-participants said they had new equipment installed because of a "new construction/remodel" (13%) or because they "did not have any existing equipment" (13%). In contrast, about 4% of program participants indicated they had new HVAC equipment installed for these same reasons (1% new facility/remodel; 3% no existing equipment).

Less than one-quarter of respondents who had installed new HVAC equipment did so because their existing equipment had failed completely.

Of the customers that reported having new equipment installed for elective reasons, the dominant motivations were because their existing equipment did not function well (28% nonparticipants, 36% participants) or was not energy efficient (13% nonparticipants, 21% participants.)

Figure 4-1: Primary Reason for Installing New HVAC Equipment among Residential Respondents



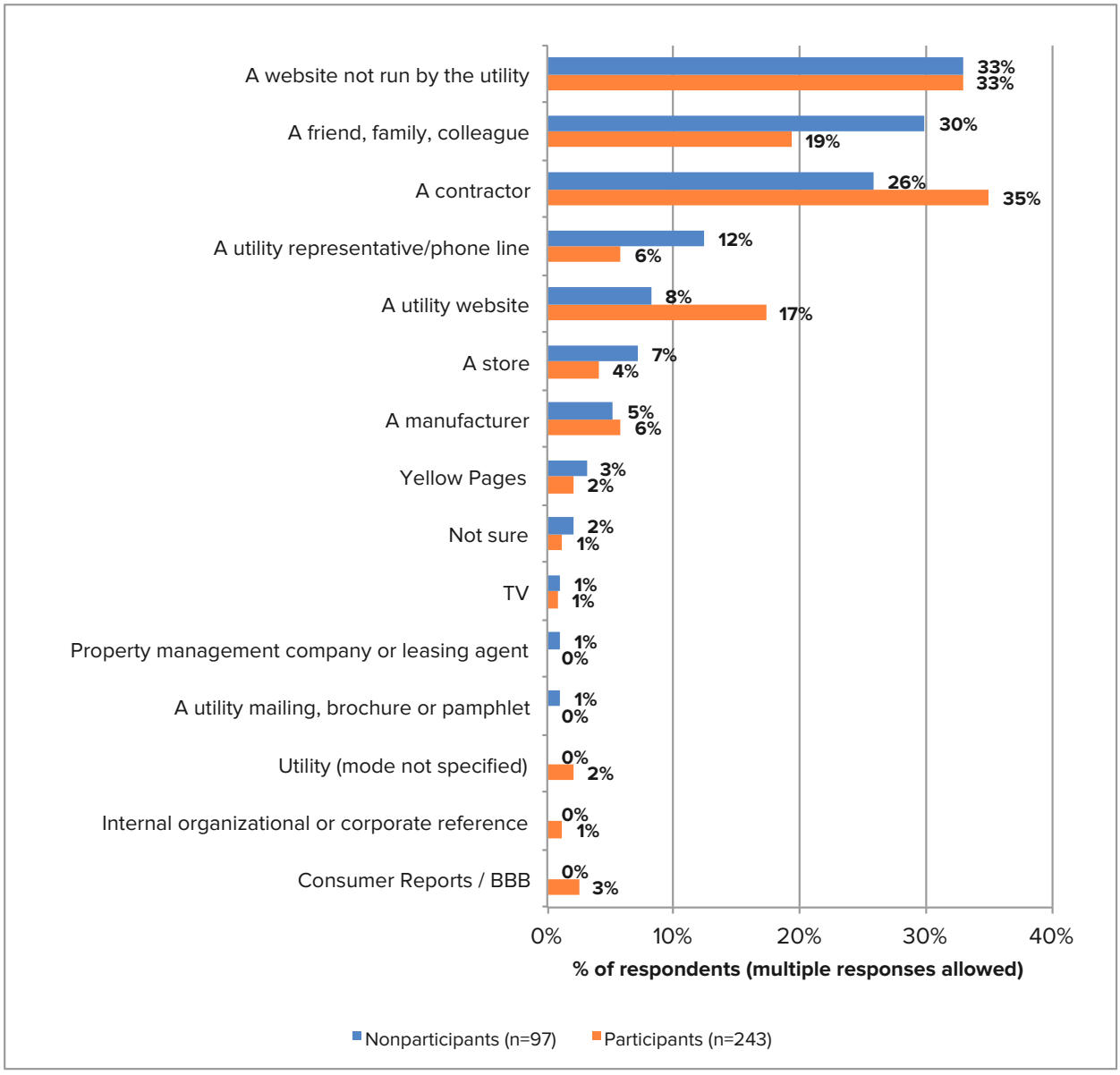
Step 2: Information Search

In the information search step, customers seek out information to help inform their purchasing decision. Figure 4-2 shows that responding customers indicated they would generally rely most heavily on two main sources of information: (1) contractors (32%), and (2) the Internet (33% non-utility websites; [24] 15% utility website). Statistically significant differences did exist between participants and nonparticipants in their answers to this question. The category "a utility website"

[24] Note that among the non-utility websites customers rely on, general Google searches dominated (80%).

was mentioned by 17% of program participants but only by 8% of nonparticipants (χ^2=4.517, df=1, p<0.05). Alternatively, nonparticipants were statistically more likely to mention the categories "friend family or colleague" (30% nonparticipants vs. 19% participants; χ^2=4.372, df=1, p=0.037) or "a utility representative or phone line" (12% nonparticipants vs. 6% participants; χ^2=4.255, df=1, p=0.039). These findings – as well as other findings presented throughout this report – may suggest a need for an expanded web presence where customers who perform a general Internet search are routed to utility websites where they may easily access information about QI programs.

Figure 4-2: Where Residential Customers Would Go to Get Information on New HVAC Installation



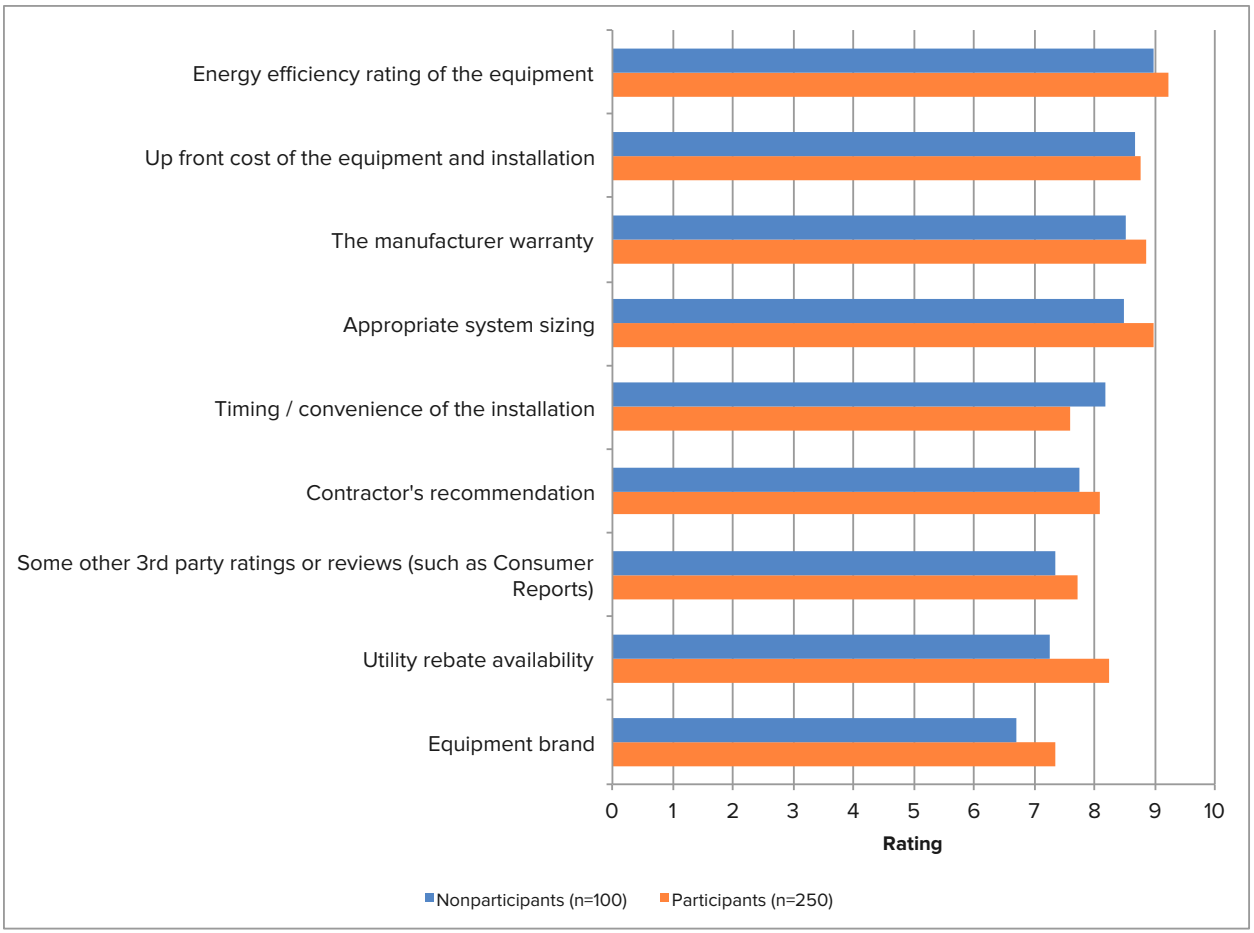
(n=340)

Steps 3 & 4: Evaluation of Alternatives and Purchase Decision

In the third and fourth steps of the decision-making process, customers evaluate the information they collected and then make a purchase decision. Several considerations inform the purchase decision, including aspects of the equipment; characteristics of the contractor they choose to do the work; and, the timing of the work.

In terms of different aspects of their equipment, respondents rated a wide range of factors as very important. Figure 4-3 shows that of the nine factors they were asked about, all were rated as a seven or higher on a zero to ten-point scale. It is interesting to note that "timing/convenience of the installation" was the only factor rated higher by nonparticipants (mean=8.2, SD=2.14) than participants (mean=7.6, SD=2.26), a difference determined to be statistically significant (t(248)=2.183, p=0.03). This may mean that QI messaging may need to allay concerns that it is less convenient than "typical installations."

Figure 4-3: Importance of Factors Related to HVAC Equipment for Residential Respondents

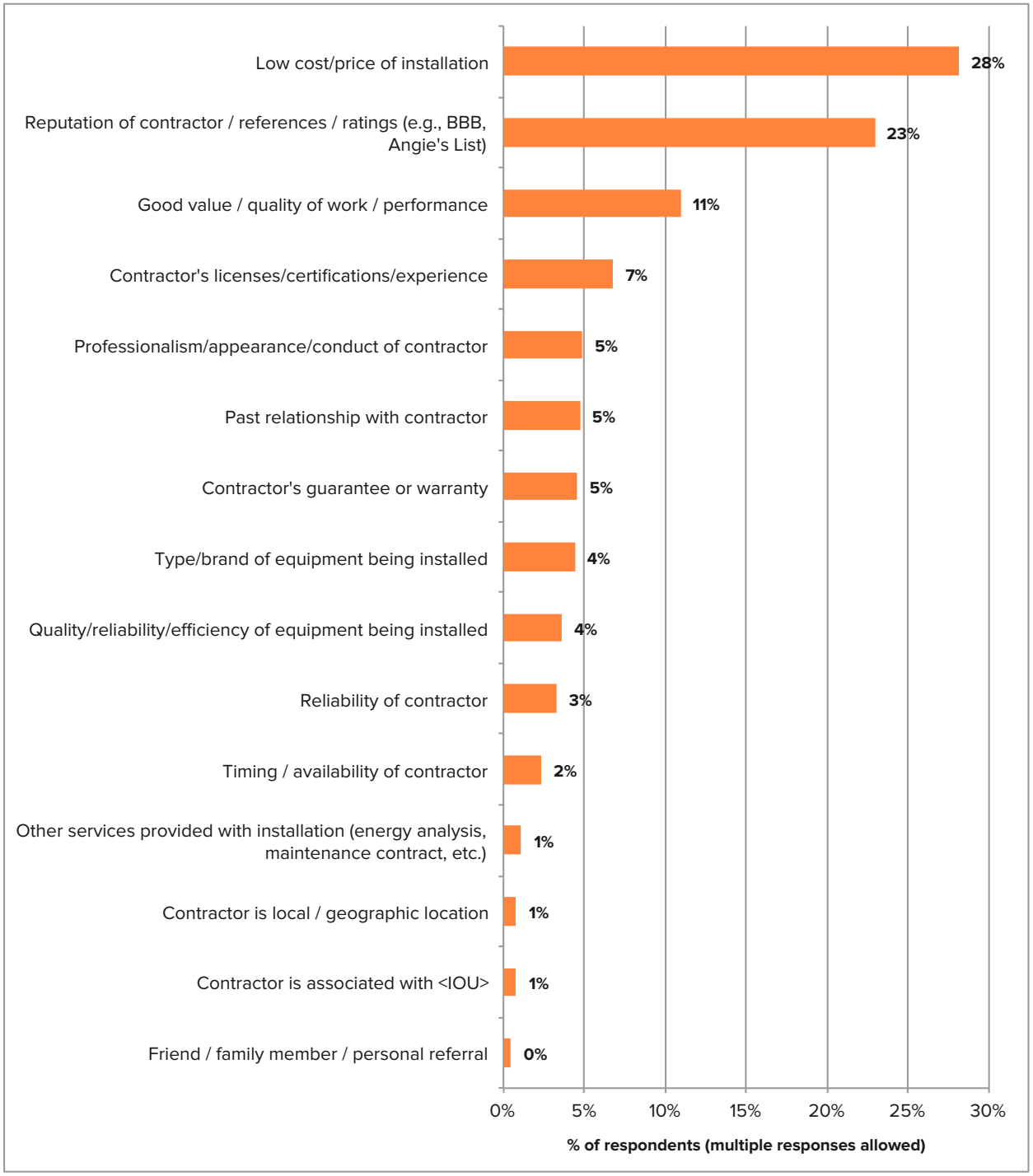


(n=350)

Another factor customers consider before committing to the purchase decision is the choice of a contractor to do the work. Results show that the California HVAC market is a competitive marketplace for contractors and that equipment/installation cost and reputation of the contractor are factors customers weigh most heavily in deciding on what contractor to hire. When asked to

name the most important aspects of the contractor selection process (Figure 4-4), one-quarter (28%) of respondents mentioned the cost of the equipment and installation was important, while just under one-quarter (23%) indicated the contractor's reputation was important. (This question was unprompted.)

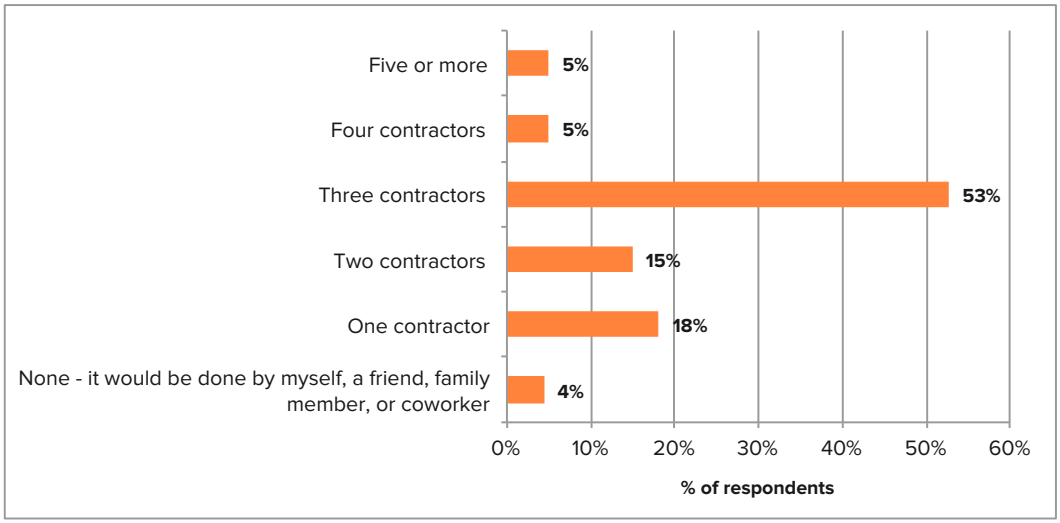
Figure 4-4: Factors Influencing Residential Respondents' Selection of an Installation Contractor



Note. This question was unprompted. (n=327)

Most respondents indicated they would consider multiple contractors for conducting installation work under normal circumstances. Figure 4-5 shows that when asked how many contractors they might consider before selecting one to do the work, roughly half of the respondents (53%) reported they would consider three contractors while 10% indicated they would consider more than three contractors.

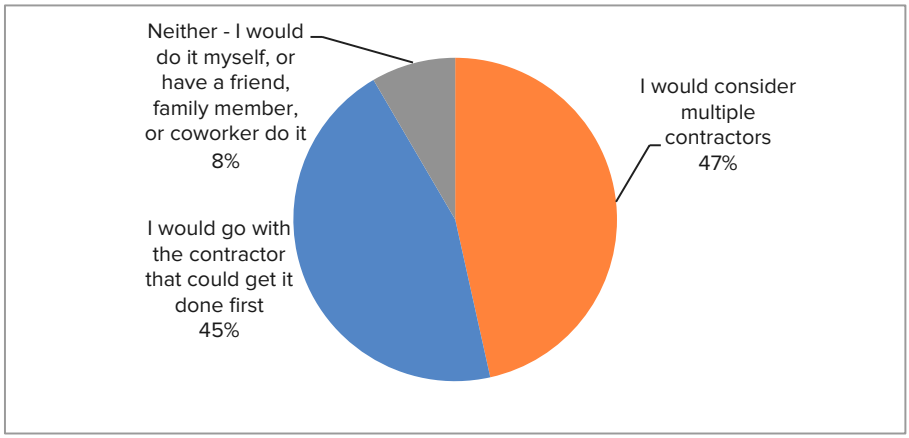
Figure 4-5: Number of Contractors Residential Respondents Would Consider for Installation Work



(n=342)

However, results differ when customers are faced with extreme weather conditions. Figure 4-6 shows that when asked whether they would consider multiple contractors should their equipment fail during the hottest time of the year, almost half (45%) indicated they would simply go with the contractor that could get the work done first. While this suggests that QI offerings may have a better chance of being selected in non-extreme conditions, it also suggests that the more contractors in the marketplace that are offering QI, the more of the market that can likely get captured.

Figure 4-6: Number of Contractors Residential Respondents Would Consider for Installation Work Under Extreme Weather Conditions



(n=273)

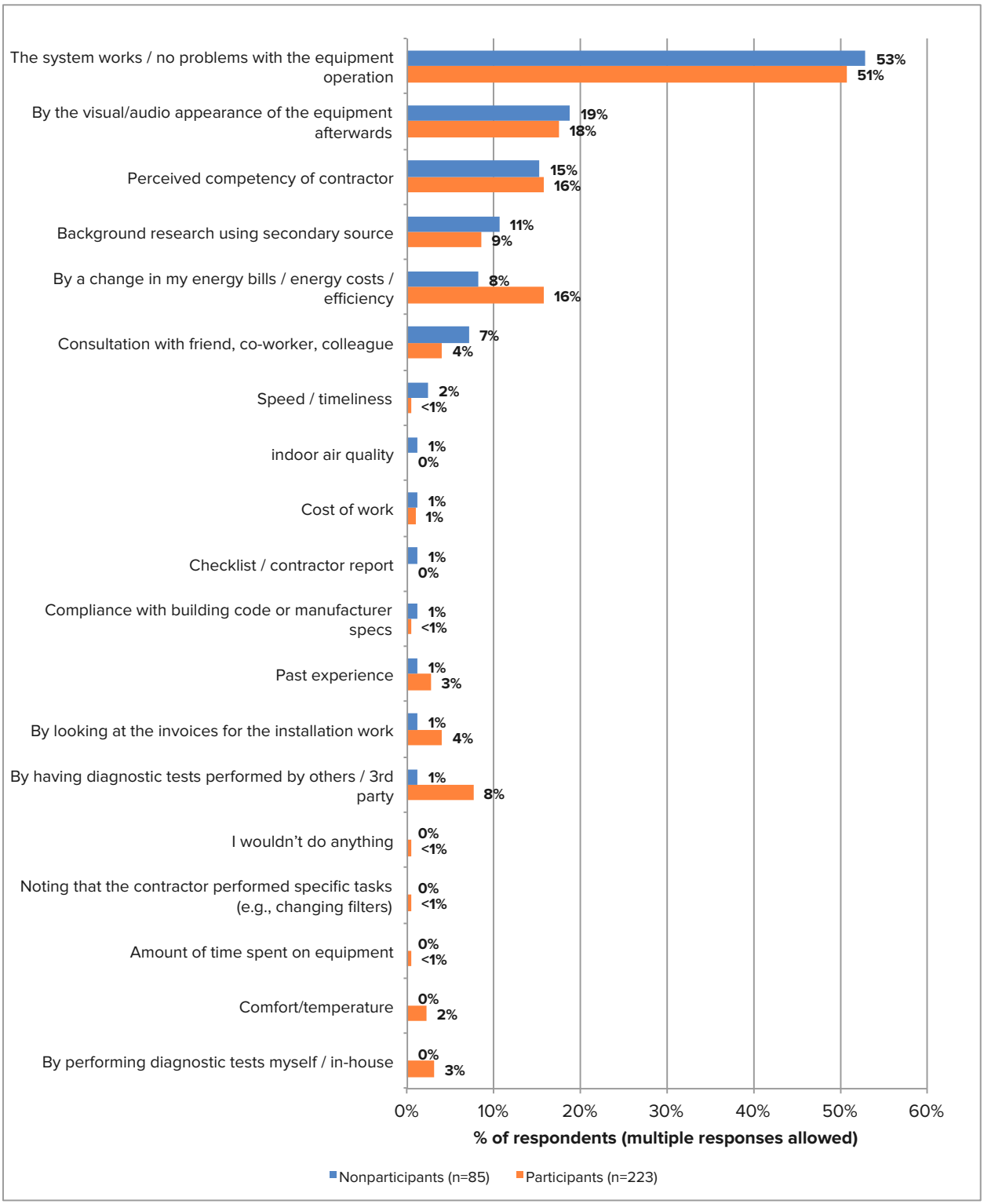
Step 5: Post-Purchase Evaluation

The final step of the decision-making process involves evaluating the purchase decision once it has been made. Consistent with the findings from the focus group, many residential customers appear to utilize relatively simplistic, non-technical methods to evaluate the quality of their HVAC equipment installation. Figure 4-7 shows that over half of respondents (51% of participants and 53% of nonparticipants) reported that they judge the quality of installation simply by whether or not they experience any problems with the equipment. Additionally, nearly one- fifth of respondents (19% of nonparticipants and 18% of participants) reported that they judge the quality of installation by the way it *looks* or *sounds* (again closely paralleling the findings from the residential focus group, in which sensory interaction was important). Similar proportions (15% of nonparticipants and 16% of participants) reported that the *perceived competency* of the contractor doing the work was important.

Almost a fifth of residential consumers judge the quality of installation by the way it *looks* or *sounds*.

Minor though statistically significant differences did exist between participants and nonparticipants in their reported evaluation techniques, with participants reporting a higher incidence of having diagnostic tests performed by a third party (χ^2=4.648, df=1, p=0.03). However it is difficult to know whether these differences existed *prior* to program participation or came about as a *result* of program participation. On one hand, the early adopters may reflect a group of customers that are generally more informed about energy efficiency and the technical aspects of their HVAC systems. On the other hand, information provided by the contractor, or other information customers may have gathered in relation to the program, might have made them more aware of these aspects of the installation. Although participants were also more likely than nonparticipants to mention a change in their energy bills, this difference was not significant (at alpha=.05).

Figure 4-7: Methods for Evaluating the Quality of an Installation among Residential Respondents



(n=308)

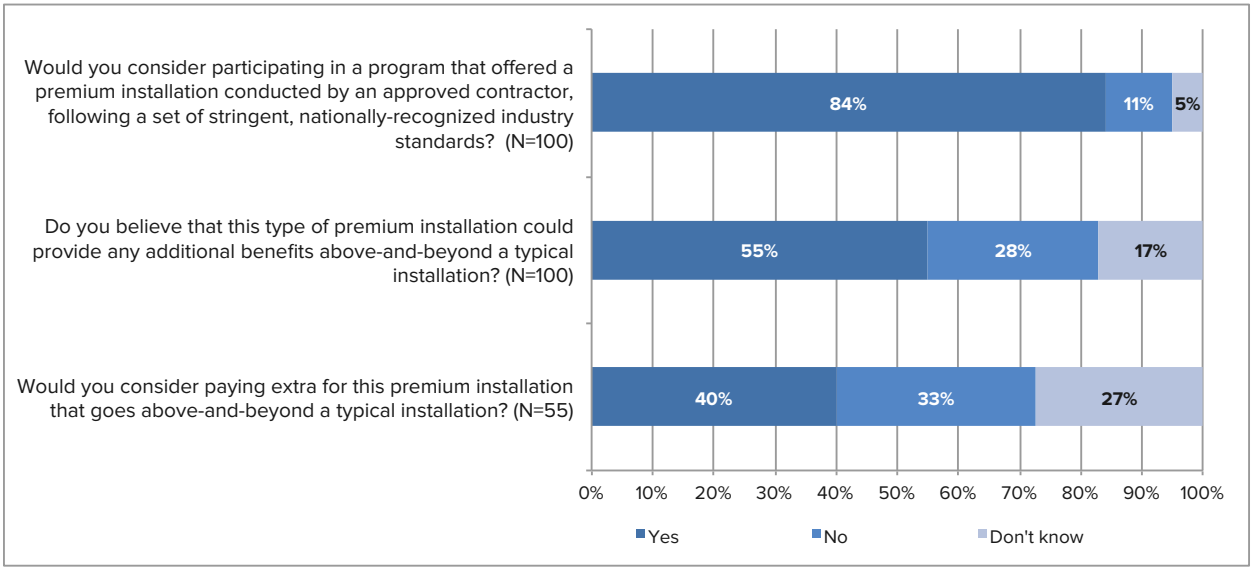
Receptivity to QI and Perceived Benefits

To better understand residential customers' receptivity to and perceptions about potential benefits of QI, we probed *nonparticipants* on their attitudes and beliefs related to standards-based installation. Results suggest that there is significant opportunity in the marketplace, as customers seem receptive to the notion of QI programs. How the programs are marketed and messaged (i.e., emphasizing the most effective and appropriate value propositions) can do much to bolster this potential.

Figure 4-8 shows that when nonparticipants were asked whether or not they would consider participating in a QI program, a clear majority (84%) replied "yes".[25] When asked if they thought this type of installation offered benefits above-and-beyond a typical installation, over half (55%) indicated they did. However, maybe more important is the finding that just under half (45%) indicated they did not think there would be any benefits (28%) or that they simply were not sure (17%).

Finally, when nonparticipants who believed there could be benefits to participation were asked whether or not they would be willing to *pay* for these benefits, 40% said they were willing to pay for such a program. It is important to note there was a substantial amount of uncertainty (i.e., 27% of respondents answered "don't know") in answers to these questions, suggesting that general understanding of the benefits of program participation is low.

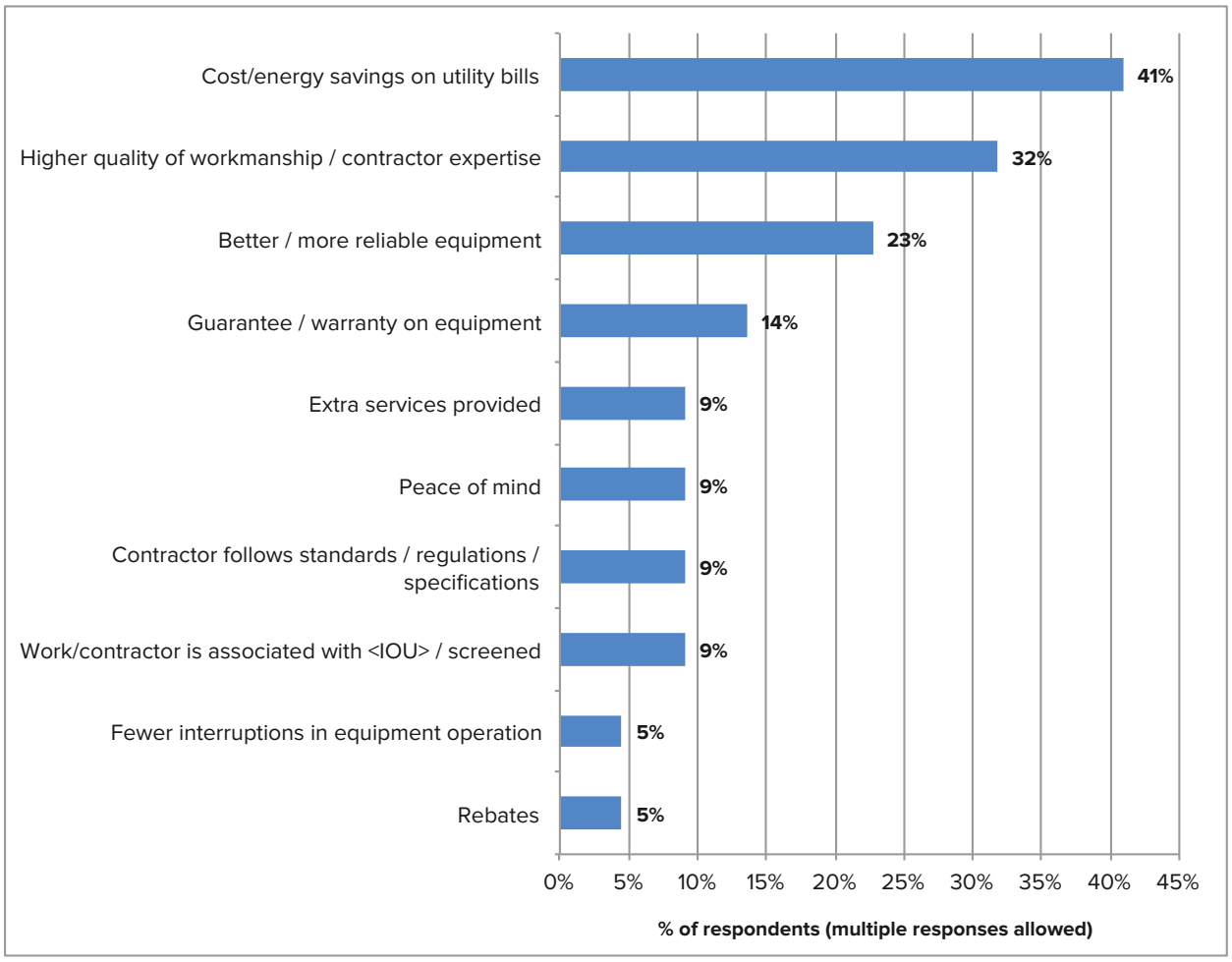
Figure 4-8: Receptivity to Quality Installation Programs among Residential Respondents



[25]Because customers are generally not familiar with the term or concept of "Quality Installation," in the survey this was presented as a program offering a premium installation conducted by approved contractor following a set of stringent, nationally-recognized standards.

To better understand customers' views of the value propositions for QI, we asked the nonparticipants who indicated they *would* be willing to pay extra for a premium installation *why* they might pay extra. Just over 40% of these respondents indicated they would like to see a reduction in their utility bills, while 32% indicated such a program may signify a higher quality of workmanship (Figure 4-9).

Figure 4-9: Perceived Benefits of Quality Installation among Residential Nonparticipants

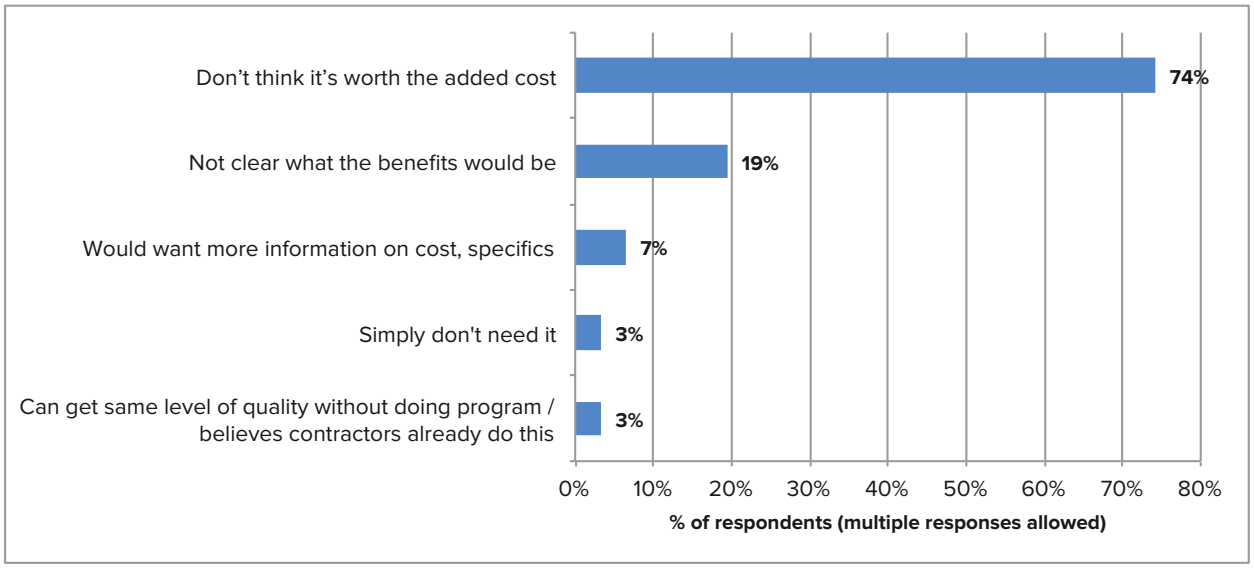


(n=22)

We also asked respondents who said they *were not* willing to pay for such a program *why* they would not. Here, respondents were mainly concerned with the costs versus benefits of participation. Almost three-quarters (74%) of these respondents reported they simply did not think it was worth the extra cost while an additional 19% indicated they were not sure what the benefits would be (Figure 4-10).

The cost-benefit proposition for QI is not clear to some residential consumers.

Figure 4-10: Residential Nonparticipants' Reasons for Not Paying Extra for QI



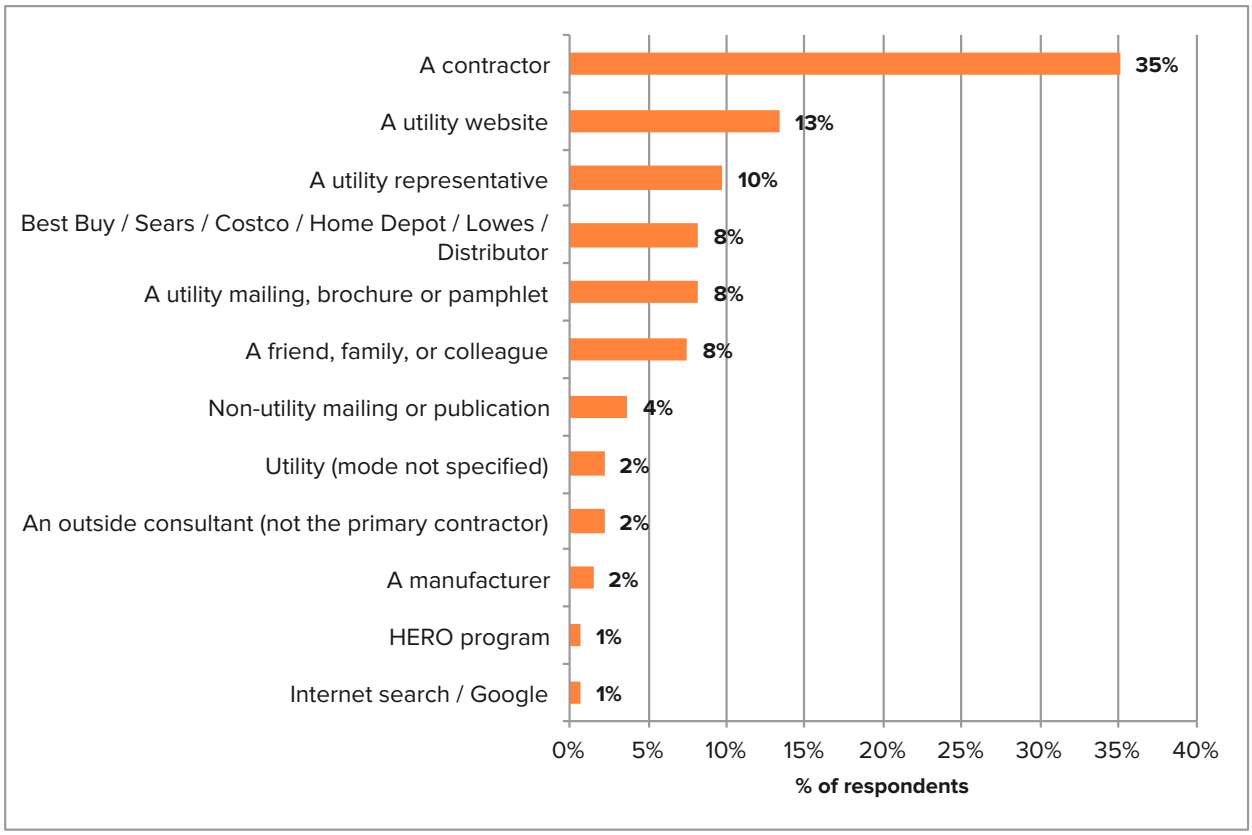
(n=31)

While the preceding results looked at nonparticipant perspectives towards QI, we also looked at aspects of the participant experience, namely where they heard about the program and their post-participation assessment of energy savings.

35% of participants heard about the program from a contractor; yet nearly that same proportion (33%) heard about it from a utility source (website, mailing, or representative, or other).

Figure 4-11 shows that 35% of participant respondents heard about the program from a contractor, 13% saw it on a utility website, 10% heard about it from a utility representative, and 8% learned about the program from a utility mailing. Overall, 33% of respondents had first heard about the program from a utility source. While these results reaffirm the critical importance of the contractor in conveying the QI proposition, it also affirms the importance of promoting these programs through IOU marketing channels.

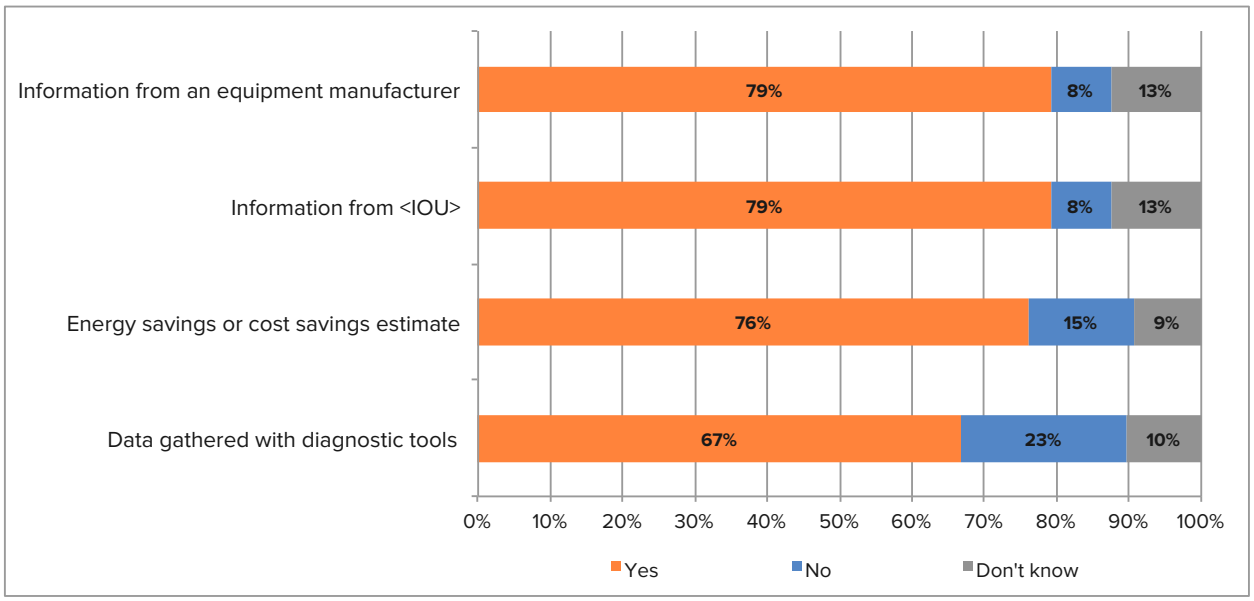
Figure 4-11: Where Residential Participants First Heard About QI Program



(n=125)

Figure 4-12 shows that when prompted about the types of information they received from their contractor, over three-quarters of program participants reported receiving manufacturer-related information (79%), information related to their respective IOU (79%), and/or information regarding expected cost or energy savings from this installation (76%). Additionally, roughly two-thirds of participants reported their contractor also provided them with diagnostic data on their HVAC system.

Figure 4-12: Type of Information Received by Residential Program Participants from Contractor

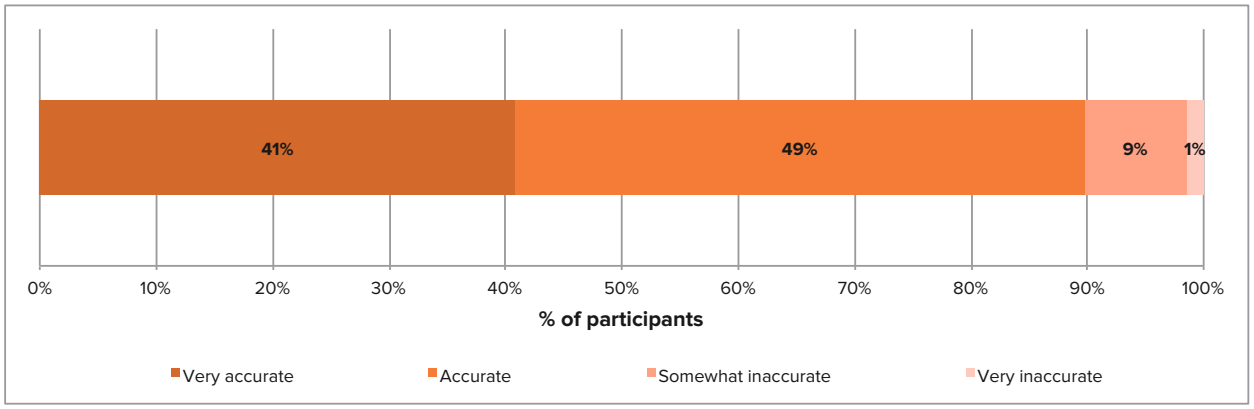


(n=96)

The ability to be able to provide customers with an estimate of savings resulting from the installation of new equipment is a valuable selling point for contractors. When asked to evaluate how accurate these estimates ultimately turned out to be (Figure 4-13), respondents overwhelmingly (90%) indicated that the estimates were accurate (41% "very accurate," 49% "accurate"). In addition to making energy savings a component of the marketing message, supporting contractors' ability to provide accurate energy/cost savings estimates to customers can also serve to help bolster customers understanding of the key value propositions of QI programs.

Seventy-six percent of program participants reported receiving an energy or cost savings estimate from their contractor.

Figure 4-13: How Accurate Were Energy/Cost Savings Estimates?

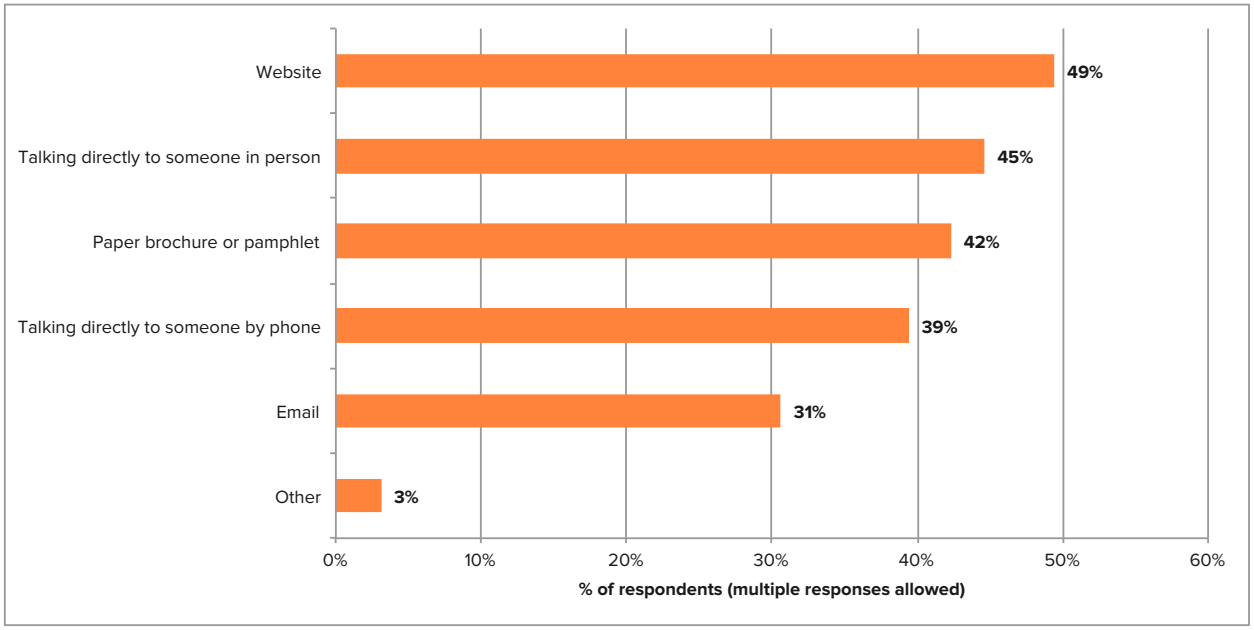


(n=68)

Key Educational Needs – Residential Customers

Figure 4-14 reveals that nearly half of residential survey respondents (49%) said they would be interested in receiving information about HVAC installation/maintenance in the form of a website; other favorable channels included talking directly to someone in person (45% of respondents) and a paper brochure or pamphlet (42% of respondents). Email was preferred by fewer respondents, though it was still mentioned by almost one-third (31%) of those surveyed.

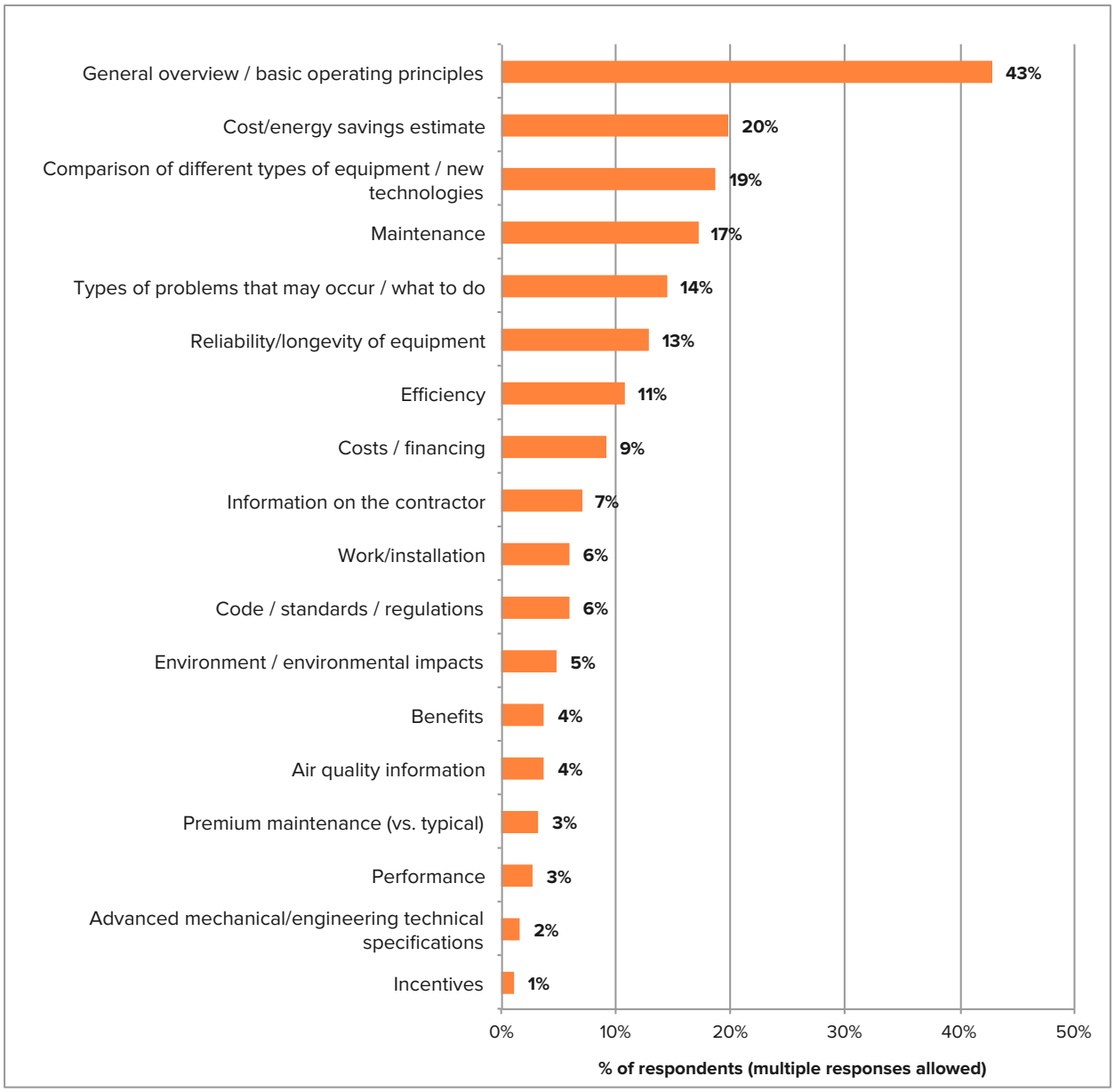
Figure 4-14: Information Formats Preferred by Residential Respondents



(n=350)

Fifty-five percent of residential survey respondents said they thought specific information on the installation and maintenance of heating/cooling equipment would be helpful to them. When asked about what topics they would be most interested in, most respondents (43%) indicated a general overview of HVAC equipment operation, while 20% mentioned cost/energy savings estimates and 19% mentioned being able to compare different units or technologies (Figure 4-15).

Figure 4-15: Information Topics Most Useful to Residential Respondents



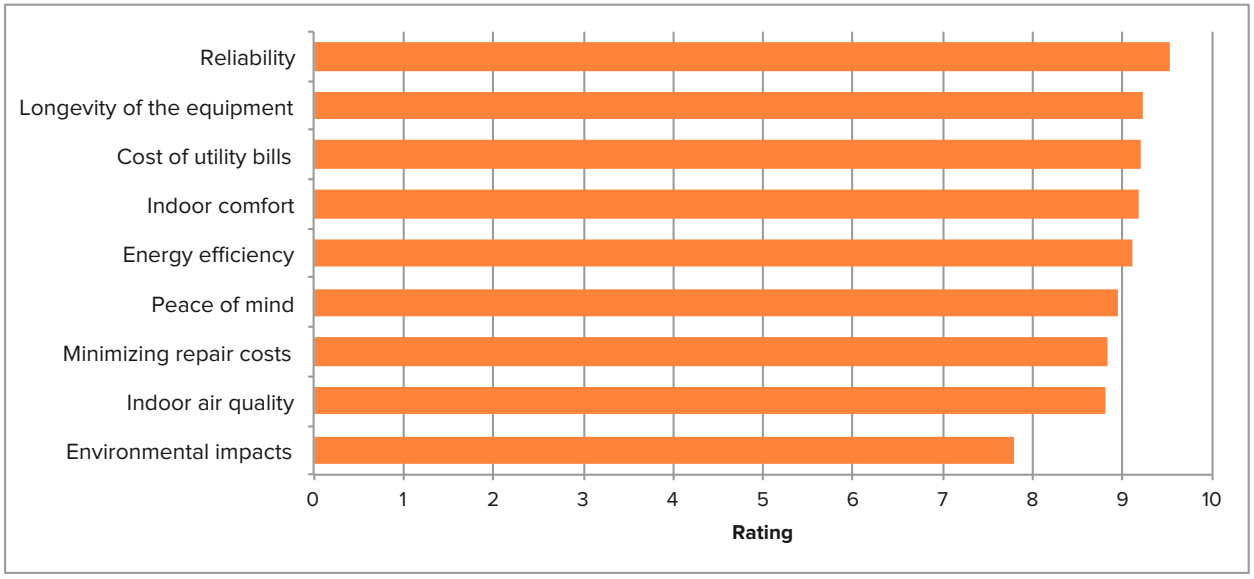
(n=187)

Estimating Customer Preferences for Quality Installation

In this section, we discuss the results of the web-based discrete choice study conducted with residential customers in regards to QI. As we discuss throughout this report, decision-making is a complex process that requires people to contemplate and weigh an array of factors before deciding on a final course of action. The more complicated the choices and the greater the number of factors playing a part in the decision, the more complex the decision making process becomes.

In the telephone survey, we used a traditional approach to assessing the variable effect that different factors might play in peoples' decisions. This approach consisted of asking survey respondents to rate or rank factors on a 0 to 10 scale, where 0="not at all important" and 10="very important". Figure 4-16 presents these results, showing that while reliability, longevity, cost of utility bills, indoor comfort, and energy efficiency were scored the highest, all of the factors were reported to be relatively important; environmental impacts were rated the lowest, with a mean score of 7.8.

Figure 4-16: Residential Telephone Survey Respondents' Ratings of Factors Related to HVAC Equipment



(n=350)

While the above results provide some insights into customers' preferences, as discussed in the Methods section, such an approach does not capture the full complexity (i.e., trade-offs) inherent in the decision-making process. As such, we also conducted a discrete choice study. Table 4-1 shows the attributes and levels that were used for the residential installation discrete choice study.

Table 4-1: Attributes and Levels Used in Installation Discrete Choice Study

ATTRIBUTES	LEVELS
System reliability	1 day downtime
	3 days downtime
	5 days downtime
System longevity	No different than typical install
	5 years longer than typical install
	10 years longer than typical install
Environmental impacts	No less impact than typical install
	15% less impact than typical install
	30% less impact than typical install
Monthly cost savings	No savings over typical install
	15% savings over typical install
	30% savings over typical install
Up-front installation cost	No more costly than typical install
	15% more costly than typical install
	30% more costly than typical install

From the discrete choice data, we were able to estimate a number of metrics that describe customer preferences for HVAC installation work that go beyond the simple telephone survey. The first metric we discuss is the importance scores associated with each of the attributes.[26] The sum of importance scores for all attributes sum to 100%. Thus, the *importance scores* represent a "decision weight," or each attribute's individual contribution to the overall decision (in this case, the decision to install an HVAC unit).

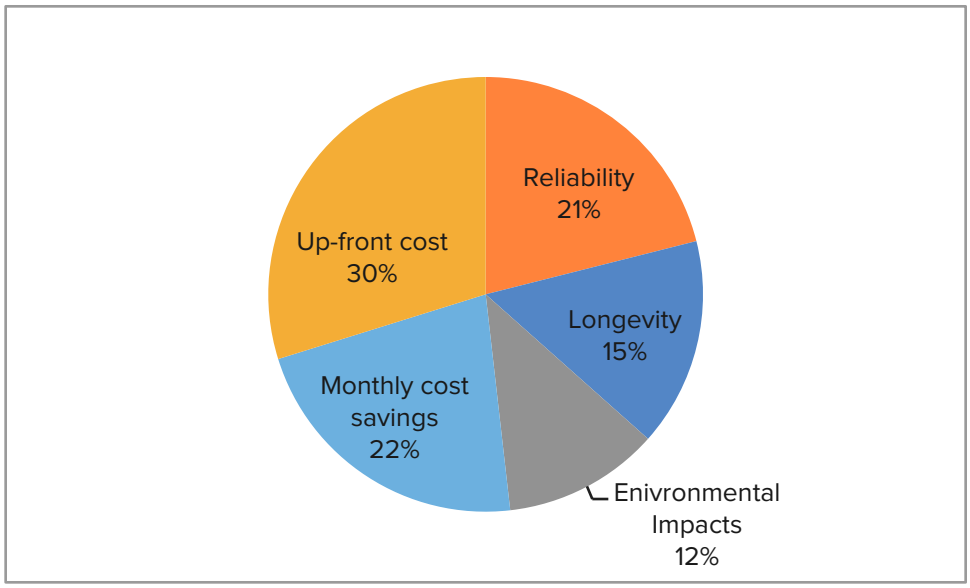
Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that

[26] These importance scores were computed from part-worth utilities derived using Sawtooth Software's Hierarchical Bayes (HB) functionality.

any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome.

Figure 4-17 shows that for residential customers, the most important factors were up-front cost (30% of the decision weight), followed by savings on monthly utility bills (22%) and then by reliability (21%); respondents assigned less value to system longevity (15%) and environmental impacts (12%). This may be interpreted to mean that the up-front cost of an installation has slightly more influence on the average customer's HVAC installation decision than do the impact on monthly utility bills or expected reliability of the equipment resulting from the installation; environmental impacts have the least influence of all the attributes tested.

Figure 4-17: Importance Scores for Residential Installation Discrete Choice Study

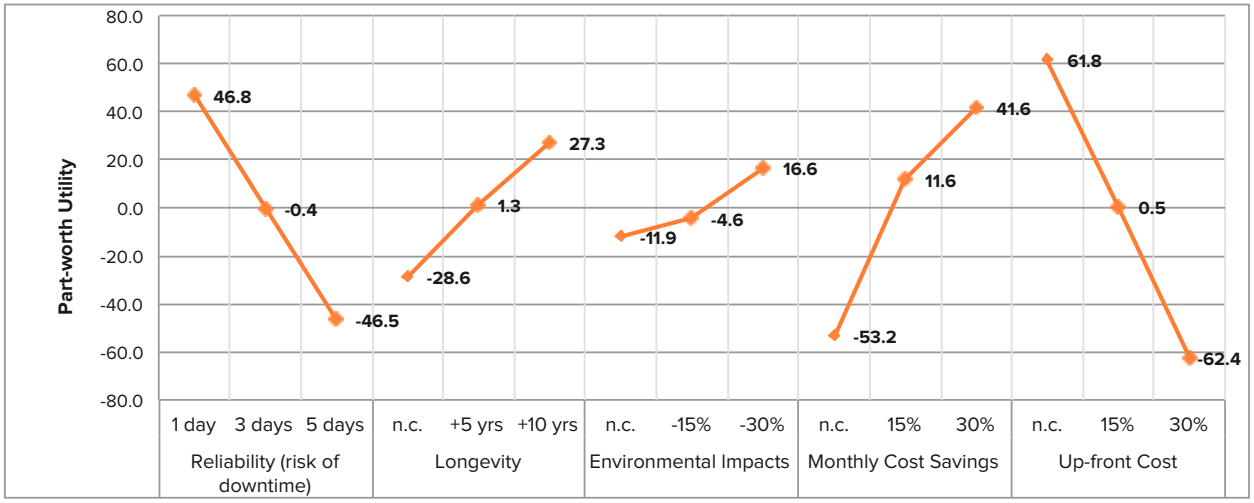


The importance scores can be further broken out into *preference scores* (referred to in discrete choice studies as "part-worth utilities") for each individual level of an attribute. Larger preference scores reflect a more "desirable" attribute level, as rated by the respondents. Figure 4-18 shows residential respondents' preferences for individual levels of the five attributes tested in the residential installation discrete choice analysis. Examination of these preference scores adds insights that go beyond those provided by simple review of the importance scores in Figure 4-17, by helping to clarify the sensitivity or elasticity of respondents' preferences across levels *within* an attribute.

For example, the attribute "reliability" exhibits a steady and notable decrease in preference score from left to right, as the risk of downtime increases from one day to five days. In contrast, for up-front cost, we also see a steady decline in preference score as the price increases, but the decline from level-to-level is greater than it is with reliability. With regards to longevity, preference scores increase as the longevity of the unit increases, and like with reliability and up-front cost, the increase is relatively consistent from level to level; however, the increase from level to level is substantially less then it is for either reliability or up-front cost. Thus, we can see that, of the attributes tested in the study, respondents are more sensitive to different levels of up-front cost than they are different levels of reliability, and they are more sensitive to both reliability and up-front cost than they are longevity.

Also from Figure 4-18 we see that the relationships between the levels of "monthly cost savings" and "environmental impacts" are slightly more complicated. Instead of relatively consistent differences between all levels for monthly cost savings, we see that respondent preference increases rapidly when moving from "no cost savings" to 15% savings but then is notably smaller when going from 15% savings to 30% savings. What this means is that while respondents obviously prefer a 30% monthly cost savings overall, there appears to be a slight diminishing return for monthly cost savings as we move above 15%. For the attribute "environmental impacts," this trend is reversed – there is a small increase in preference as we move from "no reduction" to a 15% reduction, but this increase is more pronounced as we move from 15% reduction to a 30% reduction. This suggests that while respondents were minimally responsive to a *minor* reduction in environmental impacts, they became more responsive to reductions greater than 15%.

Figure 4-18: Residential Respondents' Implicit Valuation of Individual Levels for Each Attribute



These results suggest that marketing strategies for residential QI programs might focus on emphasizing the reliability and monthly cost savings associated with QI programs (and to a lesser degree, longevity). However, the up-front cost of the installation will likely override any of the other attributes. Thus strategies might be aimed at helping minimize or reduce customer costs (e.g., added incentives), or else receptivity to residential QI programs may suffer regardless of the message. **It must be noted that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.**

4.3 Residential Installation Decision-Making: Synthesis

In this section, we first present a brief summary of the results discussed earlier in this chapter. We then provide synthesis of key themes and make several recommendations to drive greater customer receptiveness to residential QI offerings.

Summary and Key Points: Residential Installation Decision-making

Here we summarize key points from each decision step for HVAC installation:

Problem/Need Recognition

- Residential customers report they are primarily concerned with the reliability and longevity of their HVAC equipment, but results from the discrete choice survey suggest that the cost of utility bills is more important.
- Residential customers do not necessarily "run it until it breaks," with a sizeable percentage of customers reporting they had new equipment installed because their existing equipment had ceased to function well.

Information Search

- A substantial proportion of residential customers report relying on web sources to inform their information search on HVAC installations. Respondents reported relying more frequently on non-utility websites than on utility websites.
- Respondents are likely to consult Internet sources even when other sources may be consulted.
- Only a few respondents mentioned utility mailings, brochures and pamphlets as a source they would consult – yet a fair number of respondents had heard about the program through one of these sources.
- Few respondents indicated that manufacturers and retailers were sources they would consult.

Evaluation of Alternatives and Purchase Decision

- Residential respondents do rely on metrics such as energy efficiency ratings to help guide their selection of heating/cooling equipment. Sizing, cost, and manufacturer warranty also play an important role.
- Over 50% of residential respondents reported they would consider 3 contractors before selecting one to perform an installation; however, nearly 20% of respondents indicated they would only consider 1 contractor.
- The most important factors in actually choosing a contractor were the cost of the installation and the reputation of that contractor.

Post-Purchase Evaluation

- Over half of residential respondents reported not using sophisticated techniques to assess the quality of installation of HVAC equipment in their homes, relying instead on such simple metrics as "Am I having any problems with the equipment?" or "Does my unit sound OK?"

- This simplistic type of assessment makes it potentially more difficult to promote QI, since many customers appear unable to discern finer differences in the operation/efficiency of the equipment until an obvious problem materializes.
- A subset of respondents reported doing a more thorough evaluation of HVAC equipment installation, including monitoring their energy bills, having diagnostic tests performed, and performing background research. However, this appeared to be a minority of respondents.

Key Themes and Recommendations: Residential Installation Decision-making

Key themes from the residential telephone and discrete choice surveys expanded on earlier themes from the residential focus group, in many cases adding additional information on residential customer behavior regarding HVAC equipment:

Theme #1: **Many residential customers have a limited understanding of HVAC equipment and operating principles.** Customers generally appear overwhelmed by the technical complexity of HVAC systems, with respondents reporting they use simplistic, non-technical methods to select contractors and evaluate the quality of their installation.

Recommendation: Provide basic information about how HVAC units work and the importance of proper installation (and maintenance) procedures in an easy-to-understand "infographic" format.

Theme #2: **Residential customers are highly dependent on Internet sources and contractors when it comes to obtaining information about HVAC equipment.**

Recommendation: Utilize the Internet to provide better information regarding what QI is and *how it is different* from typical installations. An expanded Internet presence would be helpful in generating more interest and awareness for QI and the programs that support it. This may also be helpful in convincing customers that QI is something worth asking for – even if the contractor does not initially promote it to them.

Theme #3: **Residential customers are receptive to the idea of QI but could use more information on the benefits.** Most residential customers appear willing to participate in a program that offers premium installation services for their HVAC equipment, but many are unclear as to what the specific benefits might be.

Recommendation: Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits of QI. However, it is critical that the potential benefits must not be overstated. If this information cannot be provided in this form, efforts should instead be made to provide concrete examples of success through case studies of real projects.

Theme #4: **Residential customers are sensitive to the up-front cost of HVAC installations. However, emphasizing monthly utility bill savings and system reliability improvements would likely resonate with customers.** Discrete choice results suggest that customers are most sensitive to changes in their monthly utility bills and reliability.[27]

Recommendation: Branding efforts may benefit by focusing on cost savings for utility bill costs and reliability improvements resulting from QI (assuming that QI provides these benefits). Promoting the provision of easy-to-understand cost savings estimates of premium installation to customers could help strengthen the value proposition. Because customers are highly price sensitive to the cost of installation, the benefits of participation need to be translated into monthly cost savings. Additionally, there is evidence that this method could be effective – among program participants who received cost savings estimates, a majority indicated this estimate was either accurate or very accurate.

[27] As discussed in the Methods section of this report, if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.

5. RESIDENTIAL MAINTENANCE DECISION-MAKING

This chapter presents the results of two related phases of research aimed at better characterizing the decision-making process used by residential customers when purchasing HVAC maintenance services:

- A telephone survey conducted with both program participants and nonparticipants
- A web-based discrete choice survey conducted with residential customers

The chapter concludes with a synthesis of these results and presents several recommendations to drive greater customer receptiveness to QM offerings in the market.

5.1 Survey Results

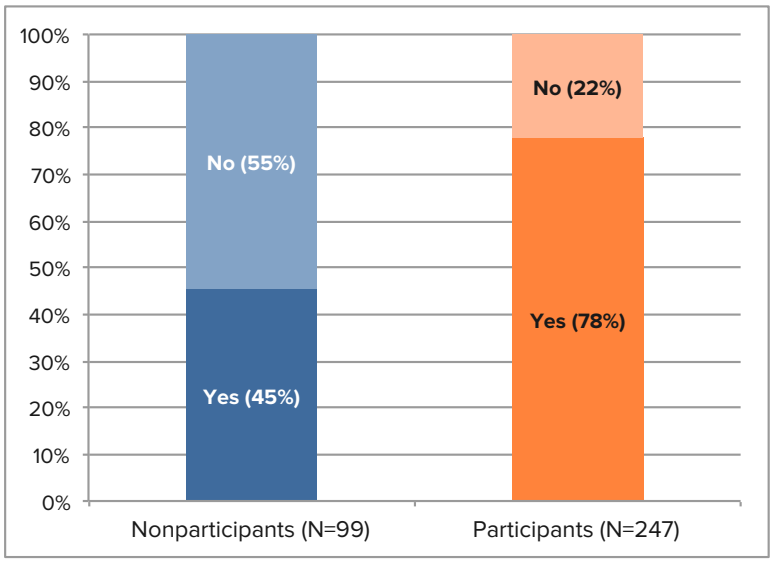
This section presents the survey results for residential maintenance decision-making in the following sections:

- Current Maintenance Behaviors: Here we present findings on residential customers' current HVAC maintenance behaviors.
- Maintenance Decision-Making Steps: In this section we use telephone survey data to characterize each stage of the five-step decision-making model discussed previously in this report.
- Receptivity to QM and Perceived Benefits: In this section we present information on customer receptivity to QM value propositions.
- Key Educational Needs: Here we provide a discussion of educational topics that respondents would find useful, as well as information on their preferred format for these materials.
- Estimating Customer Preferences for QM: In this section we present results of the discrete choice survey for residential maintenance decisions.

Current Maintenance Behaviors

Survey results indicate that 45% of nonparticipants report having regular maintenance performed on their heating/cooling equipment (Figure 5-1). Conversely, over three-quarters (78%) of participants reported having regular maintenance performed.

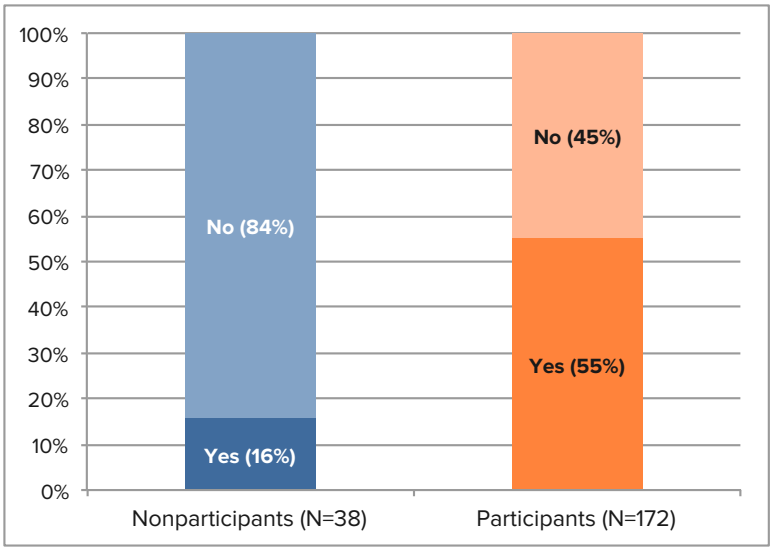
Figure 5-1: Percentage of Residential Respondents Having Periodic, Preventative Maintenance Performed



(n=346)

Figure 5-2 below shows that of those respondents who do have maintenance performed, approximately half (55%) of participants[28] reported having a maintenance contract, while one in six nonparticipants (16%) reported having a contract.

Figure 5-2: Percentage of Residential Respondents Whose Maintenance is Covered Under Contract

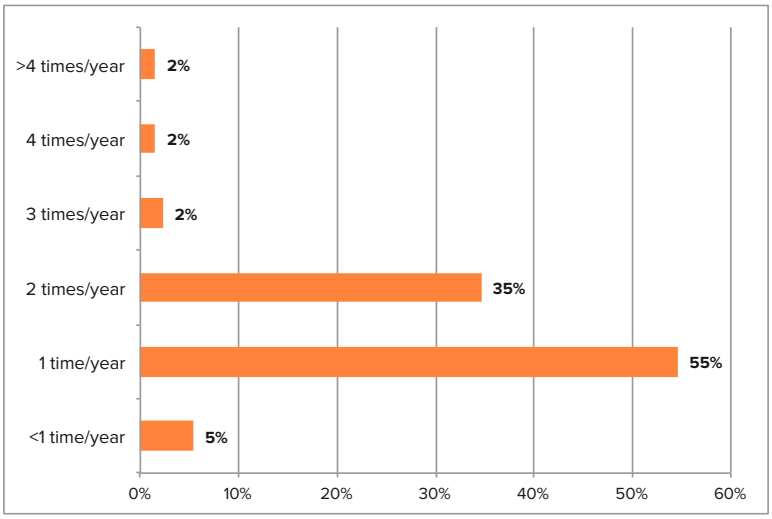


(n=210)

[28] Note that as described in the Methods section, we were unable to differentiate between QI and QM respondents in the sample files. As such, program participants are those who have participated in either a QI or a QM program over the time period 2012-2013.

Among residential respondents who do not have a contract but do have maintenance performed, 51% of participants and 64% of nonparticipants indicated they have this maintenance performed once per year. Only 21% of nonparticipants reported having maintenance performed twice per year, while 8% reported having maintenance performed less frequently than once per year (Figure 5-3).

Figure 5-3: Frequency of Maintenance for Residential Respondents Without a Contract



(n=130)

The relatively low percentage of nonparticipants who do not have regular maintenance performed on their heating/cooling equipment may signal an important barrier to achieving greater participation in QM programs. It will require an exceedingly attractive value proposition to convince these customers to pay *even more* money for a premium version of a service they do not currently purchase.

Maintenance Decision-Making Steps

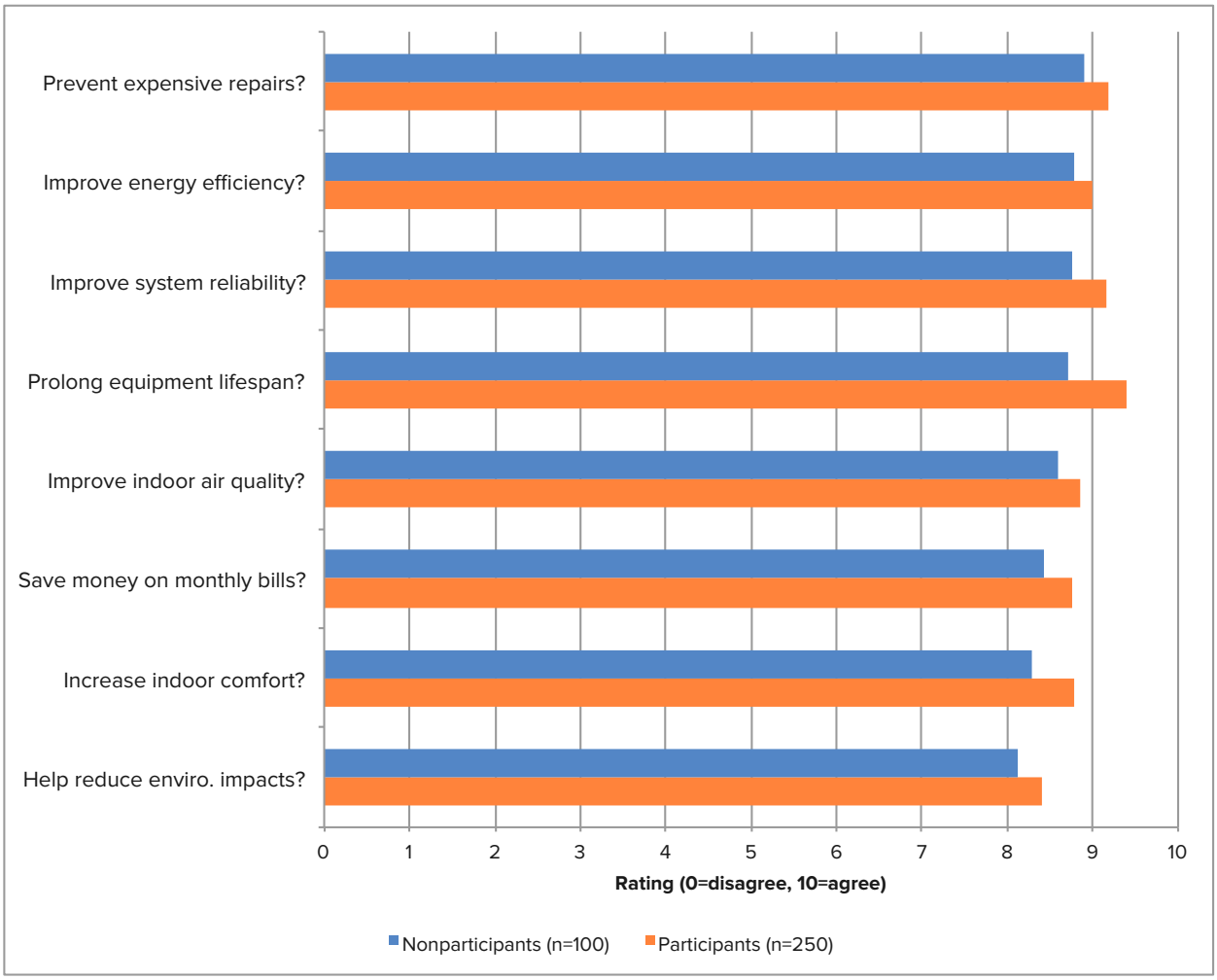
In this section, we describe each step of the five-step decision-making process as it pertains to residential HVAC maintenance decisions.

Step 1: Problem/Need Recognition

In the first step of the decision-making model, the customer recognizes there is a problem with their HVAC equipment. We asked respondents about their beliefs and understanding regarding the role and benefits of regular, preventative maintenance on their HVAC equipment. Because previous research has suggested that customers do not always understand or value the potential benefits of regular maintenance, this line of questioning was critical to better understanding the assumptions that customers rely on to make decisions. We found that residential respondents generally agreed that regular maintenance can prolong the life of their HVAC equipment and may help prevent expensive repairs. However, they were less decisive in stating that regular maintenance can help save money on monthly utility bills, can increase indoor comfort, or help reduce the environmental impacts of their equipment operation. As with installation, program participants tended to rate each of these statements higher than nonparticipants. Participants and nonparticipants differed the most in their agreement with the statement that regular

maintenance can help prolong the lifespan of heating and cooling equipment (with participants more confident in this statement), a difference that was statistically significant (participant mean rating=9.39, SD=1.33, nonparticipant mean rating=8.72, SD=1.86, t(348)=-3.294, p=0.001). Participants were also significantly more likely than nonparticipants to agree with the statement that regular maintenance can improve a system's reliability (participant mean rating=9.16, SD=1.42, nonparticipant mean rating=8.76, SD=1.67, t(348)=-2.089, p=0.038).

Figure 5-4: Residential Respondents' Beliefs Concerning Regular Maintenance

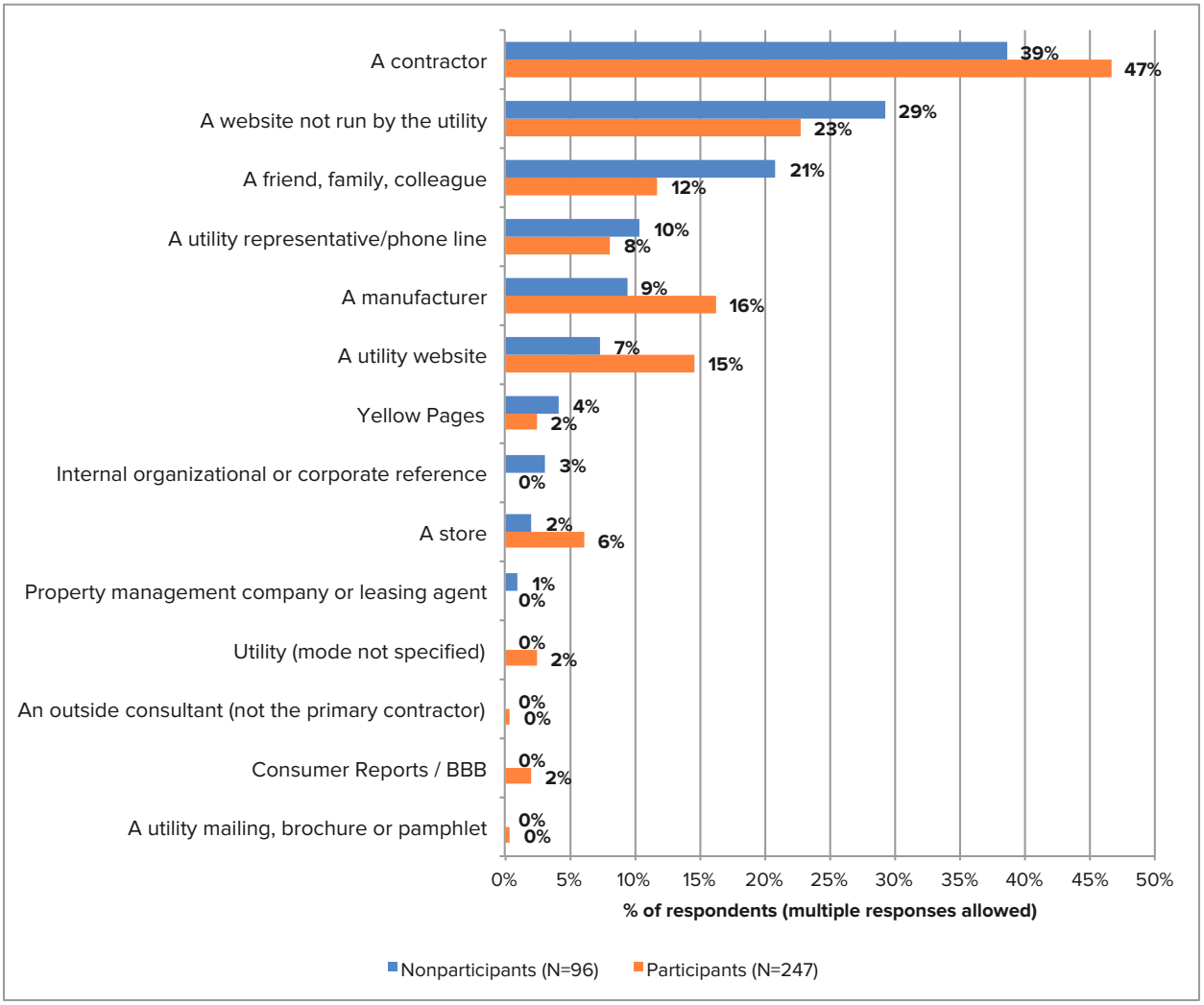


(n=350)

Step 2: Information Search

When asked what sources of information they might consult regarding the proper maintenance of their heating/cooling equipment, residential respondents reported being most reliant on a contractor (38% of nonparticipants and 47% of program participants as shown in Figure 5-5). Roughly a quarter of respondents (27% of nonparticipants and 23% of participants) indicated they would consult a non-utility website for this information, while a smaller fraction of respondents cited a website associated with a utility (7% of nonparticipants and 14% of participants).

Figure 5-5: Sources of Information Consulted by Residential Respondents Regarding Maintenance of Heating/Cooling Equipment



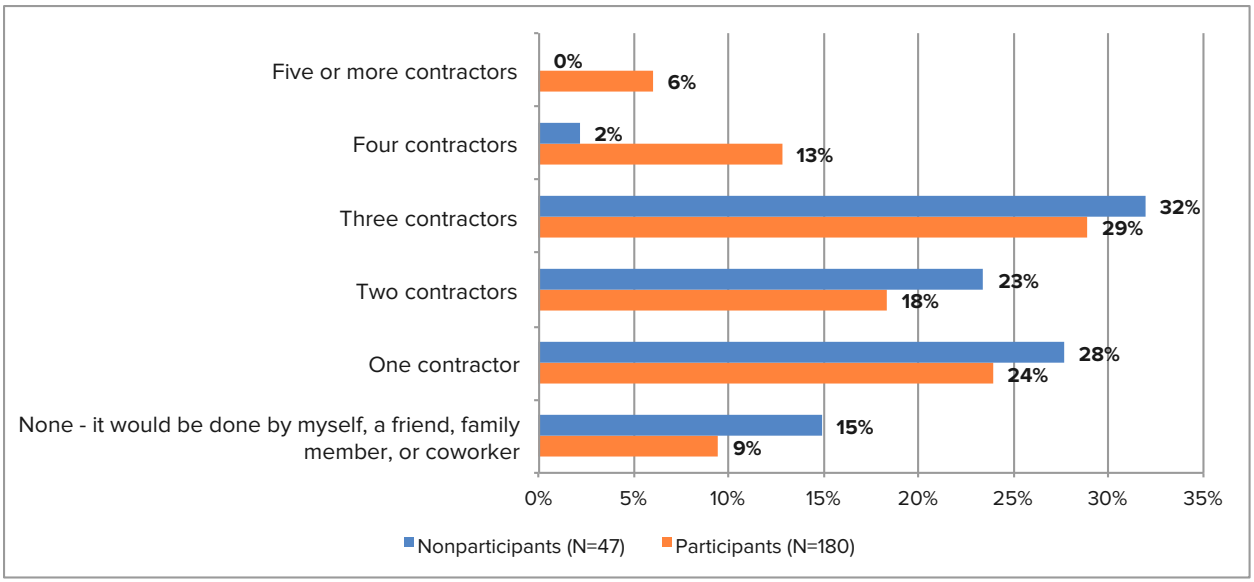
(n=343)

It is interesting to note here that nonparticipants were slightly more likely to consult a friend, family member or co-worker (21% of nonparticipants vs. 12% of participants) while participants were slightly more likely to consult a utility website (15% participants vs. 7% of nonparticipants).

Steps 3 & 4: Evaluation of Alternatives and Purchase Decision

As with installation, we queried respondents on the number of contractors they would consider before selecting one to perform maintenance work on their HVAC equipment. Figure 5-6 shows how respondents answered this question separately for participants and nonparticipants. Both sets of respondents were similar in the proportion choosing to consider one, two, or three contractors. However, participants were more likely to consider more than three contractors while nonparticipants were more likely to have the work done by a friend, family member, co-worker or themselves.

Figure 5-6: Number of Maintenance Contractors Residential Respondents Would Consider



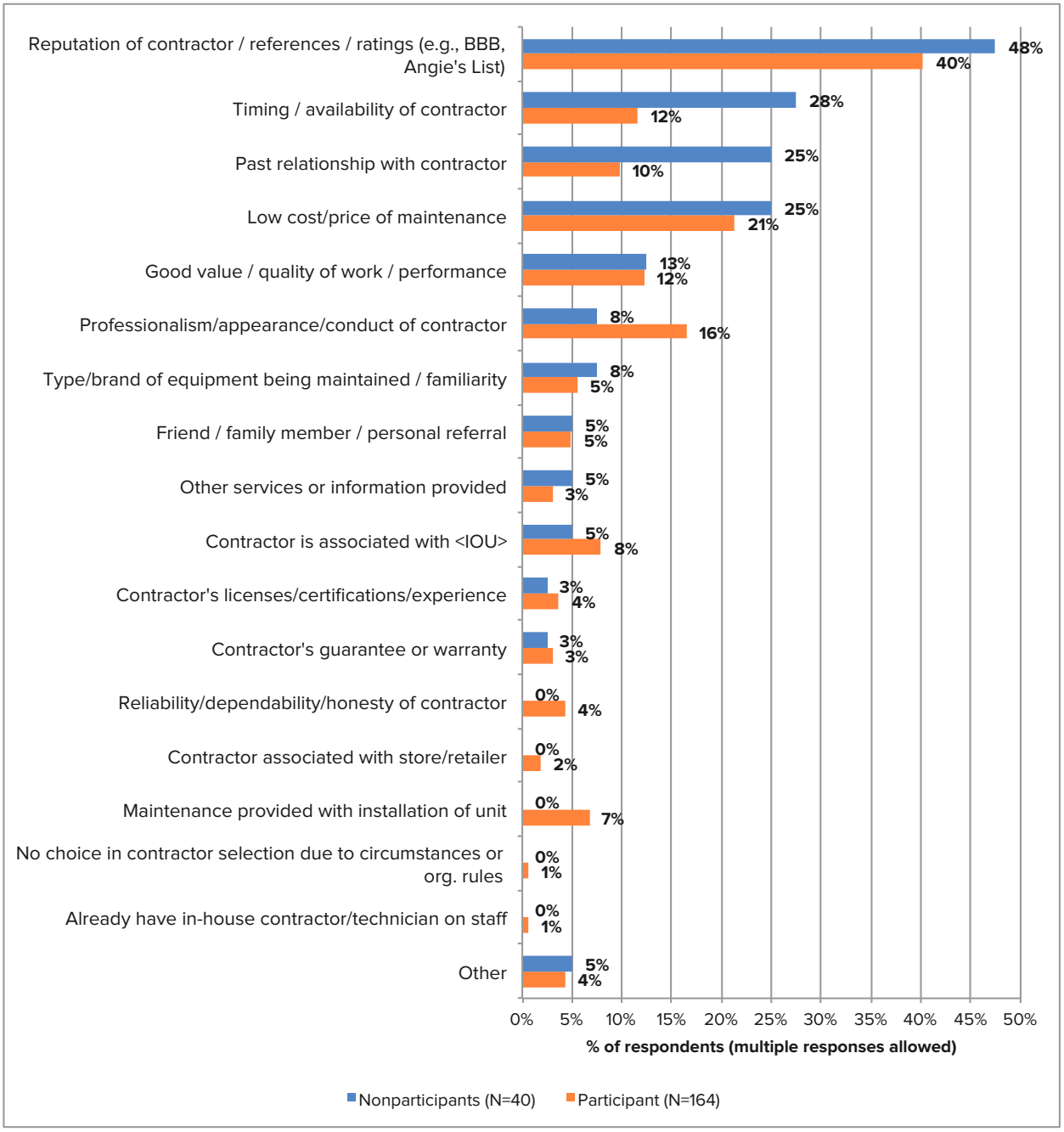
(n=227)

When it comes to actually selecting a maintenance contractor to do the work, the most popular criterion for both participants and nonparticipants was an evaluation of the contractor's reputation using references and/or ratings (approximately 40% of participants and 47% of nonparticipants cited this criterion). Nonparticipants were more concerned than participants with "a past relationship with a contractor" (25% vs. 10%) and "timing/availability of the contractor" (28% vs. 12%) as important criteria. Participants appeared less concerned with past relationships and timing, though they did place nearly equal importance on the cost of service as a selection criterion (a topic explored at greater depth in the discrete choice study).

A potential barrier to increased involvement in QM programs is existing relationships between customers and their contractors (who may not provide QM services).

These results suggest a potential barrier to greater participation in QM programs may be the inertia surrounding customers' existing relationships with their contractors. If these contractors do not offer QM services, it is more difficult to convince customers that they should switch to a new provider.

Figure 5-7: Criteria Influencing Residential Respondents' Selection of a Maintenance Contractor



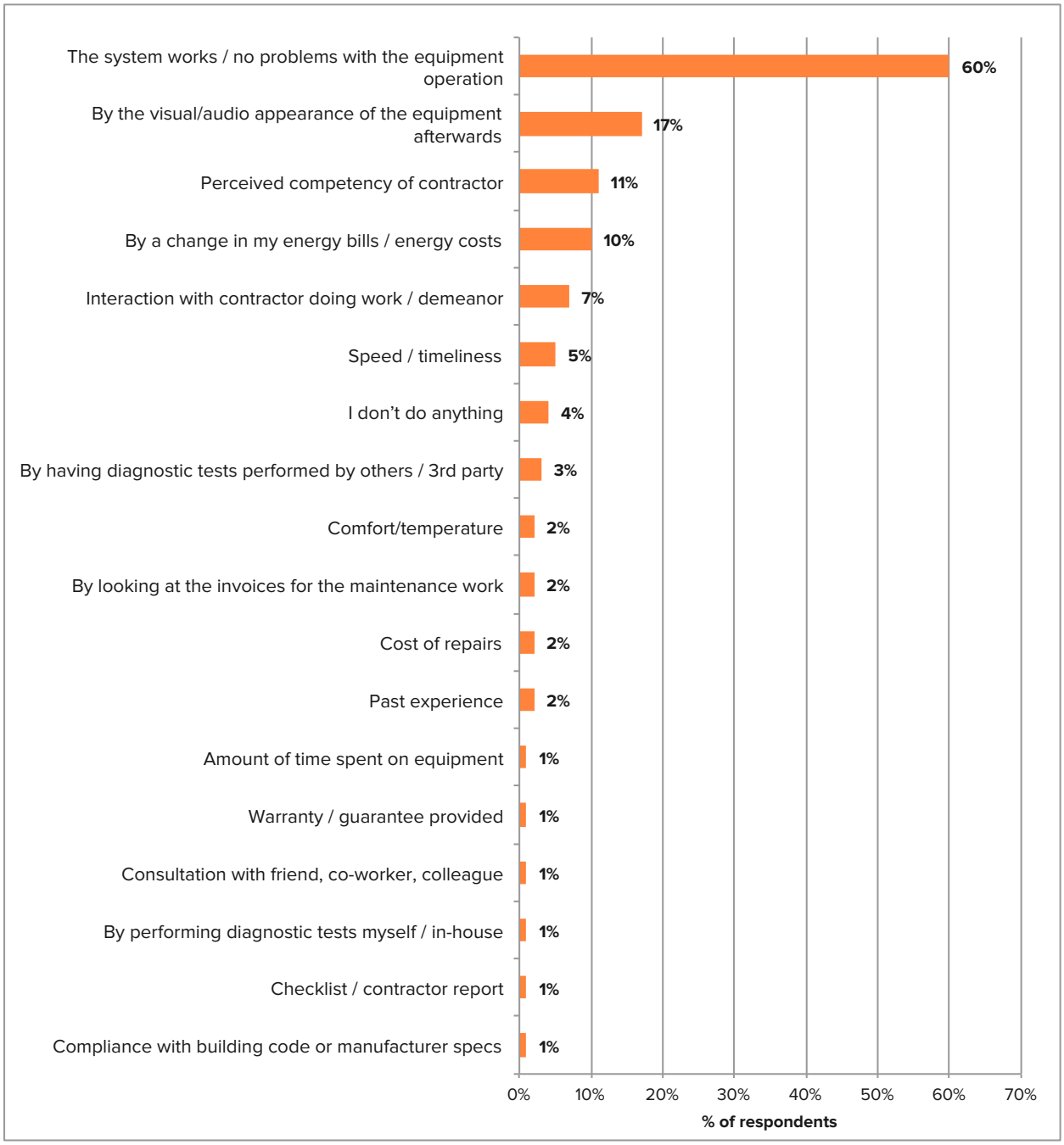
(n=204)

Step 5: Post-Purchase Evaluation

In the final stage of the decision-making process, customers evaluate the maintenance they have received. When asked about the criteria that residential respondents would use to judge the *quality* of the maintenance, a majority (60%) indicated that they would simply monitor whether or not there were any problems with the equipment operation (Figure 5-8). Using simple audio/visual assessments of the equipment and relying on perceptions of the contractor's competency were also reported by 17% and 11% of respondents, respectively. Interestingly, only a

small percentage of respondents (10%) said they would judge the quality of maintenance by a change in their utility bills. There did not appear to be major differences between participants and nonparticipants in their post-purchase evaluation strategies.

Figure 5-8: Strategies Used to Judge Quality of Maintenance Services among Residential Respondents

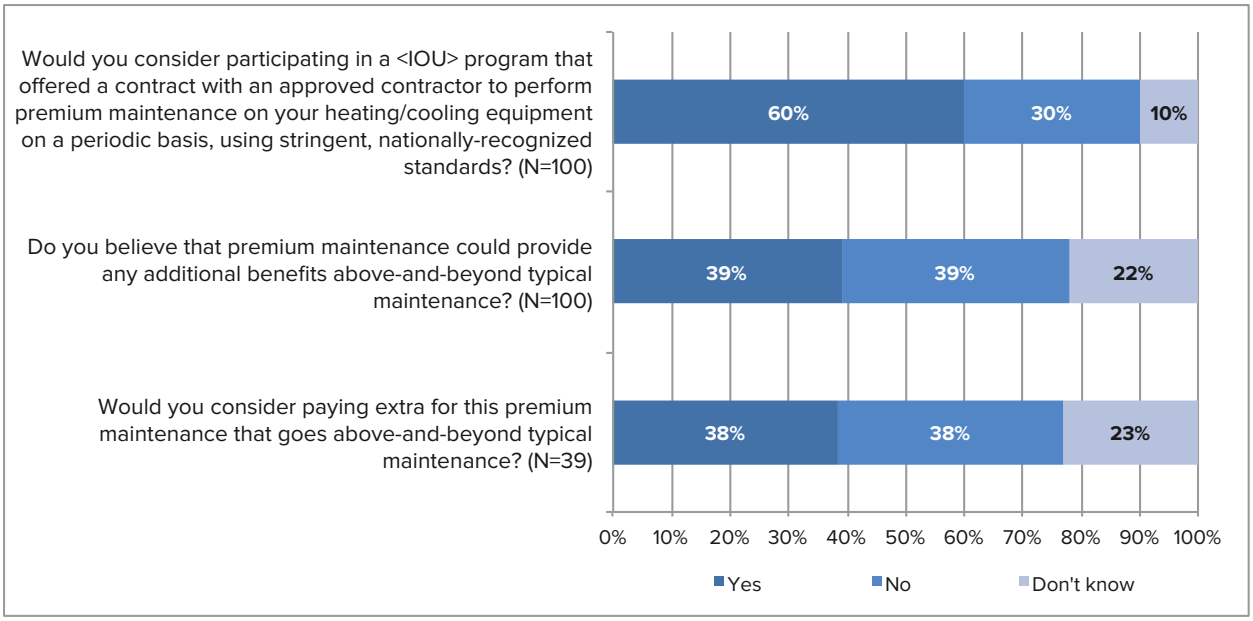


(n=305)

Receptivity to QM and Perceived Benefits

We asked nonparticipants about their attitudes and beliefs related to standards-based maintenance to better understand residential customers' perceptions of the potential benefits of QM. Overall, nonparticipants were slightly less receptive to the idea of participating in a quality *maintenance* program than a quality *installation* program. When asked whether they would consider participating, only 60% of nonparticipants said 'yes' (compared with 84% nonparticipants interested in an *installation* program). Nonparticipants exhibited some uncertainty regarding the benefits of premium maintenance, with only 39% indicating agreement with the statement that premium maintenance could offer benefits above-and-beyond typical maintenance, and only 38% indicating a willingness to pay extra for such services. (In comparison, the corresponding values for installation were 55% and 40%, respectively).

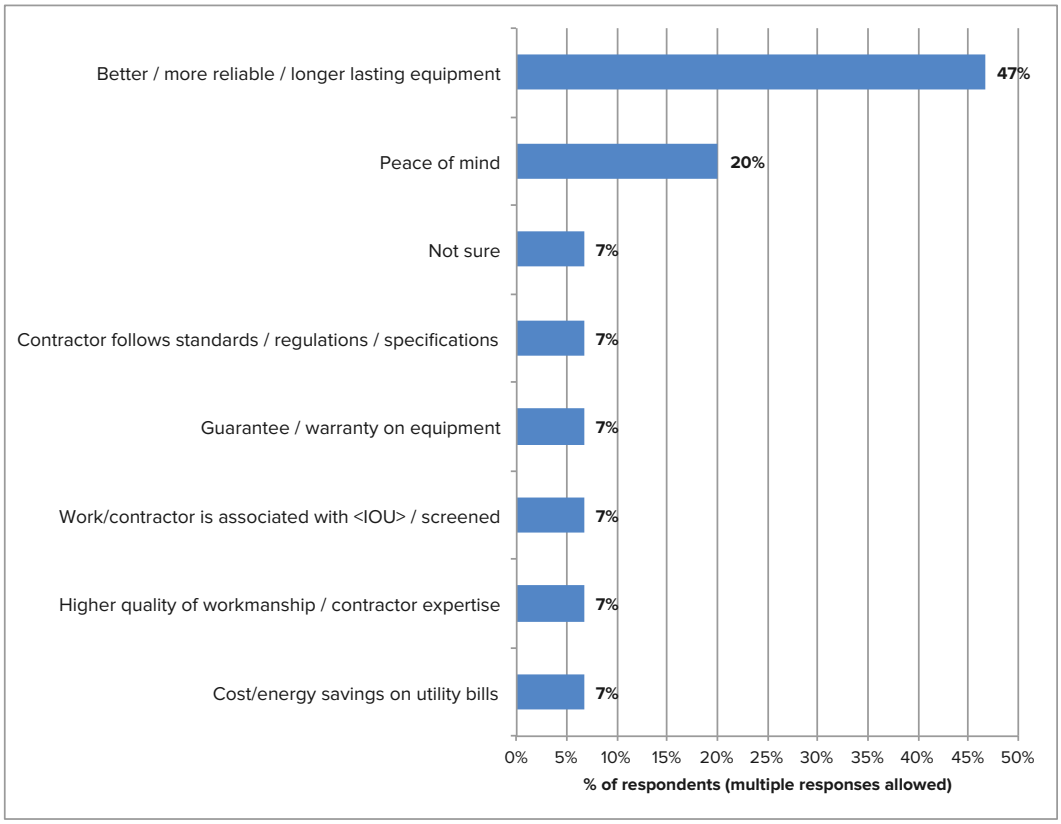
Figure 5-9: Residential Respondents' Receptivity to Quality Maintenance Programs



Residential consumers do not appear to have a clear understanding of the benefits of Quality Maintenance services.

Among the few respondents who believed that premium maintenance might offer benefits above-and-beyond typical maintenance (Figure 5-10), nonparticipants most frequently pointed to longer-lasting equipment (roughly 47% of these respondents) and "peace of mind" (20%). However, because of the small sample size of nonparticipants able to articulate what these benefits may be (n=15), it is difficult to draw robust conclusions about what the expected benefits may be for this subgroup. Instead, we interpret this as a general lack of awareness regarding the QM value proposition.

Figure 5-10: Perceived Benefits of Quality Maintenance among Residential Nonparticipants

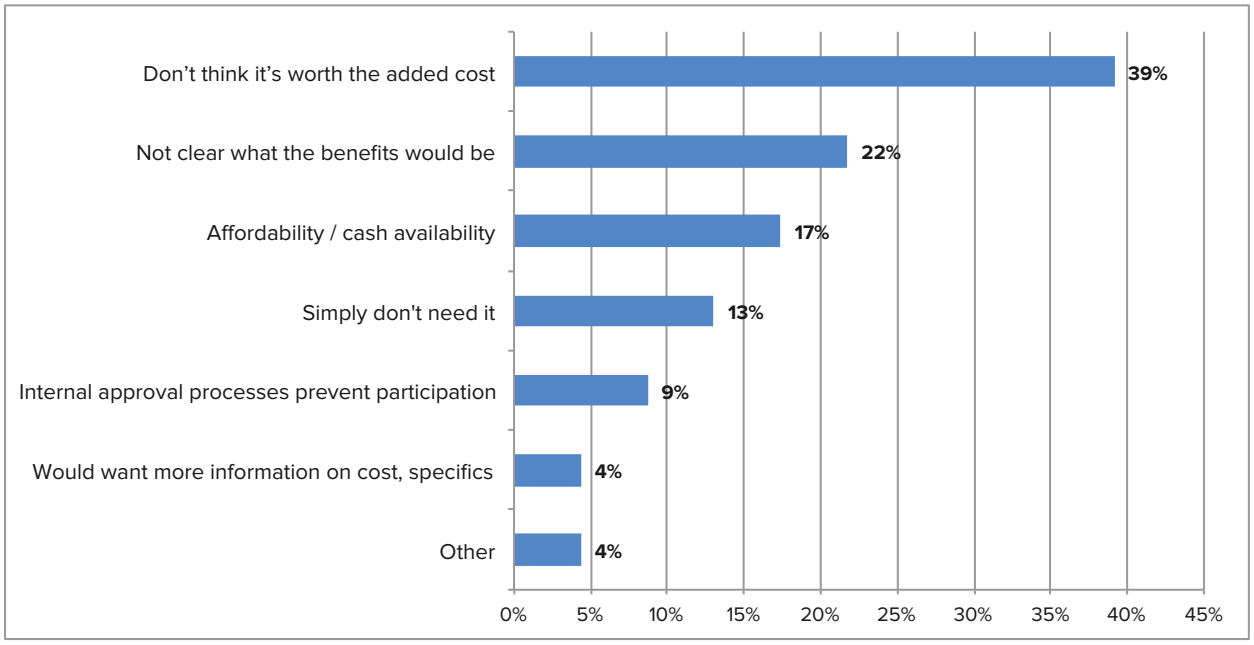


(n=15)

Nearly a quarter (22%) of nonparticipants unwilling to pay for premium maintenance indicated it wasn't clear what the benefits would be.

Figure 5-11 shows that among those nonparticipants who were unwilling to pay extra for premium maintenance, just under half (45%) indicated they simply did not think it was worth the added cost, with an additional 13% indicating they "simply don't need it." Roughly 22% of these nonparticipants reported that it wasn't clear what the benefits would be, while an additional 4% wanted to see more information on program specifics before making a judgment. These results are similar to the results for QI nonparticipants, in which 74% of nonparticipants reported they did not believe the premium version was worth paying for and 19% indicating they just weren't sure what the benefits were. However, that fact that most respondents could not provide a well-reasoned answer suggests there is potential for better educating the public about these programs.

Figure 5-11. Residential Nonparticipants' Reasons for Not Paying Extra for QM

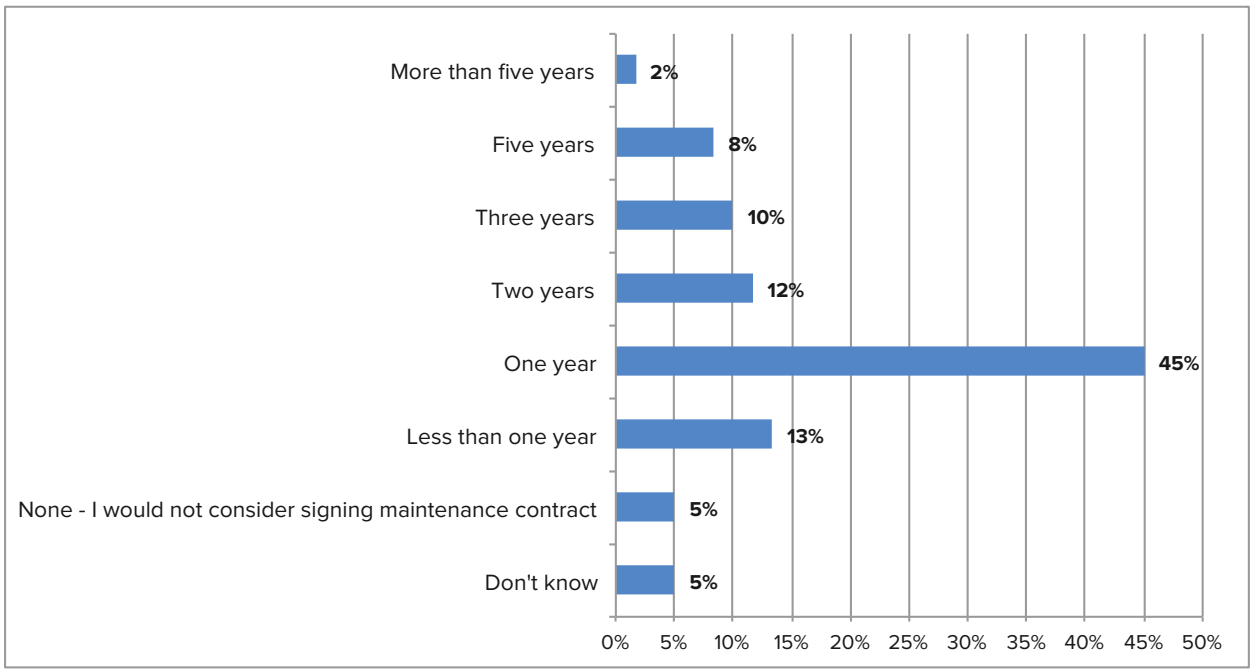


(n=23)

To characterize residential customers' preferences for *length* of a maintenance contract (and to determine whether this may be a barrier to QM services), we asked nonparticipants to consider the longest duration of a maintenance contract they would be willing to sign. Figure 5-12 shows that 45% were willing to sign a contract with a maximum length of one year while an additional 13% were only willing to sign a contract *less* than one year in length. Only 5% indicated they would not sign a maintenance contract *at all*, no matter what the length was. While this likely does not represent a critical barrier for QM programs, it does suggest that there is a small segment of residential customers who are unlikely to participate in any program that requires them to sign a maintenance contract.

Nearly half of respondents (45%) said one year is the longest contract length they would consider. Only 32% of respondents said they would be willing to sign a maintenance contract longer than one year in duration.

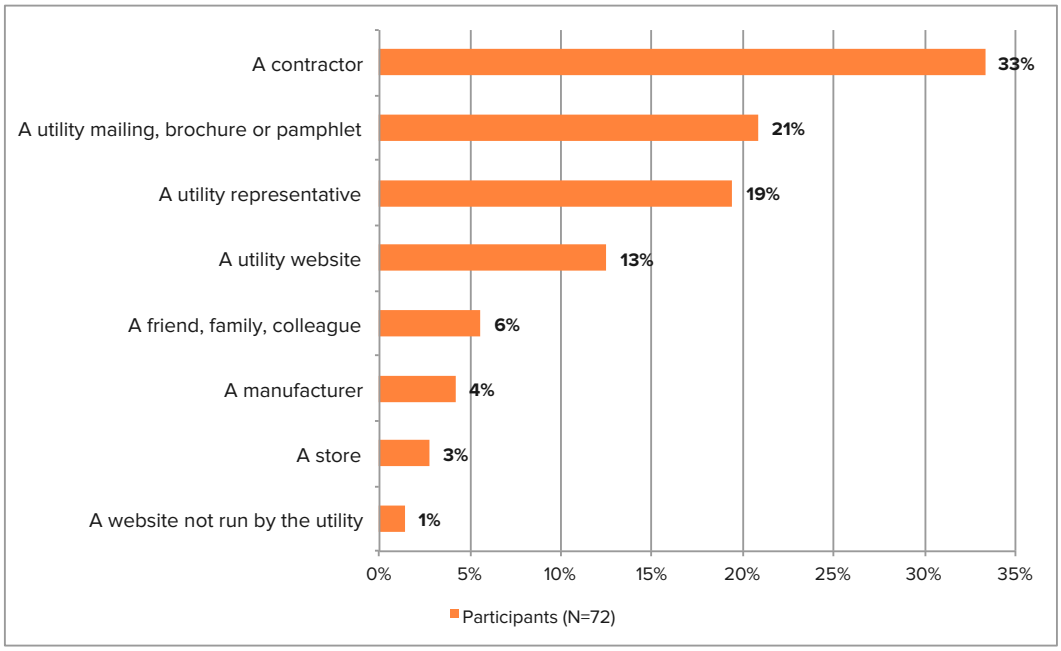
Figure 5-12: The Longest Contract Residential Nonparticipants Would Consider Signing



(n=60)

To understand residential customers' awareness of IOU HVAC QM programs, we queried program participants on where they had first heard about the program. One-third (33%) of these participants reported hearing about the program from a contractor, while just over one-fifth (21%) reported seeing it in a utility mailing, brochure or pamphlet (Figure 5-13). This finding reaffirms the importance of the *contractor* as an important marketing channel, but also shows that alternative marketing channels may be effective (i.e., mailings, utility representatives, and utility websites).

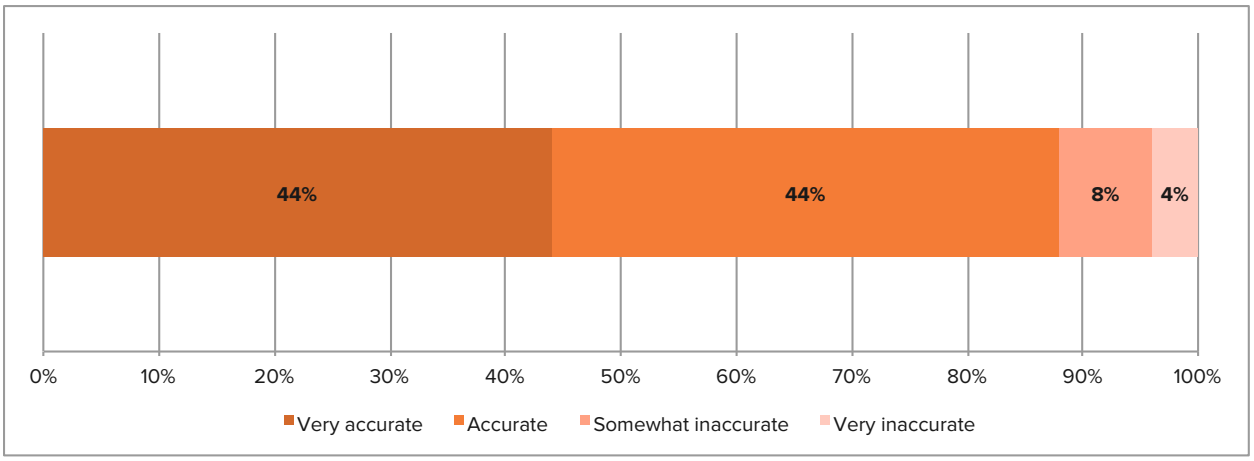
Figure 5-13: Where Residential Participants First Heard About the QM Program



(n=72)

Approximately 60% of participants indicated their contractor had provided them with a cost or energy saving estimate for their maintenance work. As with installation, most participants (approximately 88%) reported their contractor's estimate to be either very accurate or accurate. As with the energy savings estimates used by some QI contractors, these positive reviews suggest that cost savings or energy savings estimates could serve an important role in illustrating the value of Quality Maintenance to prospective customers.

Figure 5-14: How Accurate Were Energy/Cost Savings Estimates?

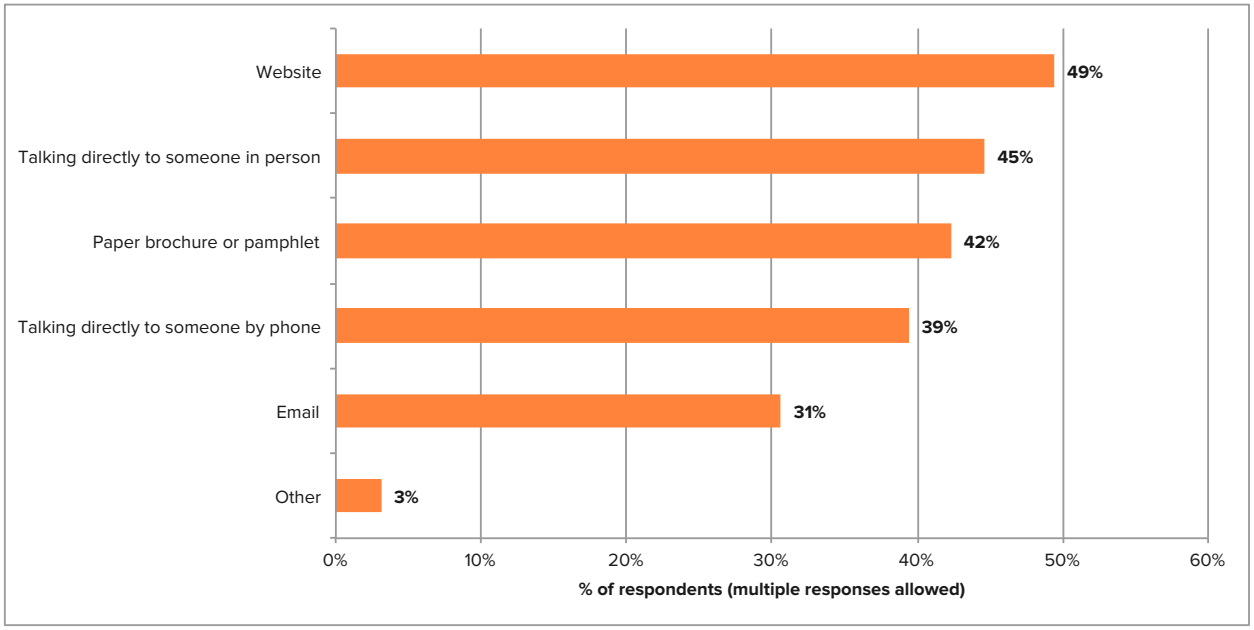


(n=25)

Key Educational Needs – Residential Customers[29]

Figure 5-15 reveals that nearly half of residential survey respondents (49%) said they would be interested in receiving information about HVAC installation/maintenance in the form of a website; other favorable channels included talking directly to someone in person (45% of respondents) and a paper brochure or pamphlet (42% of respondents). Email was preferred by fewer respondents, though it was still mentioned by almost one-third (31%) of those surveyed.

Figure 5-15: Information Formats Preferred by Residential Respondents

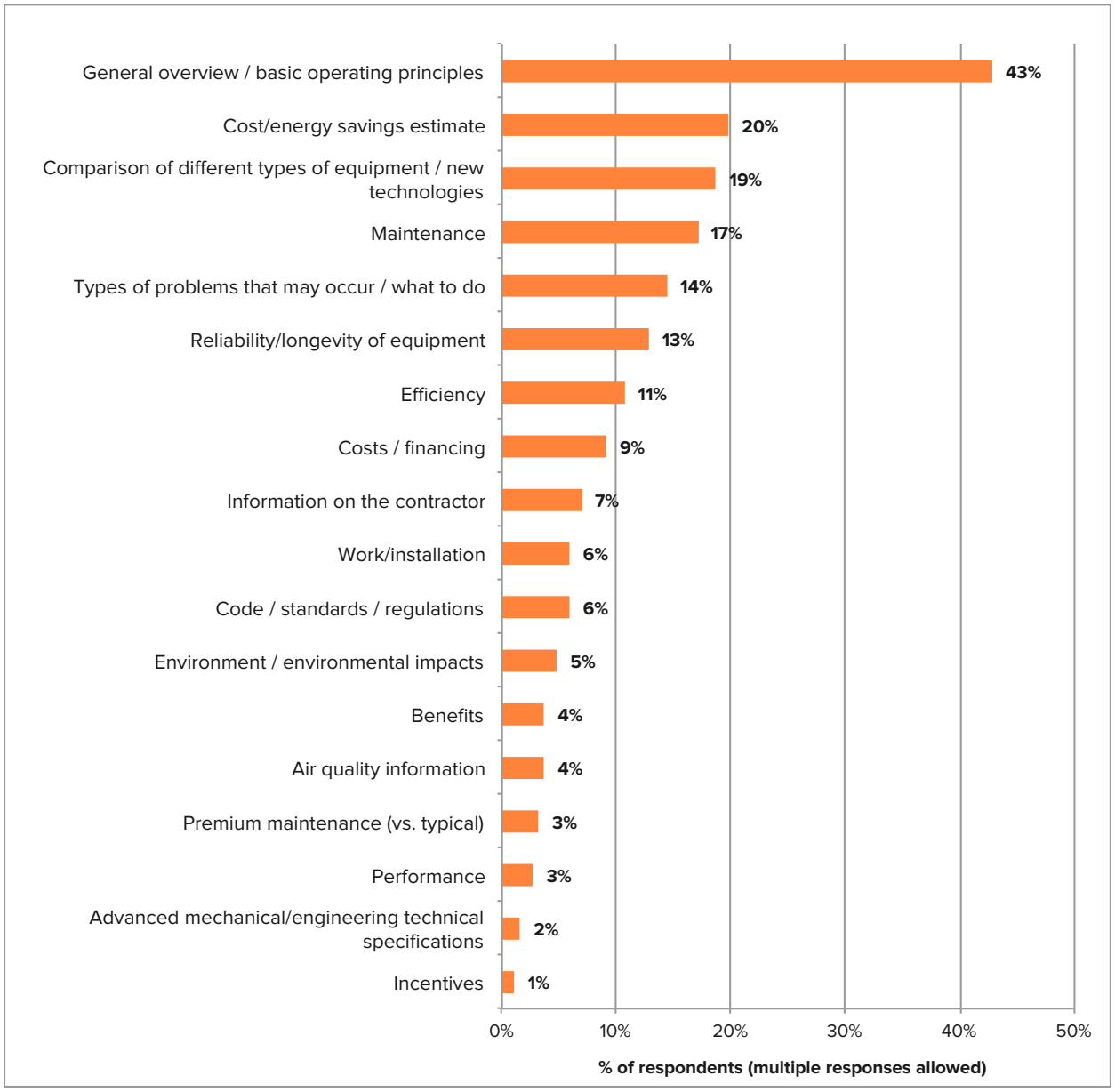


(n=350)

[29] This information is identical to the corresponding "Key Educational Needs" section presented in the residential installation chapter.

Fifty-five percent of residential survey respondents said they thought specific information on the installation and maintenance of heating/cooling equipment would be helpful to them (Figure 5-16). When asked about what topics they would be most interested in, most respondents (43%) indicated a general overview of HVAC equipment operation, while 20% mentioned cost/energy savings estimates and 19% mentioned being able to compare different units or technologies.

Figure 5-16: Information Topics Most Useful to Residential Respondents



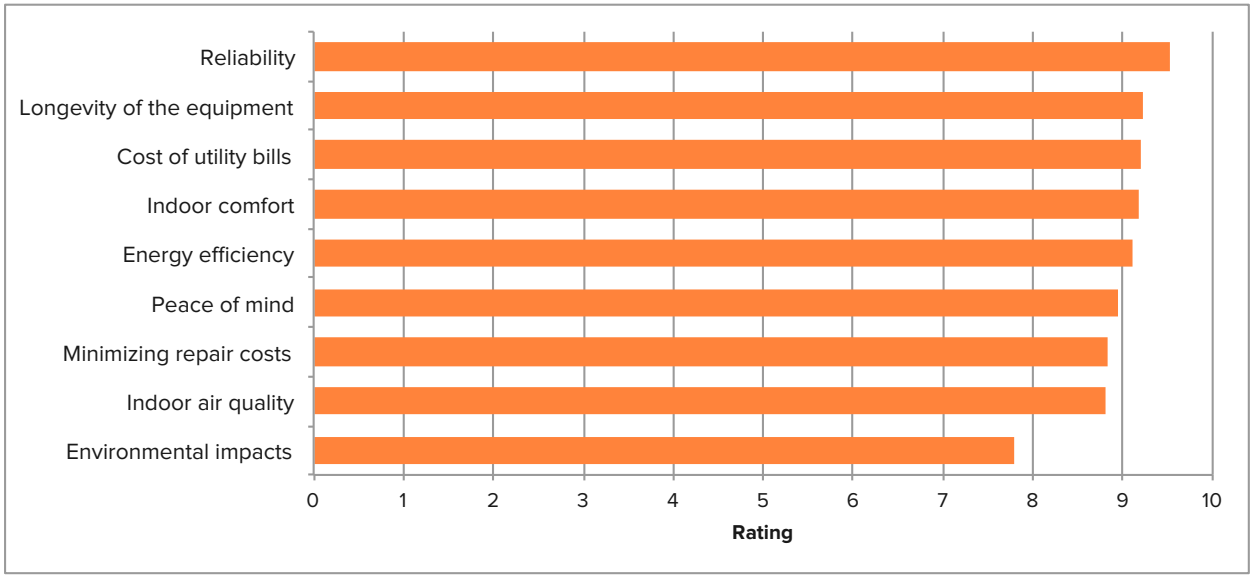
(n=187)

Estimating Customer Preferences for Quality Maintenance

In this section we discuss the results of the web-based discrete choice study conducted with a sample of residential customers. As we discuss throughout this report, decision-making is a complex process that requires people to contemplate and weigh an array of factors before deciding on a final course of action. The more complicated the choices are, and the greater the number of factors playing a part in the decision, the more complex the decision making process becomes.

In the telephone survey, we used a traditional approach to assessing the variable effect that different factors might play in peoples' decisions. This approach consisted of asking survey respondents to rate or rank factors on a 0 to 10 scale, where 0="not at all important" and 10="very important". Figure 5-17 presents these results, showing that while reliability, longevity, cost of utility bills, indoor comfort, and energy efficiency were scored the highest, all of the factors were reported to be relatively important; environmental impacts were rated the lowest, with a mean score of 7.8.

Figure 5-17: Residential Telephone Survey Respondents' Ratings of Factors Related to HVAC Equipment



While the above results provide some insights into customers' preferences, as discussed in the Methods section, such an approach does not capture the complexity (i.e., trade-offs) inherent in the decision-making process. As such, we also conducted a discrete choice study. Table 5-1 shows the attributes and levels that were used for the residential maintenance discrete choice study.

Table 5-1: Attributes and Levels for Residential Maintenance Discrete Choice Study

ATTRIBUTES	MAINTENANCE LEVELS
System reliability	1 day of downtime during hottest time of year
	3 days of downtime during hottest time of year
	5 days of downtime during hottest time of year
System longevity	No longer than typical maintenance
	5 years longer than typical maintenance
	10 years longer than typical maintenance
Environmental impacts	No less impact than typical maintenance
	15% less impact than typical maintenance
	30% less impact than typical maintenance
Monthly cost savings	No savings over typical maintenance
	15% savings over typical maintenance
	30% savings over typical maintenance
Indoor air quality	No better quality than typical maintenance
	15% better than typical maintenance
	30% better than typical maintenance
Contract cost	0% more than typical maintenance contract
	50% more than typical maintenance contract
	100% more than typical maintenance contract
Contract length	1 year
	3 years
	5 years
Visits per year	2 visits/year
	4 visits/year
	6 visits/year

From the discrete choice data we were able to estimate a number of metrics that describe customer preferences for HVAC maintenance services that go beyond the simple telephone survey. The first metric we discuss is the importance scores associated with each of the attributes.[30] The sum of importance scores for all attributes sum to 100%. Thus, the *importance scores* represent a "decision weight," or each attribute's individual contribution to the overall decision (in this case, the decision to purchase an HVAC QM contract).

Discrete choice results for maintenance services indicate that on average, "contract cost" is nearly three times as important as "monthly cost savings."

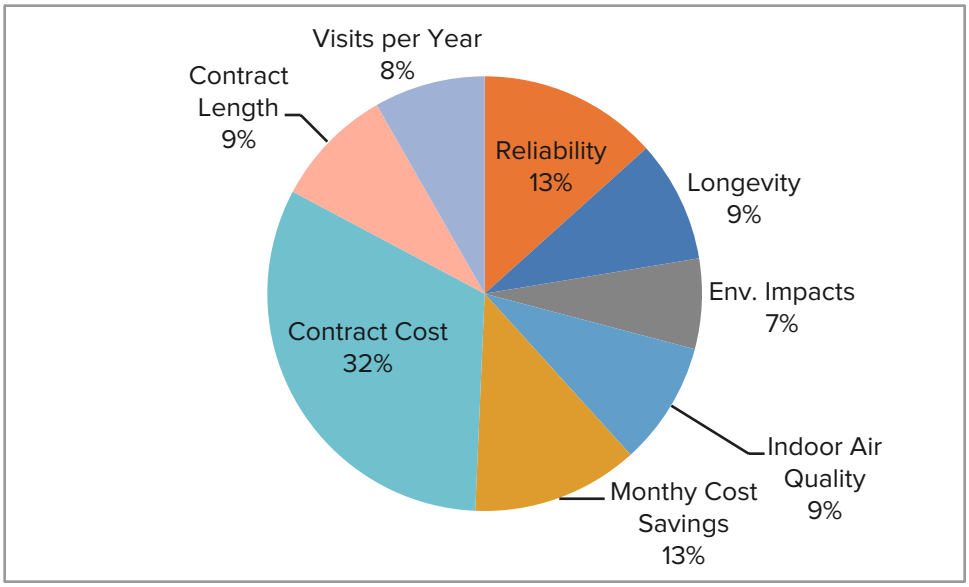
Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. This reflects the fact that an attribute's importance is a direct function of the

[30] These importance scores were computed from part-worth utilities derived using Sawtooth Software's Hierarchical Bayes (HB) functionality.

difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome.

Figure 5-18 shows that for residential customers, "contract cost" emerged as the most dominant attribute in the maintenance decision, representing just under a third (approximately 32%) of the total decision weight. In a distant second, "monthly cost savings" and "system reliability" came in tied with 13% of the decision weight. "Contract length," "longevity," "indoor air quality," "visits per year," and "environmental impacts" all contributed comparatively small amounts to the overall decision weight.

Figure 5-18: Importance Scores for Residential Maintenance Discrete Choice Study



(n=317)

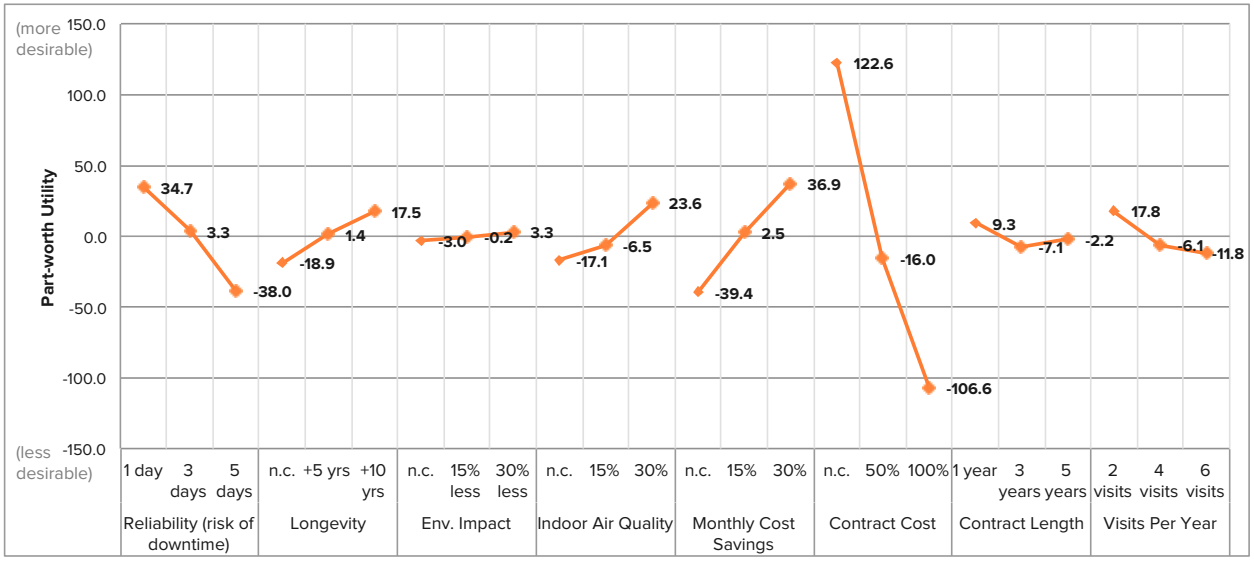
These importance scores can be further broken out into *preference scores* (referred to in discrete choice studies as "part-worth utilities") for each individual level of an attribute. Larger preference scores reflect a more "desirable" attribute level, as rated by the respondents. Figure 5-19 shows residential respondents' preferences for individual levels of the eight attributes tested in the residential maintenance discrete choice analysis. Examination of these preference scores adds insights that go beyond those provided by simple review of the importance scores in Figure 5-18 by helping to clarify the sensitivity or elasticity of respondents' preferences across levels *within* an attribute.

For example, the attribute "reliability" exhibits a steady and notable decrease in preference score from left to right, as the risk of downtime increases from one day to five days. In contrast, when looking at contract cost, we also see a steady decline in preference score as the price increases, but the decline from level-to-level is orders of magnitude greater than it is with reliability. With

regards to longevity, preference scores increase as the longevity of the unit increases, and like with reliability and contract cost, the increase is relatively consistent from level to level; however, the increase from level-to-level is substantially less then it is for either reliability or contract cost. Similar results are found with monthly cost savings. Overall, we can see that respondents are by far most sensitive to different levels of contract cost than they are different levels of reliability, longevity, or monthly cost savings.

Also from Figure 5-19 we see that the relationship between levels of attributes such as indoor air quality (IAQ), contract length, and visits per year are slightly more complicated. Instead of relatively consistent differences between all levels, we note some inflections. With indoor air quality, there is a relatively small increase in preference score from "no change" to 15% improvement, but the change from 15% to 30% is notably greater. Similar patterns are evident with contract length and visits per year; in both of these cases respondents reveal a higher preference for the lowest levels (1 year contract length and 2 visits per year), but are virtually indifferent to the other levels of these attributes. Respondents are also relatively indifferent across the three levels of environmental impacts.

Figure 5-19: Residential Respondents' Implicit Valuation of Individual Levels for Each Attribute



These results suggest that marketing strategies for residential QM programs might focus on emphasizing the reliability and monthly cost savings associated with QM programs (and to a lesser degree, longevity and indoor air quality). However, the contract cost will likely override any of the other attributes. In terms of attributes that are manipulable, though customers did not reveal strong differences in preference, higher preference scores are associated with QM contracts featuring a one-year duration and two visits per year. **It must be noted that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.**

5.2 Residential Maintenance Decision-Making: Synthesis

In this section we first present a brief summary of the results discussed earlier in this chapter. We then provide synthesis of key themes and make several recommendations to drive greater customer receptiveness to residential QM offerings.

Summary and Key Points: Residential Maintenance Decision-making

Here we summarize key points from each decision step for HVAC maintenance:

Problem/Need Recognition

- Just over half of nonparticipating residential customers reported not having regular maintenance performed on their HVAC systems (55% no, 45% yes).
- Of those nonparticipating residential customers who do have regular maintenance performed, less than 20% indicated they had a contract for this work.
- Compared with nonparticipants, program participants reported greater agreement with a number of statements regarding the benefits of regular maintenance. This may indicate a need for targeted education and marketing pertaining specifically to these topics to better inform the general population potential benefits of QI.

Information Search

- When it comes to obtaining information about the proper maintenance of HVAC equipment, “a contractor” was cited as the most popular source among both participants and nonparticipants. Internet sources were also important.
- Nonparticipants were slightly more likely than participants to consult a friend or family member for information about maintenance, though on the whole this category was much less popular than the “contractor” category.

Evaluation of Alternatives and Purchase Decision

- Approximately one-third of residential respondents reported they would consider three contractors before selecting one to perform maintenance work. A significant percentage (42% of program participants, 51% of nonparticipants) indicated they would only consider one or two contractors. On the whole, respondents reported they would consider fewer contractors for maintenance than for installation work.
- The most important factor in choosing a contractor was the reputation of that contractor. Nonparticipants appeared concerned with timing and past relationships; participants did not mention these criteria as frequently.

Post-Purchase Evaluation

- Residential customers’ strategies for evaluating the quality of the maintenance they receive were very similar to their strategies used to assess installation, with a majority of them relying on such simple heuristics as “Am I having any problems with the equipment?” or “Does my unit sound OK?”
- The appearance, demeanor, and “perceived competency” of the *contractor* remained popular measures of the quality of maintenance.

Key Themes and Recommendations: Residential Maintenance Decision-making

Key themes from the residential telephone and discrete choice surveys regarding maintenance include the following:

Theme #1: **Many residential customers do not recognize the benefits of having regular, preventative maintenance performed on their HVAC systems.** Only 45% of nonparticipants have regular maintenance performed on their heating/cooling system, and are less likely to believe that regular maintenance has real benefits (such as longer lasting equipment).

Recommendation: Provide basic information about the benefits of preventative maintenance procedures in an easy-to-understand "infographic" format. This presentation should focus on making the benefits of maintenance *concrete* by focusing on monthly cost savings, system longevity, and system reliability. Highlighting differences between QM and non-QM services is important.

Theme #2: **Residential customers have relationships with contractors and may be unwilling to switch providers for a service like QM.** Two-thirds of customers who have maintenance performed regularly reported they typically work with a specific contractor. Reaching out to customers who are currently satisfied with their non-QM maintenance contracts will be difficult to reach because they are not "in the market" for new services.

Recommendation: Increase outreach efforts to contractors and leverage IOU marketing channels to make customers aware of QM as an option for obtaining maintenance services. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QM.

Theme #3: **Residential customers are extremely price-sensitive to the cost of a maintenance contract.**[31] In the discrete choice study, "contract cost" carried over two times the decision weight as the next most important attribute, "monthly cost savings." Preference for premium maintenance services dropped off with increasing contract cost, making this a difficult value proposition for many customers.

Recommendation: If possible, emphasize that price differences between QM and non-QM services are minimal. Additionally, if supported by empirical evidence, efforts may focus on the fact that the per-visit cost may be less for QM contracts than for non-QM contracts. (For example, a QM contract may cost more than a non-QM contract but if more visits are included in the QM contract, it is possible that the cost per visit is actually less than for the non-QM contract.)

[31] As discussed in the Methods section of this report, if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.

6. COMMERCIAL INSTALLATION DECISION-MAKING

This chapter presents the results of two related but separate phases of research aimed at better characterizing the decision-making process used by commercial customers when purchasing HVAC installation services:

- A telephone survey with both participants and nonparticipants
- A web-based discrete choice survey conducted with commercial customers

The chapter concludes with a synthesis of these results and presents several recommendations for messaging to drive customer receptiveness to premium, standards-based program offerings in the market.

6.1 Survey Results

Here we present the telephone and discrete choice survey results for commercial installation decision-making in the following sections:

- Installation Decision-Making Steps: In this section we use telephone survey data to characterize each stage of the five-step decision-making model discussed previously in this report.
- Receptivity to QI and Perceived Benefits: In this section we present information on customer receptivity to QI value propositions.
- Key Educational Needs: Here we provide a discussion of educational topics that respondents would find useful, as well as information on their preferred format for these materials.
- Estimating Customer Preferences for QI: In this section we present results of the discrete choice survey for commercial installation decisions.

To better understand how different size firms responded to these questions, differences between customers assigned to different classes using a composite size index (as described in the Methods chapter) are presented when statistically significant.

Installation Decision-Making Steps

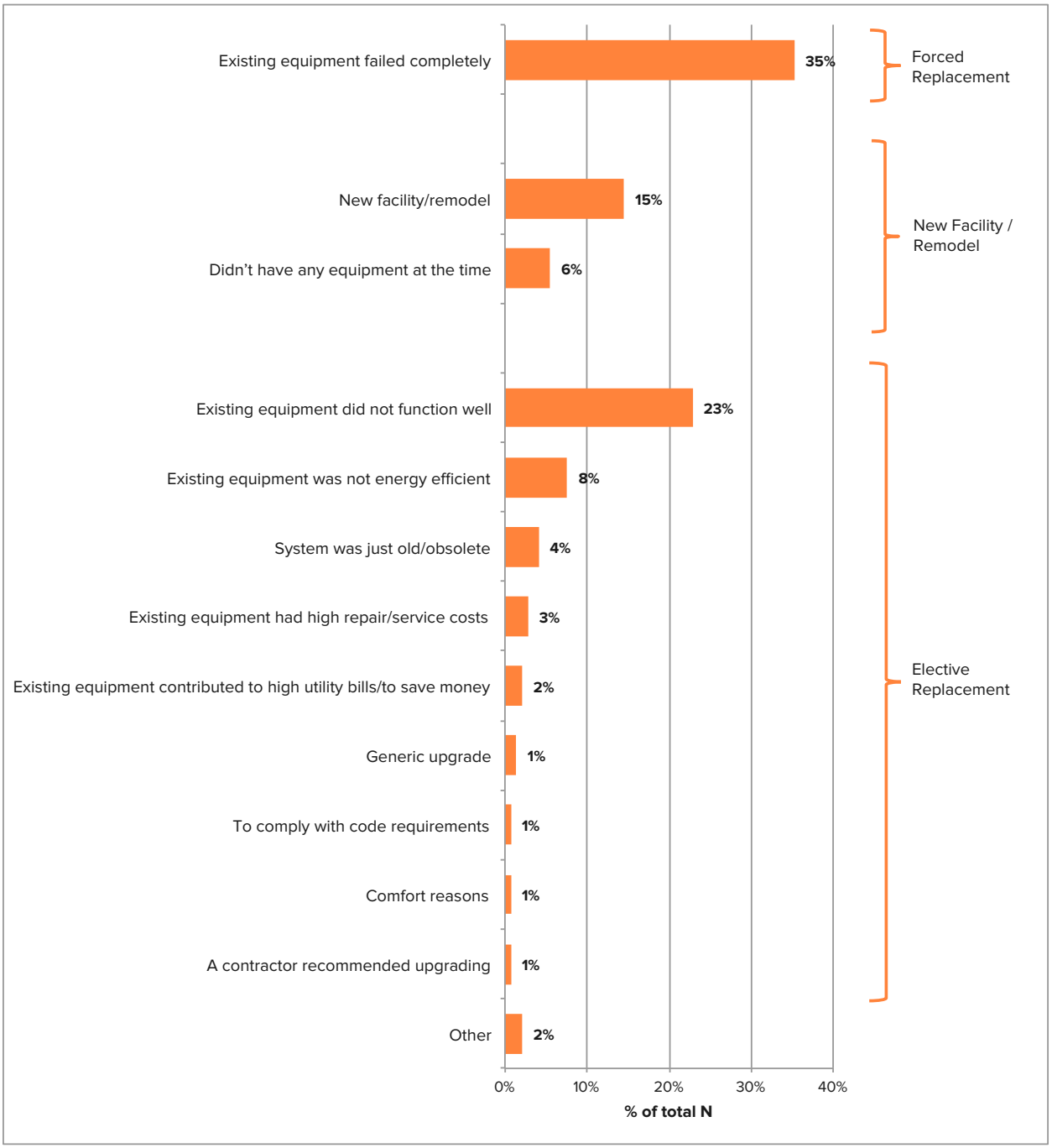
In this section, we describe each step of the five-step decision-making process as it pertains to commercial HVAC installation decisions.

Step 1: Problem/Need Recognition

In the problem or need recognition stage, customers recognize a need to purchase new HVAC equipment. A majority of commercial survey respondents had experience with the installation of HVAC equipment for their organization, with 59% of respondents having had equipment installed at some point during their professional tenure (40% did not have new equipment installed while 1% were not sure).

Commercial survey respondents reported a wide variety of primary motivations for performing HVAC installation work. Overall, these reasons were split between forced replacement, new construction or remodel work, and elective replacement. Over a third (35%) of respondents indicated they had replaced their equipment because it had failed completely. On the other hand, 44% of respondents had replaced their equipment electively. Additionally, 21% of respondents had installed new equipment as part of a new construction or remodeling project, or because they had not previously had any equipment. There were no statistically significant differences by composite size class for this question.

Figure 6-1: Primary Reason for Installing HVAC Equipment

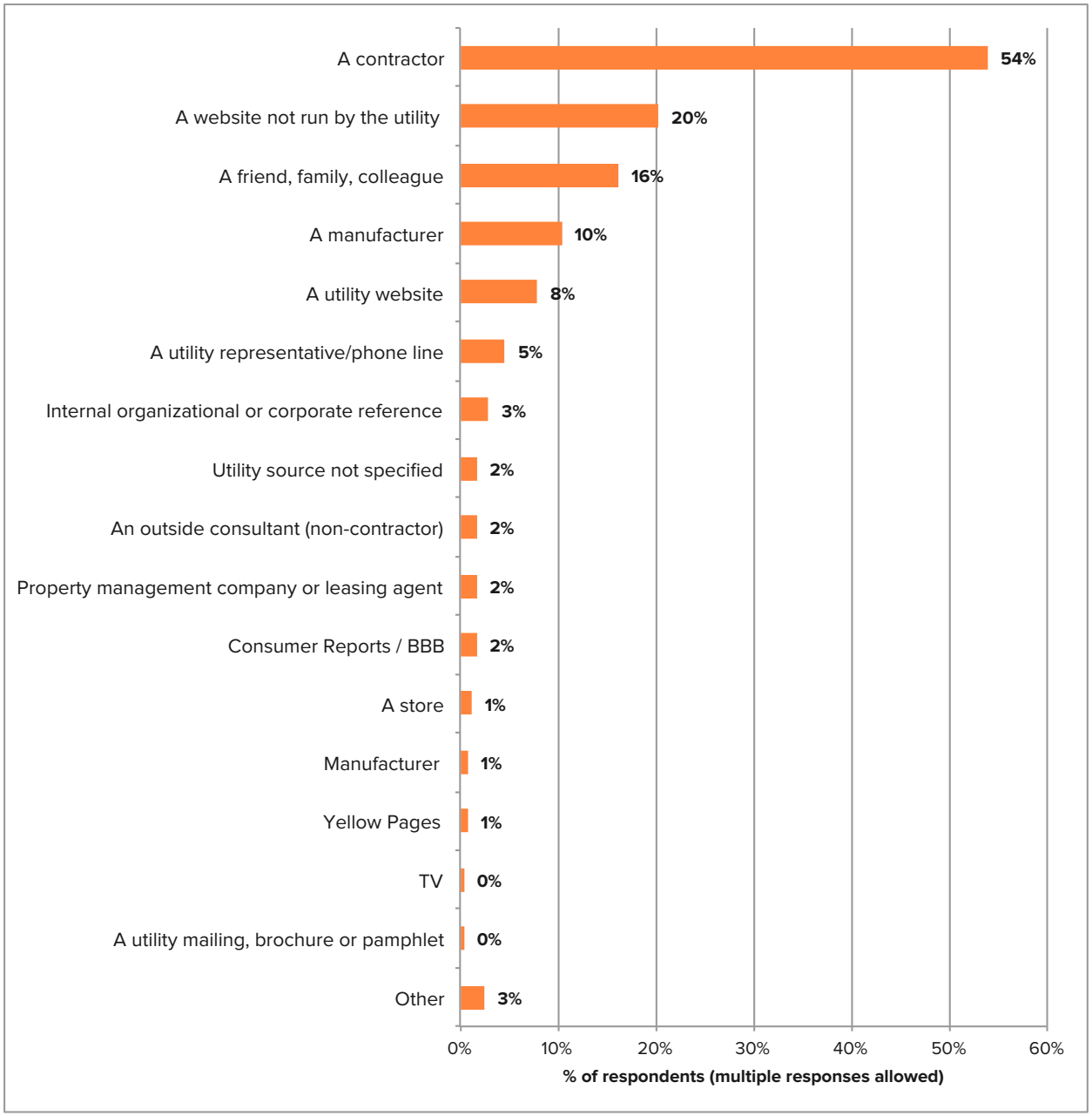


(n=145)

Step 2: Information Search

In the information search phase of the decision-making process, commercial respondents were highly reliant on *contractors*, with 54% of respondents indicating they would consult a contractor if they had a question about the proper installation of HVAC equipment. A notable portion of respondents were also web-savvy, with 20% of them using an Internet source not directly associated with a utility (typically beginning with a search engine like Google) and 8% using a utility-associated website.

Figure 6-2: Sources Respondents Would Consult Regarding a Question on HVAC Installation

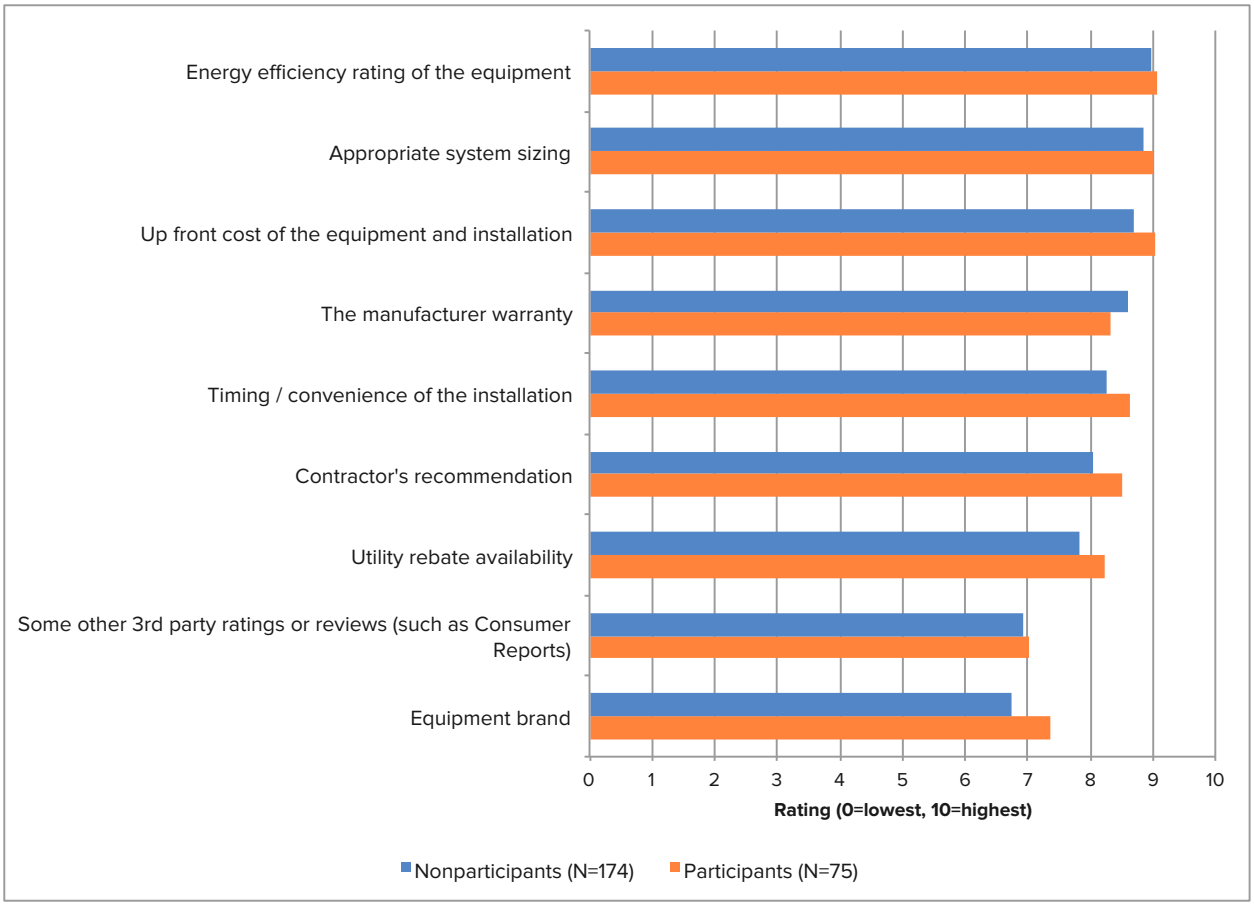


(n=241)

Steps 3 & 4: Evaluation of Alternatives and Purchase Decision

Choosing HVAC equipment is an important step in the overall installation decision process. When asked about the aspects of HVAC equipment that mattered most to them, commercial respondents seemed to care about *all* of them. Respondents rated "energy efficiency rating," "appropriate system sizing," and "up front cost of the equipment/installation" as their top three most important items, though all three ratings were very close. Respondents rated "equipment brand" and "3rd party ratings" as the lowest of all items presented. In terms of firm type, Class 3 customers assigned a significantly higher rating to "appropriate system sizing" than did either Class 1 or Class 2 customers (9.26 vs. 8.49 vs. 8.61 on a 10-point scale, respectively).[32]

Figure 6-3: Factors Influencing the Selection of New Equipment



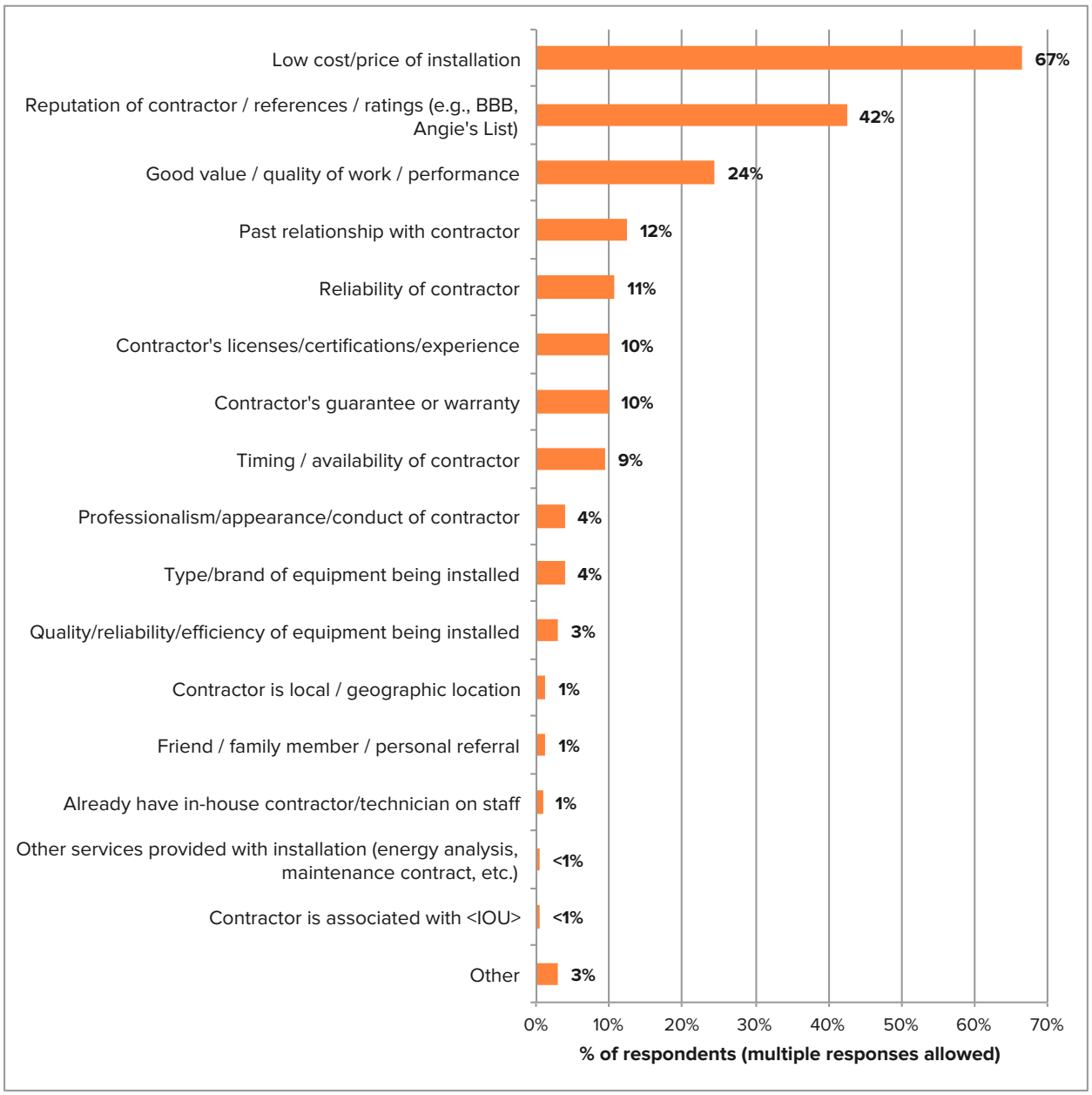
(n=249)

[32] Differences were significant using multiple t-tests, $p < .05$.

The second critical component of the alternative evaluation decision-making phase is the contractor selection process. When selecting a contractor, commercial customers appear most concerned with the cost of the installation and the reputation of the contractor, with 67% of respondents mentioning up-front equipment/installation cost as a critical factor and 42% mentioning the contractor's reputation (Figure 6-4). There were minimal differences between the different composite size classes in their responses to this question. Class 1 customers (responsible for only one location) were significantly less likely than Class 3 customers (responsible for more than one location) to mention "low cost / price of installation" (58% of Class 1 customers vs. 75% of Class 3 customers) as an important factor. Conversely, Class 1 customers were significantly more likely than Class 3 customers to mention "reliability of the contractor" as an important factor (18% of Class 1 customers vs. 7% of Class 3 customers).[33]

[33] Both sets of differences were significant using a two-proportions z-test, $p < .05$.

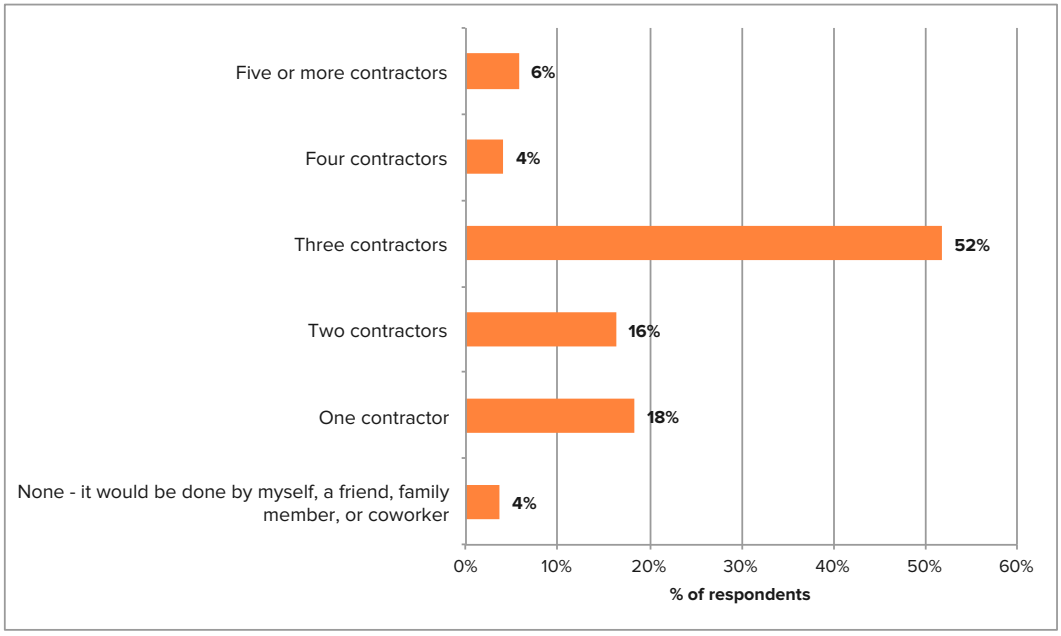
Figure 6-4: Factors Influencing Customers' Selection of an Installation Contractor



(n=233)

It appears that most commercial customers recognize the value of shopping around for a HVAC installation contractor. Over half of respondents (52%) indicated they would normally consider three contractors before actually selecting one to perform the work. However, a substantial portion of respondents also said they would only consider *one* contractor (18% of respondents) while 4% said this process was unnecessary because they would use someone other than a contractor (Figure 6-5). There were no statistically significant differences by composite size class for this question.

Figure 6-5: Number of Contractors Respondents Would Consider for HVAC Installation

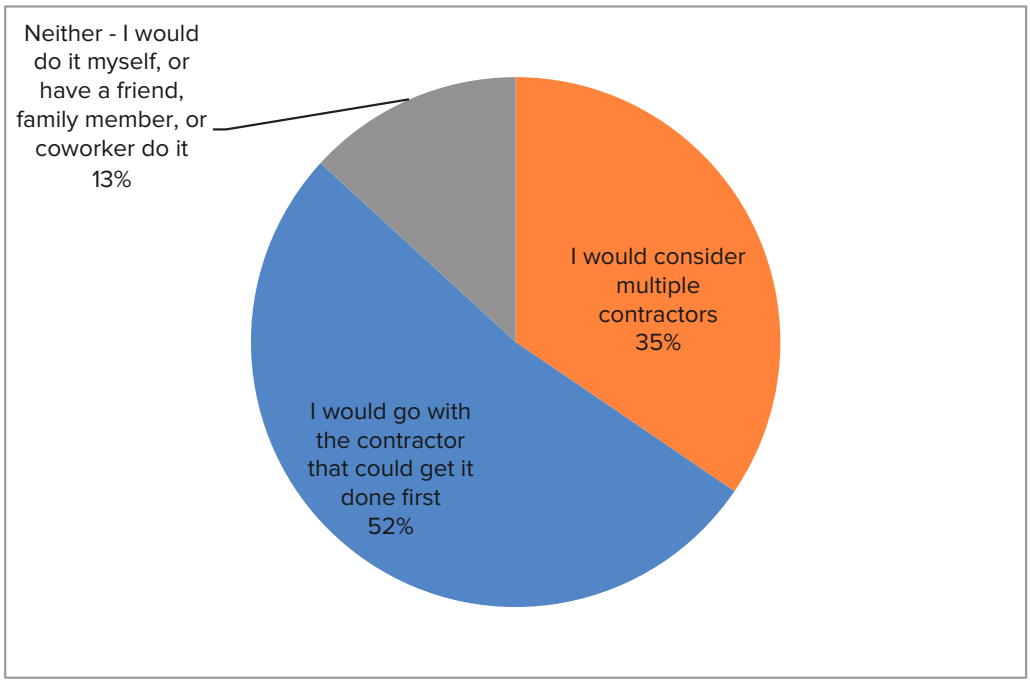


(n=245)

Because many businesses' day-to-day operations are dependent on the proper operation of their HVAC equipment to ensure the continued operation of key equipment (e.g., data servers, computers, communications equipment, etc.) or provide comfortable indoor conditions, we asked commercial respondents what they would do in the case that their HVAC equipment failed *completely* during an extreme weather event. Over half of these respondents (52%) indicated they would simply go with the first contractor who could get the work done. This stands in contrast to the scenario discussed above, in which a majority of respondents would consider multiple contractors. There were no statistically significant differences by composite size class for this question.

When faced with equipment failure during an extreme weather event, over half (52%) of respondents said they simply go with the first contractor who could get the work done.

Figure 6-6: Respondents' Consideration of Multiple Contractors Assuming Equipment Failure During Extreme Weather Conditions



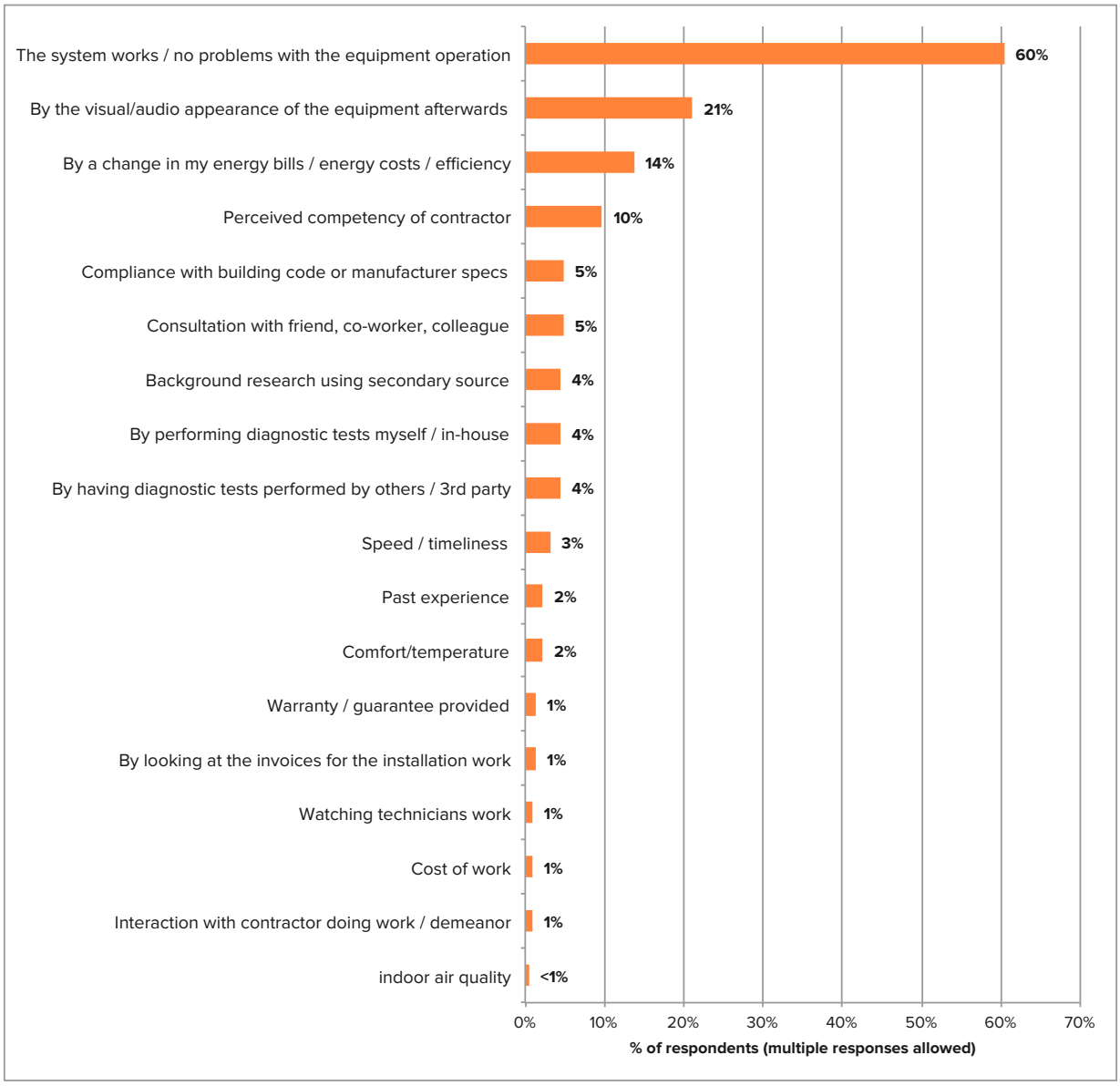
(n=197)

Step 5: Post-Purchase Evaluation

In the final stage of the decision-making process, commercial respondents did not appear more sophisticated than residential respondents in the methods they use to evaluate the quality of the HVAC equipment installation. The most common method used by respondents was simply to note whether or not the equipment seemed to be functioning properly (for example, this could be measured by a *lack of complaints* from building occupants). Some respondents did reference more advanced methods such as "compliance with building code or manufacturer specs" (5%) and having diagnostic tests performed in-house (4%) or by a third party (4%). There were minor difference by composite size class, with Class 1 customers (responsible for a single location) significantly more likely than Class 3 customers (responsible for multiple locations) to mention "by performing diagnostic tests myself or in-house" (8% of Class 1 customers vs. 1% of Class 3 customers).[34]

[34] This difference was significant using a Fisher exact test, $p < .05$.

Figure 6-7: Criteria Used to Judge the Quality of the Installation of New HVAC Equipment

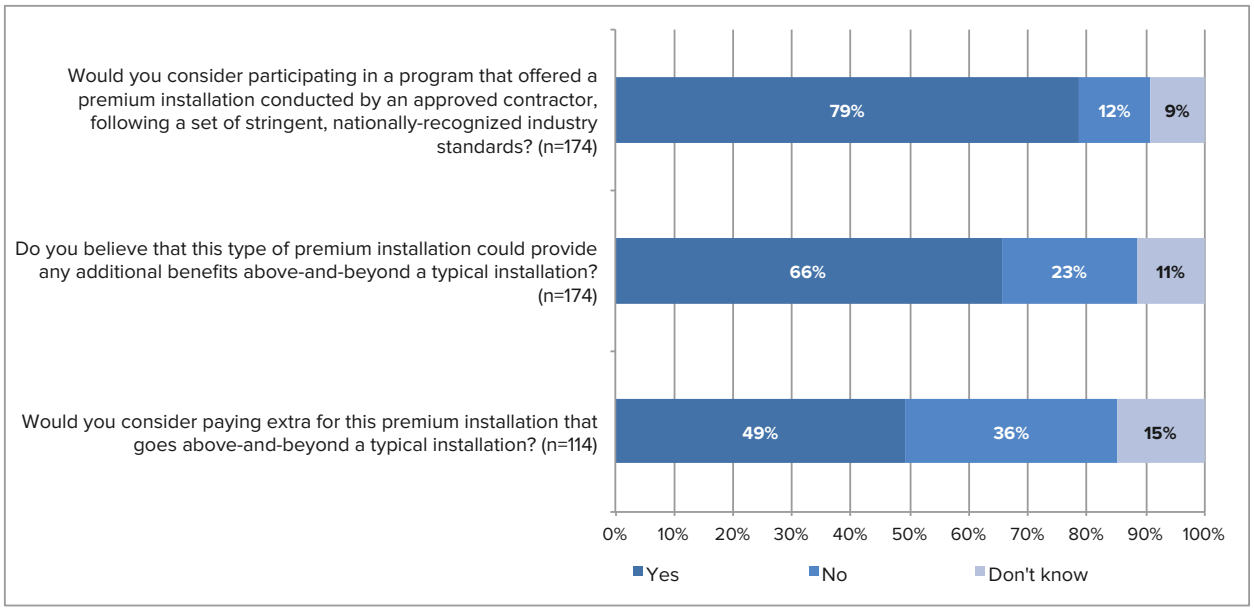


(n=227)

Receptivity to Quality Installation and Perceived Benefits

Commercial respondents generally seemed receptive to the idea of a premium, standards-based installation program, though they were less confident about paying extra for these services. When asked if they would consider participating in such a program, a clear majority (79%) of program nonparticipants said they would. Along the same lines, 66% of these nonparticipants thought that such a program could provide benefits *above-and-beyond* "typical" installation services, but when asked whether or not they might be willing to pay extra to participate in such a program, just under half (49%) said yes. As shown in Figure 6-8, for none of these questions were nonparticipants particularly *opposed* to the program or its potential benefits, instead they exhibited a substantial amount of *uncertainty* in the cost-benefit proposition. There were no statistically significant differences by composite size class for this question.

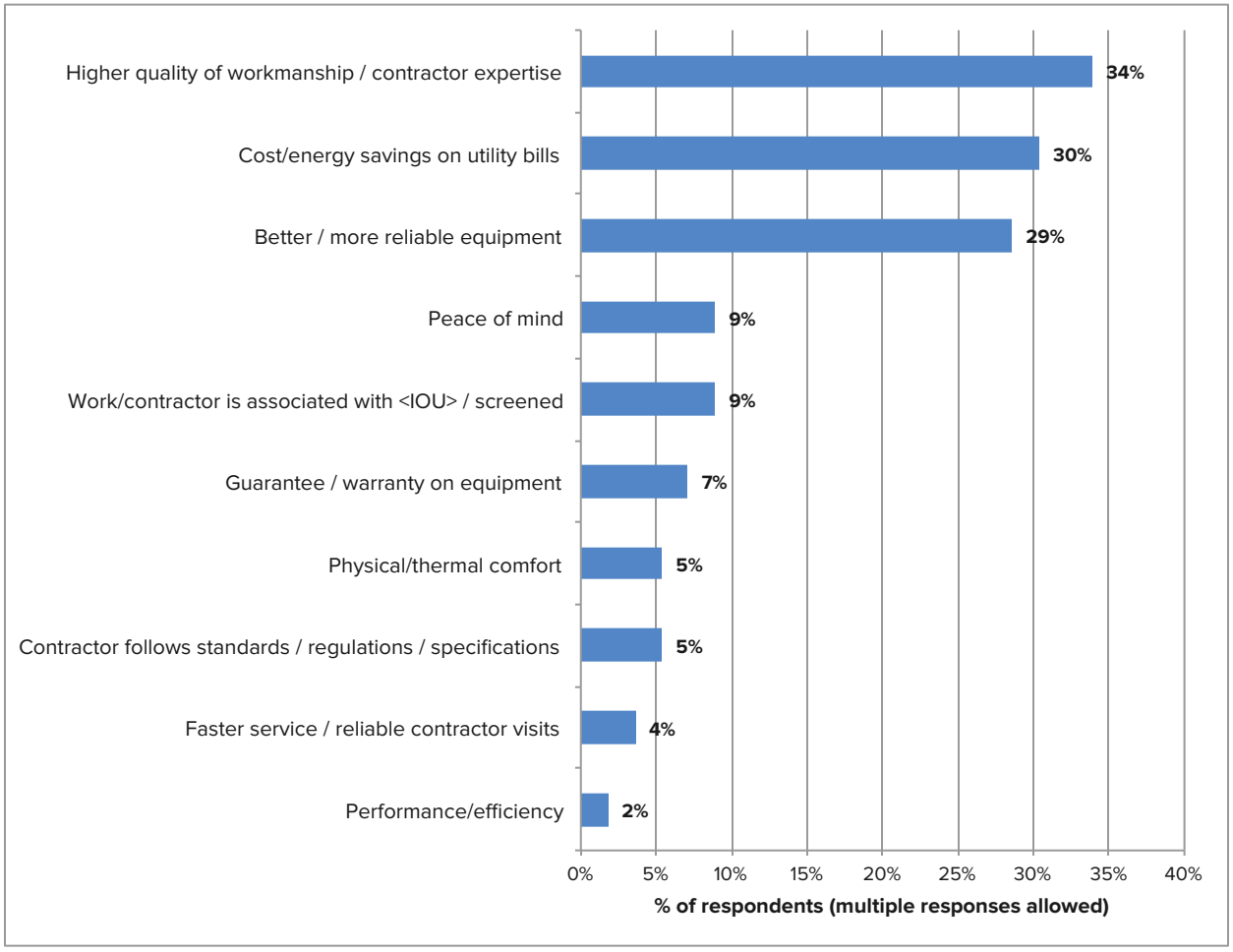
Figure 6-8: Receptivity to Quality Installation Programs



EMI CONSULTING

Nonparticipants had numerous and varied perceptions of the possible benefits of participating in a program offering premium, standards-based installation services, with some of the most commonly-mentioned benefits related specifically to the *contractor* (34% of nonparticipants mentioned *higher quality of workmanship* or *contractor expertise*. These respondents also mentioned benefits related to the equipment itself, including a reduction in one's monthly utility bills (30% of nonparticipants) and better reliability (29% of nonparticipants). There were no statistically significant differences by composite size class for this question.

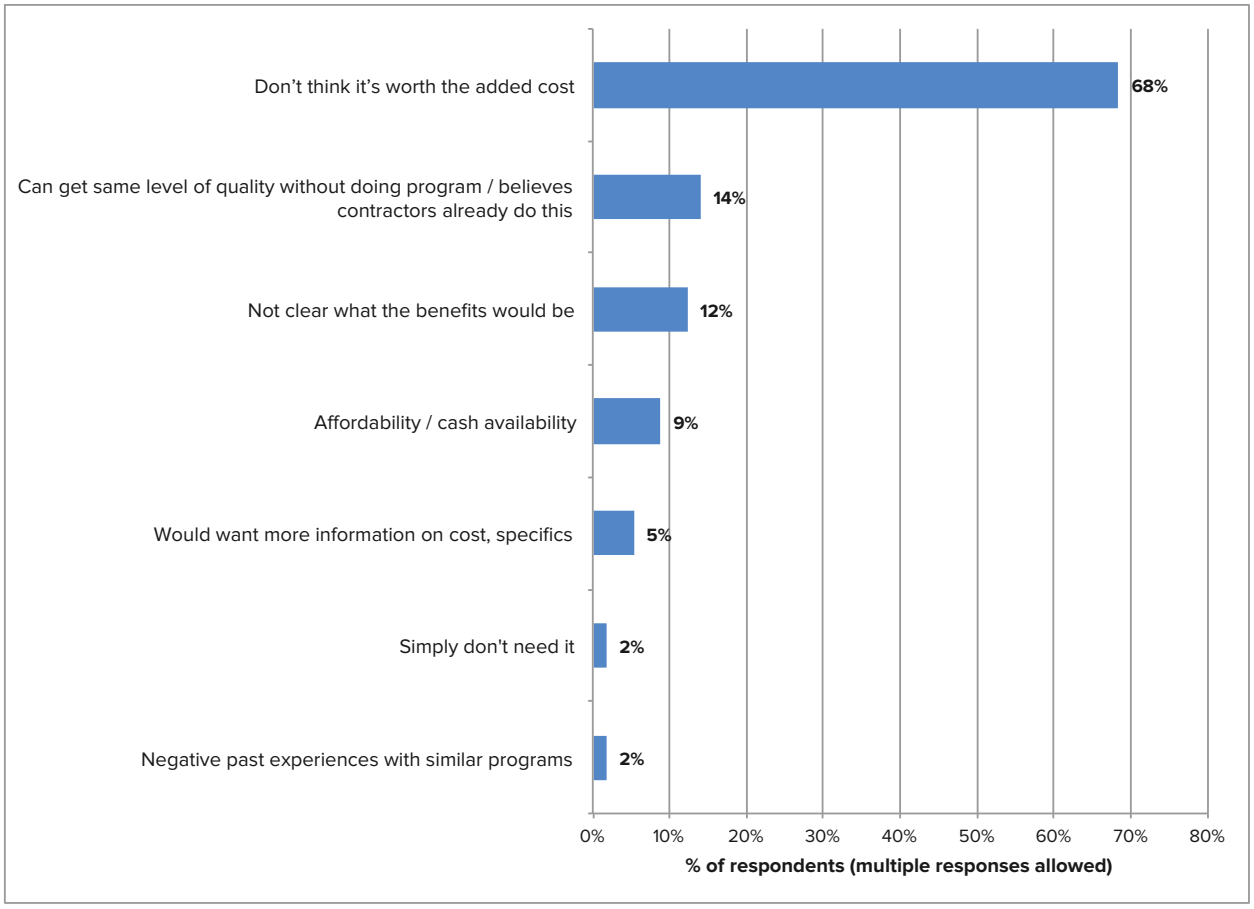
Figure 6-9: Nonparticipants' Perceived Benefits of Quality Installation



(n=56)

Figure 6-10 shows that the primary reason why nonparticipants said they were *unwilling* to pay extra for such a program centered on *cost-benefit uncertainty*. When asked why they would not pay extra, a clear majority (68%) of these respondents felt that it simply was *not worth the added cost*. An additional 14% of these respondents thought they could get the same level of quality without participating in the program, or that all contractors *already abide by these standards*. Only a small minority of respondents (9%) indicated that *affordability or cash availability* was a reason why they might not participate. On a promising note for such programs, only 2% of these nonparticipants said they *simply didn't need it*. In terms of composite size class, Class 1 customers (responsible for single location) were significantly more likely than Class 3 customers (responsible for multiple locations) to mention getting "the same level of quality without doing the program / believes contractors already do this" (6 out of 28, or 21% of Class 1 customers vs. 1 out of 40, or 2.5% of Class 3 customers).[35]

Figure 6-10: Nonparticipants' Reasons for Not Paying Extra for Quality Installation



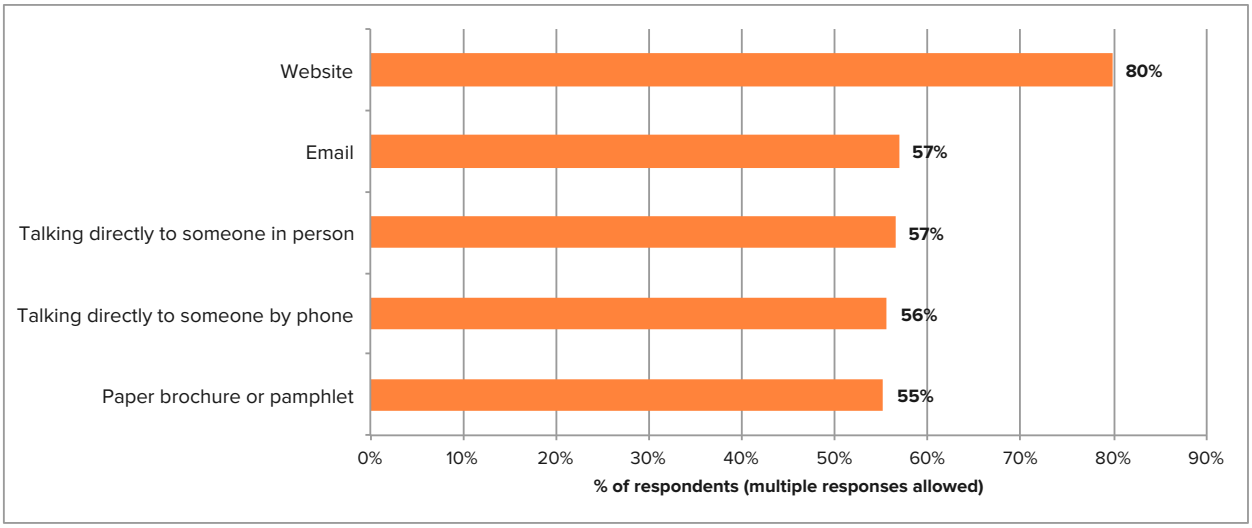
(n=57)

[35] This difference was significant using a Fisher exact test, $p < .05$.

Key Educational Needs – Commercial Customers

Figure 6-11 reveals that a majority (80%) of commercial respondents said they would be interested in receiving HVAC-related information in the form of a website; other favorable channels included email (57% of respondents) and talking directly to someone in person (57%). In terms of composite size class, Class 2 customers (responsible for a single location with more than three units) were significantly more likely than Class 1 customers (responsible for a single location with three or fewer units) to cite email as a preferred method for receiving more information (73% of Class 2 customers vs. 47% of Class 1 customers).[36]

Figure 6-11: Information Formats Preferred by Commercial Respondents

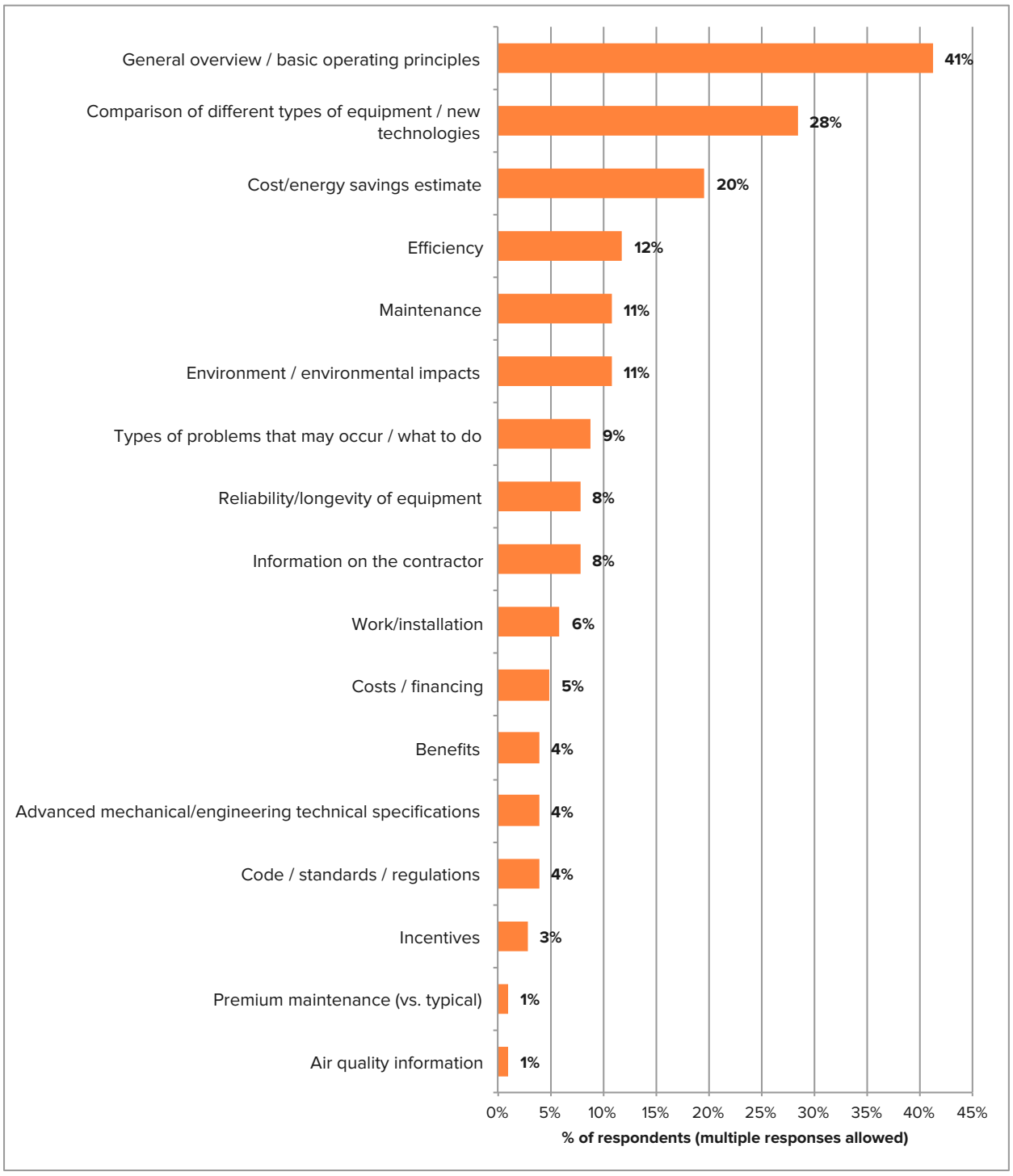


(n=248)

Forty-three percent of commercial survey respondents said they thought specific information on the installation and maintenance of heating/cooling equipment would be helpful to them. Figure 6-14 shows that when asked about what topics they would be most interested in, most commercial respondents (41%) indicated a general overview of HVAC equipment operation, while 28% mentioned being able to compare different units or technologies and 20% mentioned cost/energy savings estimates. There were no statistically significant differences by composite size class for this question.

[36] This difference was significant using a Fisher exact test, $p < .05$.

Figure 6-12: Information Topics Most Useful to Commercial Respondents



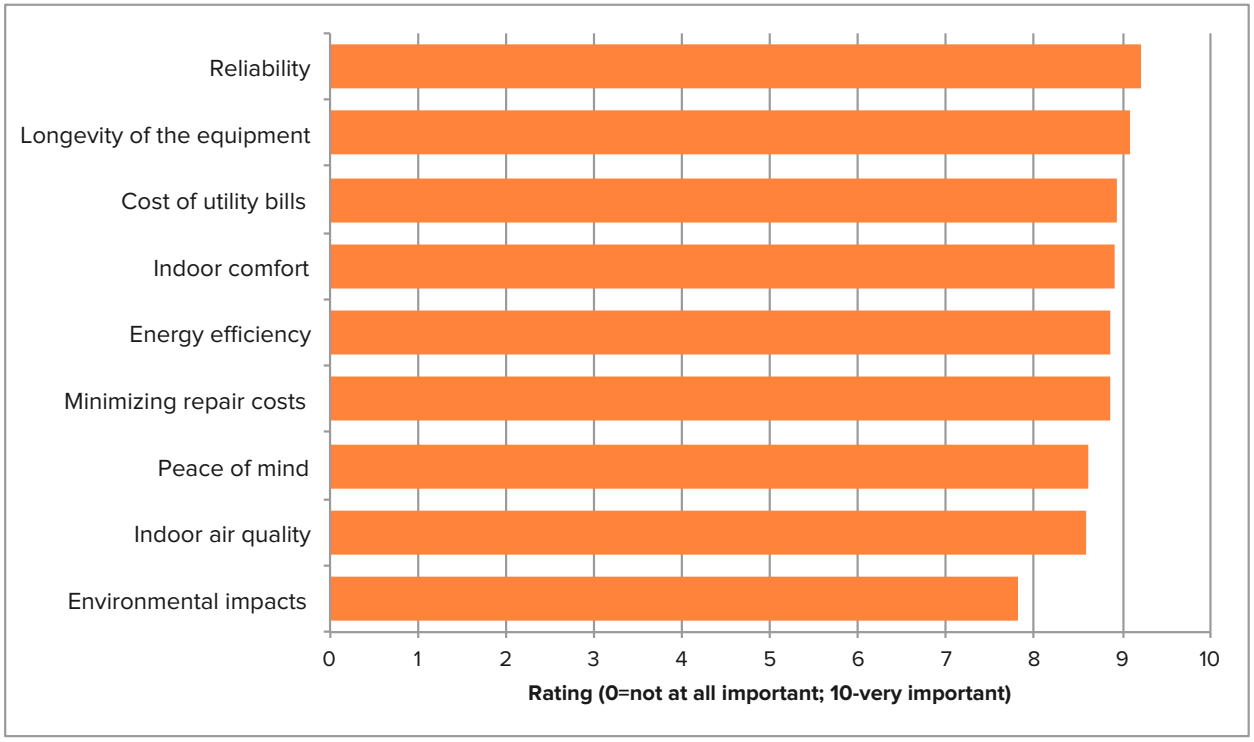
(n=102)

Estimating Commercial Customer Preferences for QI

In this section we discuss the results of the web-based discrete choice study conducted with commercial customers with regards to QI. As we discuss throughout this report, decision-making is a complex process that requires people to contemplate and weigh an array of factors before deciding on a final course of action. The more complicated the choices are, and the greater the number of factors playing a part in the decision, the more complex the decision making process becomes.

In the telephone survey, we used a traditional approach to assessing the variable effect that different factors might play in peoples' decisions. This approach consisted of asking survey respondents to rate or rank factors on a 0 to 10 scale, where 0="not at all important" and 10="very important". Figure 4-16 presents these results, showing that while reliability, longevity, cost of utility bills, indoor comfort, energy efficiency, and minimizing repair costs were scored the highest, all of the factors were reported to be relatively important; environmental impacts were rated the lowest, with a mean score of 7.8.

Figure 6-13: Commercial Telephone Survey Respondents' Ratings of Factors Related to HVAC Equipment



(n=249)

While the above results provide some insights into customers' preferences, as discussed in the Methods section, such an approach does not capture the complexity (i.e., trade-offs) inherent in the decision-making process. As such, we also conducted a discrete choice study. Table 6-1 shows the attributes and levels that were used for the commercial installation discrete choice study.

Table 6-1: Attributes and Levels Used in the Commercial Installation Discrete Choice Study

ATTRIBUTES	LEVELS
System reliability	1 day downtime
	3 days downtime
	5 days downtime
System longevity	No different than typical install
	5 years longer than typical install
	10 years longer than typical install
Environmental impacts	No less impact than typical install
	15% less impact than typical install
	30% less impact than typical install
Monthly cost savings	No savings over typical install
	15% savings over typical install
	30% savings over typical install
Up-front installation cost	No more costly than typical install
	15% more costly than typical install
	30% more costly than typical install

From the discrete choice data we were able to estimate a number of useful metrics that describe customer preferences for HVAC installation work that go beyond the simple telephone survey. The first metric we discuss is the *importance score* associated with each of the attributes.[37] The sum of importance scores for all attributes sum to 100%. Thus, the *importance scores* represent a "decision weight," or each attribute's individual contribution to the overall decision (in this case, the decision to install an HVAC unit).

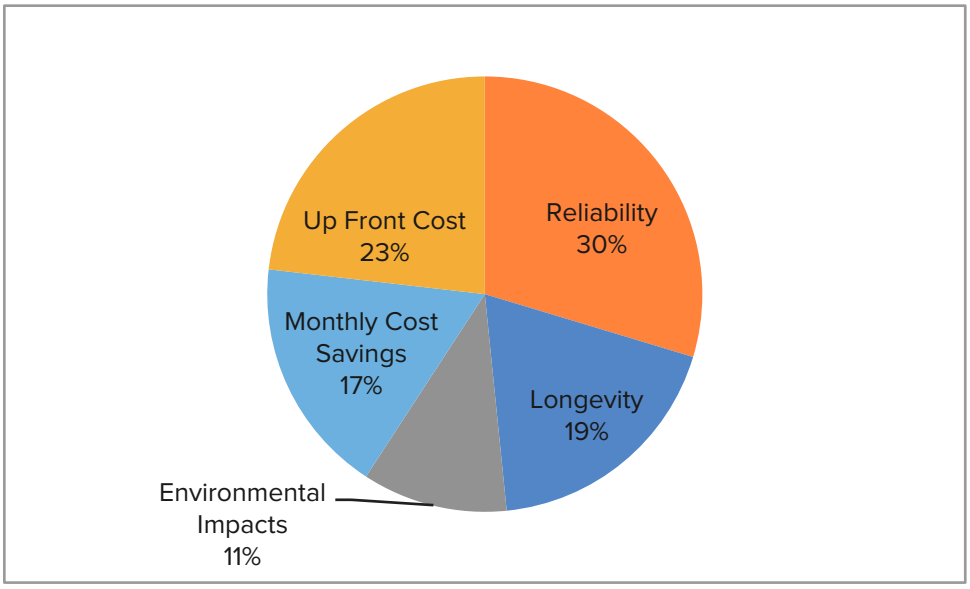
Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome.

Figure 6-14 shows that for commercial customers, the most important attributes were reliability (30% of the decision weight) and up-front cost (23% of the decision weight). This may be interpreted to mean that the expected reliability of the system has more influence on the average customer's HVAC installation decision than does the up-front cost. Longevity (19%) and monthly

[37] These importance scores were computed from part-worth utilities derived using Sawtooth Software's Hierarchical Bayes (HB) functionality.

cost savings (17%) also play a part in the decision but to a lesser degree; environmental impacts (11%) have the least influence of all the attributes tested.

Figure 6-14: Importance Scores for Commercial Installation Discrete Choice Study



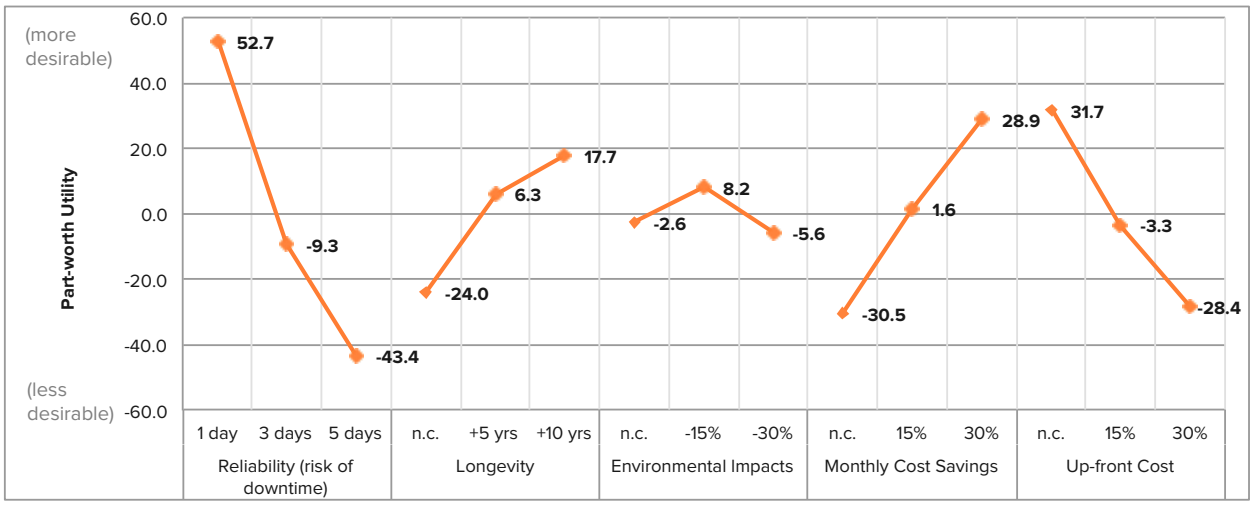
(n=337)

These importance scores can be further broken out into preference scores (referred to in discrete choice studies as "part-worth utilities") for each individual level of an attribute. Larger preference scores reflect a more "desirable" attribute level, as rated by the respondents. Figure 6-15 shows commercial respondents' preferences for individual levels of the five attributes tested in the commercial installation discrete choice analysis. Examination of these preference scores adds insights that go beyond those provided by simple review of the importance scores in Figure 6-14 by helping to clarify the sensitivity or elasticity of respondents' preferences across levels *within* an attribute.

For example, the attribute "monthly cost savings" exhibits a steady and notable increase in preference score from left to right, as the cost savings increase. For up-front cost, we see a steady and notable *decline* in preference score as the price increases. The rate of increase/decline is relatively similar across these two attributes, thus respondents' sensitivity to these two attributes is relatively similar.

Also from Figure 6-15 we see that the relationships between the levels of "reliability," "longevity," and "environmental impacts" are slightly more complicated. For reliability, people are very sensitive to a one to three-day change in downtime but less sensitive to a change to a three to five-day change in downtime. For longevity, people are more sensitive to a "no change" to five-year increase in equipment lifespan, but are less sensitive to a five-year to ten-year change. Environmental impacts exhibit an interesting pattern, where the most preferred level is the intermediate level (15% reduction in impacts) while the end points (no change and 30% reduction) are relatively similar. As discussed later in the commercial QM results, it is possible that this pattern reflects a need for some businesses to maintain a "green" image.

Figure 6-15: Commercial Respondents' Implicit Valuation of Individual Levels for Each Attribute



These results suggest that marketing strategies for commercial QI programs should focus on emphasizing the associated improvements in reliability – this overrides all other attributes tested for commercial customers. Monthly cost savings and longevity might also be emphasized as key components of this program. However, it is important to note strategies might be aimed at helping minimize or reduce customer costs (e.g., added incentives), or else receptivity to residential QI programs may suffer regardless of the message. **It must be noted that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.**

6.2 Commercial Installation Decision-Making: Synthesis

In this section we first present a brief summary of the results discussed earlier in this chapter. We then provide synthesis of key themes and make several recommendations to drive customer receptiveness to commercial QI offerings.

Summary and Key Points: Commercial Installation Decision-making

Here we summarize key points from each decision step for HVAC installation decision-making:

Problem/Need Recognition

- Overall, many commercial customers appear to wait until their equipment needs to be replaced before purchasing new HVAC equipment. Thirty-five percent of survey respondents who had purchased HVAC equipment for their organization did so because their existing equipment had failed completely. However, certain businesses rely heavily on their HVAC systems to work well.
- An additional 21% of the respondents who had purchased equipment did so as part of a remodel or new construction project.

Information Search

- Contractors are a critical information source for the commercial HVAC market. Just over half the respondents (54%) said they would consult a contractor if they had a question about the proper installation or maintenance of HVAC equipment, while utility associated sources (website, representative, mailing, or not specified) were mentioned by approximately 15% of respondents.

Evaluation of Alternatives and Purchase Decision

- When selecting equipment, commercial customers appear to acknowledge the importance of energy efficiency ratings and appropriate system sizing. Survey respondents rated these two attributes slightly higher than other attributes tested (9.0 and 8.9 on a 0-10 scale, respectively).
- Customers responsible for only one location with three or fewer units were more likely than customers responsible for multiple locations to mention *reliability* as an important factor in selecting a contractor, and less likely to mention *cost*.

Post-purchase Evaluation

- Many commercial customers do not appear to use sophisticated methods to assess the quality of their HVAC installations, with 60% of survey respondents indicating they would simply note whether there appeared to be any operational issues with the equipment. An addition 21% said they would judge the installation by the way it looks or sounds.
- Only 21% of survey respondents said they would judge the quality of installation by a change in their monthly utility bills.
- Customers responsible for only a single location with fewer than three units were more likely than customers responsible for multiple locations to mention performing diagnostic tests themselves (or in-house) to evaluate the quality of their HVAC installation work.

Key Themes and Recommendations: Commercial Installation Decision-making

In this section we discuss several key themes from the commercial telephone and discrete choice surveys and then provide recommendations to stimulate demand for commercial QI program offerings:

Theme #1: **Commercial customers are receptive to the idea of QI but could use more information on the benefits.** Most commercial customers we surveyed would be willing to participate in a program that offers premium installation services for their HVAC equipment, but many indicated they could use more information clarifying the benefits. Of those program nonparticipants who indicated they would not pay extra for QI, the most popular reasons were “not worth the added cost,” “believes contractors already do this,” and “not clear what the benefits would be.”

Recommendation: Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits of premium, standards-based installation. However, it is critical that this information must not be overstated. If this information cannot be provided in

this form, efforts should instead be made to provide concrete examples of success through case studies of real projects. Additionally, this messaging should strive to clarify the differences between QI services and traditional installation services.

Theme #2: **Commercial customers are particularly sensitive to improvements in the reliability of their HVAC systems.** In the discrete choice survey, commercial respondents exhibited strong preferences for alternatives that minimized the risk of system downtime. In aggregate, commercial respondents attributed greater importance to reliability than to any other attribute tested.[38]

Recommendation: When promoting the benefits of premium, standards-based installation, messaging to commercial customers could focus on the increased reliability resulting from these services (assuming that increased reliability is in fact a benefit attributable to QI/QM). Additionally, this messaging could benefit from providing information that is more specific or concrete than just "greater reliability."

Theme #3: **Commercial customers are highly reliant on contractors for information about HVAC installations.** Nearly half (48%) of commercial respondents indicated they would consult a contractor for more information on proper HVAC installation (or maintenance). Additionally, of the commercial respondents who had participated in a QI/QM program, "contractor" was tied with "utility representative" as the source from which most customers had initially become aware of the program.

Recommendation: Increase outreach efforts to contractors. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QM.

[38] If actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.

7. COMMERCIAL MAINTENANCE DECISION-MAKING

This chapter presents the results of three related but separate phases of research aimed at better characterizing the decision-making process used by commercial customers when purchasing HVAC maintenance services:

- A series of IDIs with QM participants
- A telephone survey with both participants and nonparticipants
- A web-based discrete choice survey conducted with commercial customers

This chapter is divided into subsections for (1) the results of the IDIs, and (2) the results of the telephone survey and discrete choice study. The chapter concludes with a synthesis of these results and presents several recommendations for messaging to drive customer receptiveness to QM program offerings in the market.

7.1 In-Depth Interview Results

In this section, we discuss the findings from the IDIs conducted with commercial QM program participants and summarize results in alignment with the conceptual framework guiding this study—the customer decision-making model. For a more detailed discussion of the methods used to conduct the IDIs, please see the Methods chapter in this report.

A total of ten IDIs were conducted during June of 2014 by EMI Consulting staff. The IDIs typically lasted anywhere from 20 minutes to 35 minutes. All interviews except one were recorded and notes for each respondent were written immediately following each interview. As with the focus group analysis, EMI Consulting team analyzed the in-depth interviews with small-commercial customers and organized the findings according to the customer decision-making model.

In this section, we describe IDI findings organized by each step of the five-step decision-making process as it pertains to commercial HVAC maintenance decisions.

Step 1: Problem/need recognition

While there was a great deal of variability in terms of what motivated small commercial customers to begin thinking about purchasing a maintenance service contract (much of this attributable to the type of business), one common theme emerged across business types – these program participants were knowledgeable about HVAC equipment operation and had realized that the *heart* of their business operation was affected to some degree by the heating, cooling, and ventilation in their facilities.

As an example, several participants from manufacturing facilities indicated that having regularly scheduled maintenance and priority service was critical to keeping their non-HVAC equipment in good condition. One participant noted that the cost of having his data servers damaged by malfunctioning HVAC equipment would be substantial. His decision to participate in a maintenance service agreement thus helped to safeguard against such an event. This participant mentioned obtaining these contracts as soon as the building was built. For other participants whose business model was dependent on the satisfaction of their clients, a common driver was building occupant *comfort*. This was the critical factor in buildings where there were medical facilities, educational facilities, or in buildings with assembly spaces (such as churches).

SOME REPORTED PRIMARY DRIVERS FOR PURCHASING QM CONTRACTS:

"Cost and preservation of the equipment."

"Resident comfort."

"Seeing [problems] before they happen."

"Preventative maintenance."

Energy efficiency by itself seemed to be of *primary* importance for two respondents. To most respondents, energy efficiency was important because of its association with lower energy bills, and it appeared to be the case that all of the IDI subjects had made the connection between the two (level of understanding regarding how their HVAC systems operated is discussed in the next section).

"An administrator is not going to have the time to go out to the site and see if the set points are right, or sometimes the clock is wrong…"

One IDI respondent reported that she spent 100% her time addressing energy issues for her organization and as a result, she often thought about the amount of energy that their HVAC systems use. She reported being responsible for reviewing energy bills, conducting audits at sites to see how the equipment is running, and identifying savings opportunities. She also noted that she scheduled the energy management system runtimes, adjusted the set points, and worked with their in-house HVAC technician to keep the equipment operating properly. She believed that having the time to check on the systems herself was very important – she also noted that while her organization had a handful of in-house technicians, they were so busy making repairs that they rarely had time to perform *routine* maintenance on the systems. Further she noted that her superiors, who were primarily administrators, simply did not have time to deal with the issues pertaining to the minor logistical details of equipment operation.

Step 2: Information search

While a majority of interview respondents reported having a moderate level of understanding regarding the operation of HVAC equipment, very few of them were experts. Thus, identifying reliable outside sources of information was an important skill that was common to most of the participants interviewed. A majority of them referenced using the Internet (and in particular, Google's search engine) as one of the first places where they would begin their information search. As one respondent noted: "I'm an Internet man. I go to Google and ask a question. And I get some kind of idea before I call [my contractor]." Several participants indicated that they were likely to use information from SCE, while others preferred to see information straight from the manufacturer (the format of this information was not specified).

There was significant variation in the manner in which these customers had heard about the maintenance contract option for their businesses. In some cases, a contractor with whom they had previously worked turned customers on to the idea of a maintenance program. One participant reported that his previous SCE account manager would compile energy consumption statistics for his building and discuss these with him in person. This respondent reported that having a personalized paper letter or email from the utility would "not be the same." Another participant, an individual who served as an energy coordinator for a school district, indicated that she had proactively approached SCE to inquire about programs that may be helpful to the schools. She was able to become involved with the QM program but felt that other program options were limited for her because much of the HVAC equipment was heating only (she reported not being eligible for certain incentive programs because of this). Yet other customers reported having had some type of service contract for several years, which in some cases preceded the individual currently holding their position.

Steps 3 & 4: Evaluation of alternatives and purchase decision

The level of evaluation varied between firms; it was common for customers to get bids from 2-3 contractors before signing a maintenance service contract. For those customers who had solid working relationships with existing contractors, this was generally a more streamlined process. Other customers indicated doing a round of "cross referencing" before finally deciding which contractor to choose. This was particularly common among respondents who indicated they were wary of contractors in general because of past experiences.

While a number of respondents mentioned receiving rebates for participating in the program, usually rebates were not a primary motivator in the process. However, customers did mention that rebates are universally a good way to "sweeten the deal." The respondent who worried about his data servers indicated that while the rebate was "nice," it was not the driving factor for him to purchase a QM agreement.

> "I've heard of a lot of other <IOU> programs but not 'Quality Maintenance.'"

Awareness of the "Quality Maintenance" name was generally low across the respondents. A vast majority of IDI respondents said they had never heard of the term "Quality Maintenance" even though they recognized the fact that they were participating in a SCE program. Several people referred to it by the "ACCA 180" designation while others simply referred to it as the "optimization" or "HVAC optimization" program (the name SCE's QM program is marketed under).

Step 5: Post-Purchase Evaluation

Customers judged the quality of the maintenance they were receiving through many different methods and with varying levels of sophistication. Only a few respondents indicated that they would follow the technicians around and perform spot-checks of the maintenance work, and even when this was done, there was not necessarily a clear methodology for evaluating the results. One participant, a facilities manager who had been working at the same facility for a number of years, reported being able to listen to the sound that the units made and be able to tell if they had been properly serviced or not. Many of these seemingly more knowledgeable respondents did indicate performing a consistent review of the invoices from their contractor and in some cases asking for adjustments to be made.

Respondents who were seemingly less knowledgeable about HVAC system operation tended to rely on a different set of methods to assess the quality of the maintenance they were receiving. In some cases, respondents reported they were able to use other in-house staff members to perform these checks (though this option was not always available). Those respondents who were the least knowledgeable about HVAC operation noted that they judged the quality of the maintenance work only by whether or not there were any noticeable problems with the functioning of the equipment.

7.2 Survey Results

To more accurately characterize some of the findings from the in-depth interviews with commercial QM participants, EMI Consulting conducted two related but distinct surveys. First, a telephone survey was conducted with 250 commercial decision-makers, including 75 program participants and 175 nonparticipants. The second survey phase consisted of a web-based discrete choice study that we used to gain a deeper understanding of the aspects of premium, standards-based maintenance practices that these customers are most interested in. We present the survey results for commercial maintenance decision-making in the following sections:

- Maintenance Behavior Profile: Here we present findings on commercial customers' current HVAC maintenance behaviors.
- Maintenance Decision-Making Steps: In this section we use telephone survey data to characterize each stage of the five-step decision-making model discussed previously in this report.
- Receptivity to QM and Perceived Benefits: In this section we present information on customer receptivity to QM value propositions.
- Key Educational Needs: Here we provide a discussion of educational topics that respondents would find useful, as well as information on their preferred format for these materials.
- Estimating Customer Preferences for QM: In this section we present results of the discrete choice survey for commercial maintenance decisions.

We then conclude the chapter with a summary and discussion of the overall findings in the final section. To better understand how different size firms responded to these questions, differences between customers assigned to different classes using a composite size index (as described in the Methods chapter) are presented when statistically significant.

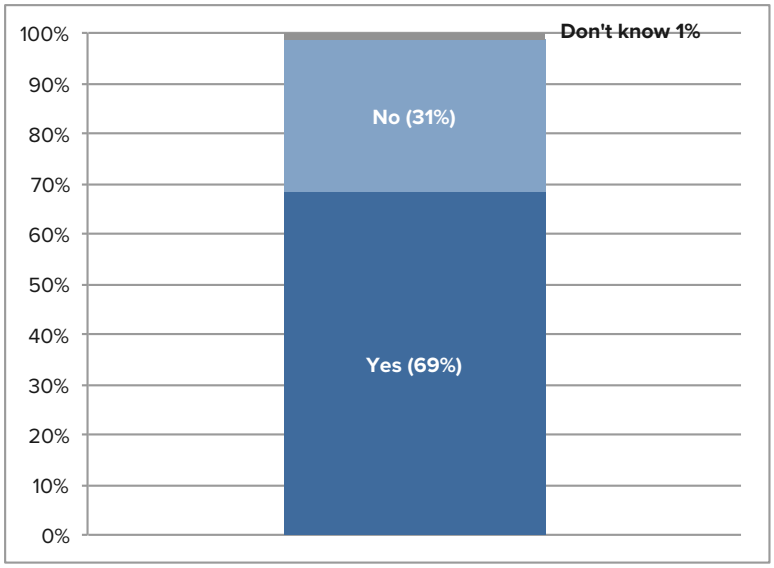
Maintenance Behavior Profile

A majority of commercial respondents (74%) reported that they currently perform periodic, preventative maintenance on their HVAC equipment, while a quarter (25%) indicated they do not (additionally, 1% of respondents were not sure). Figure 7-1 shows that among nonparticipants, only 31% of respondents indicated they do *not* have maintenance performed while 1% were not sure whether they have maintenance performed or not. There were statistically significant differences between composite size classes for this question, with Class 1 customers (responsible for a single location) significantly less likely than other types of customers to report having

preventative maintenance performed (63% of Class 1 customers vs. 89% of Class 2 customers vs. 78% of Class 3 customers).[39]

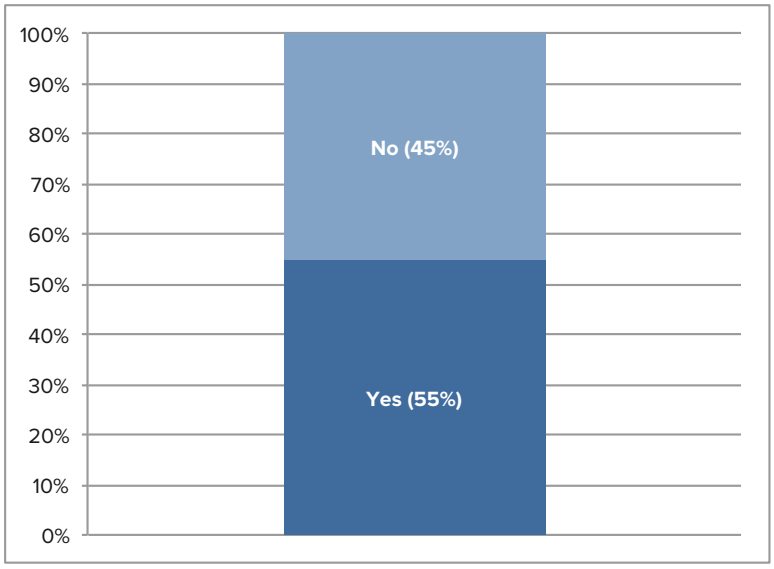
Among nonparticipants who have preventative maintenance performed, only 55% indicated this maintenance was covered under some sort of maintenance contract. This means that almost half (45%) of nonparticipants who have maintenance performed do so on an "as needed" basis.

Figure 7-1: Nonparticipants Performing Preventative HVAC Maintenance



(n=174)

Figure 7-2: Percentage of Nonparticipants Whose Maintenance is Covered Under Contract

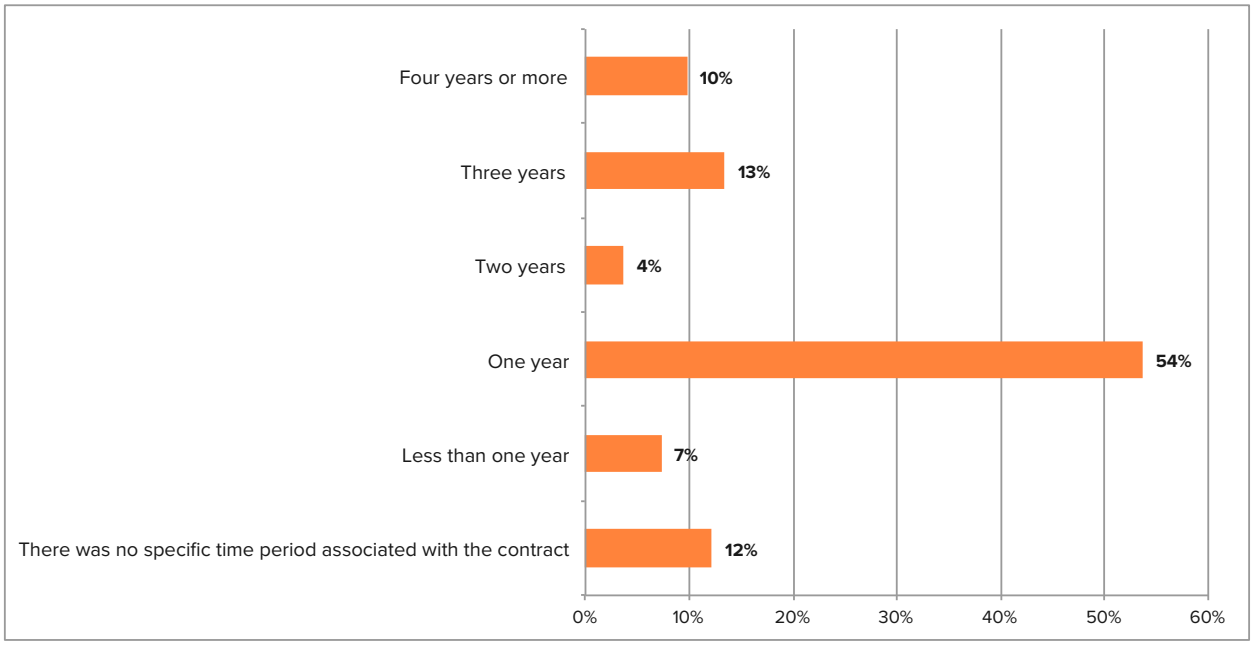


(n=93)

[39] This difference was statistically significant using a two proportions z-test, $p < .05$.

Figure 7-2 shows that among those respondents who reported having a maintenance contract, a majority (54%) had a contract length of one year. A minority of respondents (10%) had a contract that was four or more years in duration, while 12% had no specific duration associated with their contract. There were no significant differences between participants/nonparticipants or between composite size classes in their responses to this question.

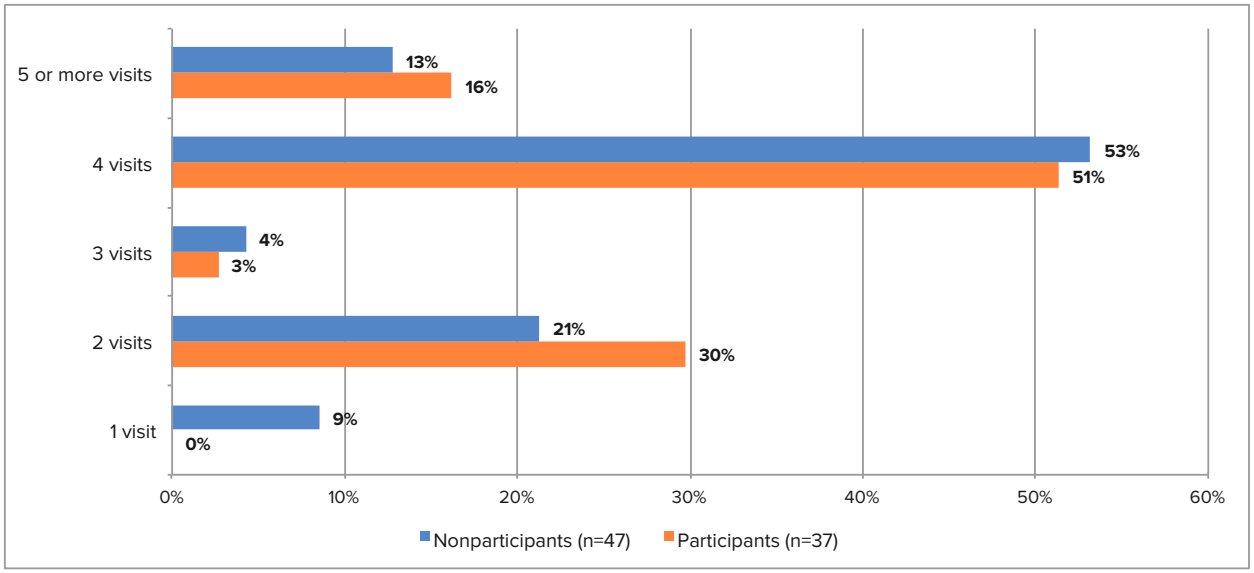
Figure 7-3: Length of Maintenance Contracts



(n=82)

Participants and nonparticipants were nearly identical in terms of the number of visits they received as part of their maintenance contracts, with the minor exception that 9% of nonparticipants had only one visit per year while none of the participants had fewer than two visits per year (Figure 7-4). It is interesting to note that similar proportions of participants (51%) and nonparticipants (53%) reported receiving four visits per year as part of their contract. There were no statistically significant differences by composite size class for this question.

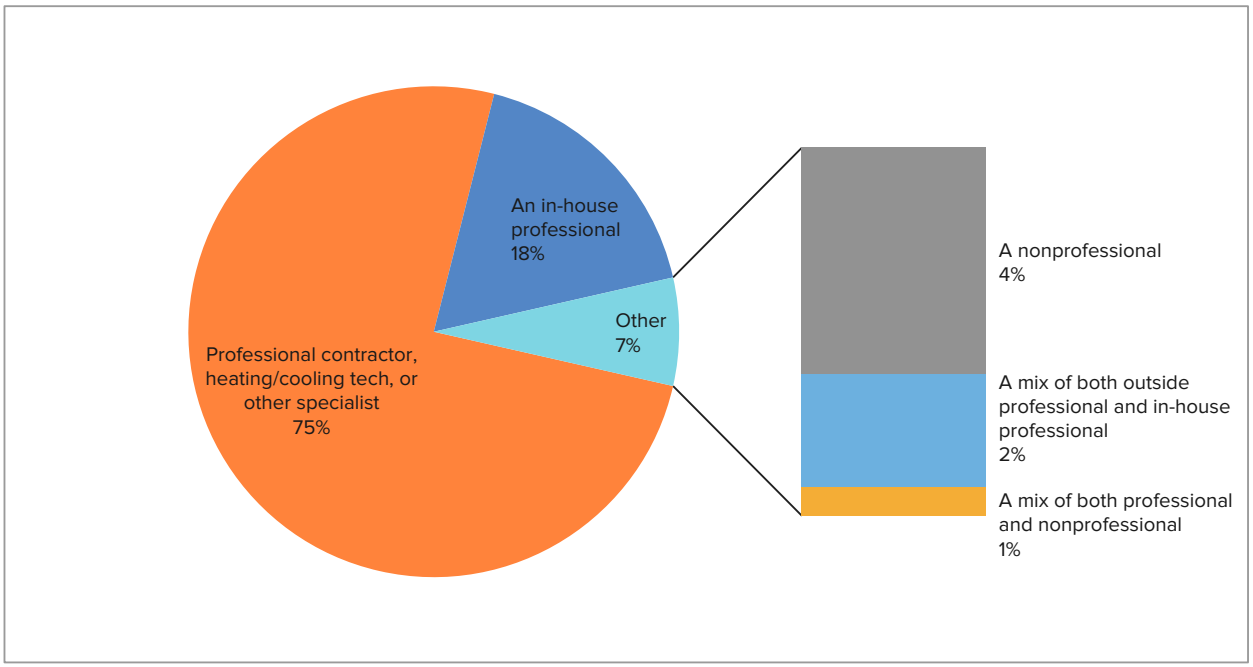
Figure 7-4: Number of Annual Visits Included with Maintenance Contract



(n=84)

A majority (75%) of respondents who have maintenance performed have it done by a professional outside contractor or technician, while nearly a fifth (18%) have it performed by an in-house staff professional (Figure 7-5). Only 4% of respondents indicated that a nonprofessional performs their maintenance. There were no statistically significant differences by composite size class for this question.

Figure 7-5: Types of Maintenance Providers for Commercial Respondents



(n=183)

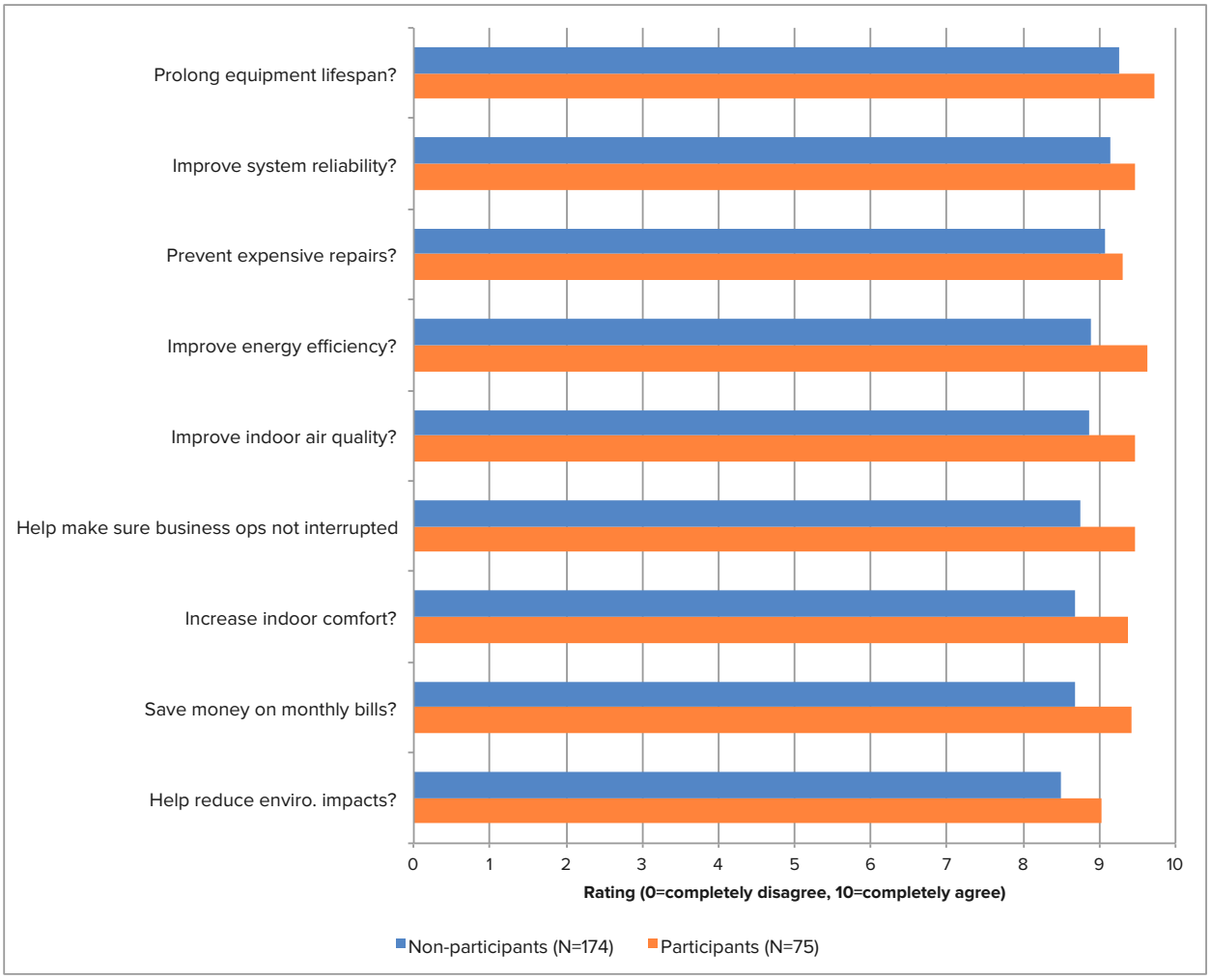
Maintenance Decision-Making Steps

In this section we present telephone survey results organized by the five-step decision-making model discussed previously in this report. At each stage, we describe the strategies used by respondents to guide their decision, and where appropriate, highlight potential drivers and barriers for greater receptiveness to QM programs.

Step 1: Problem/Need Recognition

Survey respondents recognized that good reasons to perform regular maintenance include *prolonging the life of their HVAC equipment*, *improving system reliability,* and *helping prevent expensive repairs*. Figure 7-6 shows that when asked to rate their agreement with a number of statements regarding the benefits of regular maintenance, respondents rated nearly all of them as equally important – however, they rated longevity and reliability slightly higher than other considerations (across all respondents, a mean of 9.4 for longevity and 9.2 for reliability on a ten-point scale). Most respondents did not feel strongly that performing regular maintenance can help reduce the environmental impacts of their equipment (across all respondents, a mean of 8.6 on a ten-point scale). There were no statistically significant differences by composite size class for this question.

Figure 7-6: Respondents' Beliefs Regarding Regular Maintenance



(n=249)

Participants rated all of these considerations higher than nonparticipants except for the statement "regular maintenance can help prevent expensive repairs."[40] Although it is impossible to say with certainty why this trend exists, one likely explanation is that program participants are better informed than nonparticipants about the benefits of regular maintenance.

Step 2: Information Search

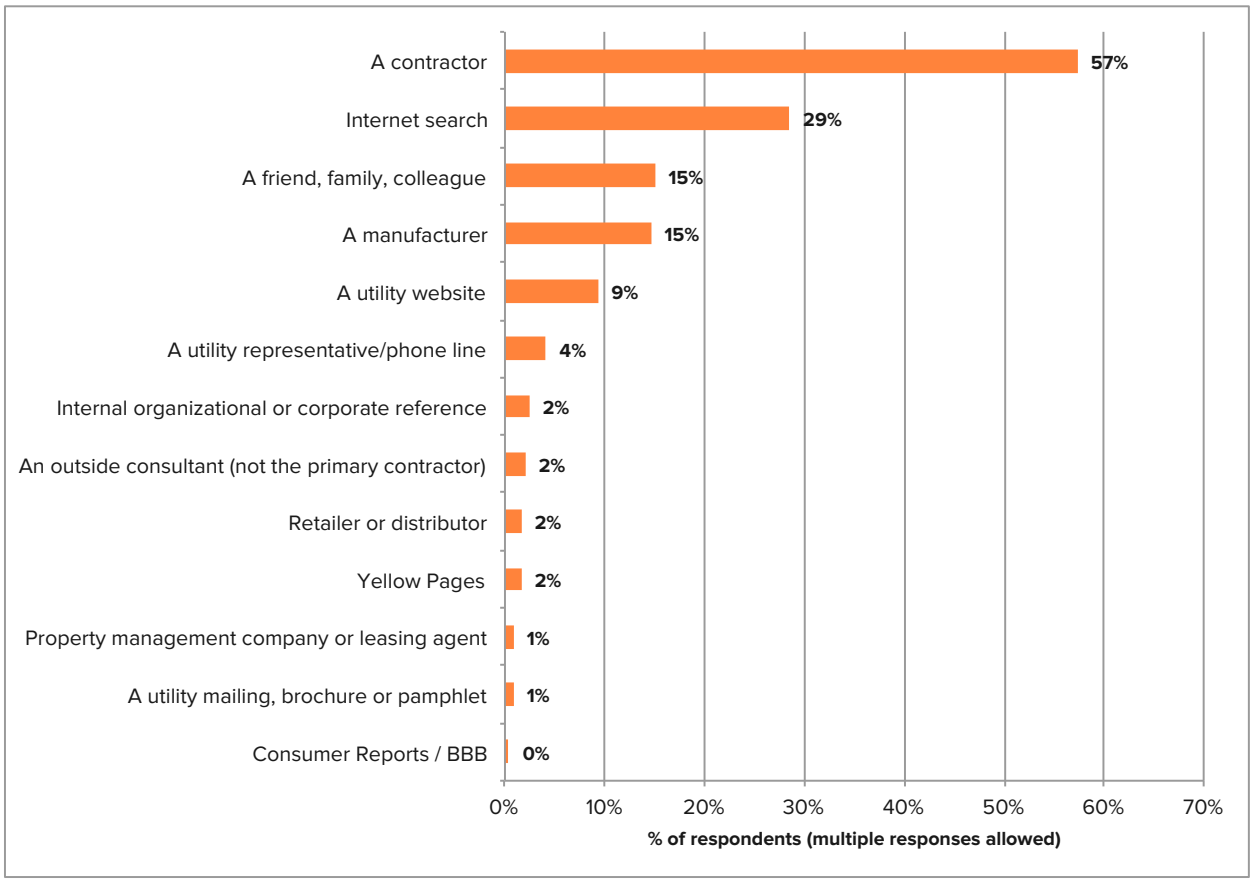
In the information search stage, commercial customers rely mainly on contractors and the Internet to answer any questions they may have on the proper maintenance of HVAC equipment. When asked what source of information they would consult for answers, over half the respondents (57%) indicated they would be most likely to consult a contractor, while nearly a third (29%) would perform a general Internet search. Respondents were less likely to rely on utility-associated sources of information, such as a utility website (9% of respondents), a utility

[40] Utilizing an independent samples t-test, these differences between participants and nonparticipants were all found to be statistically significant at alpha=0.05 except for the statement "Regular maintenance can help prevent expensive repairs."

representative/phone line (4% of respondents), or a utility mailing/brochure/pamphlet (1% of respondents). There were no statistically significant differences by composite size class for this question.

Although not mentioned as frequently as other sources, a small percentage of respondents (15%) did indicate they would consult an equipment manufacturer to help answer questions regarding the maintenance of their HVAC equipment. This may suggest that manufacturers could serve as an additional marketing channel for generating program awareness.

Figure 7-7: Sources Respondents Would Consult Regarding Question on Proper HVAC Maintenance



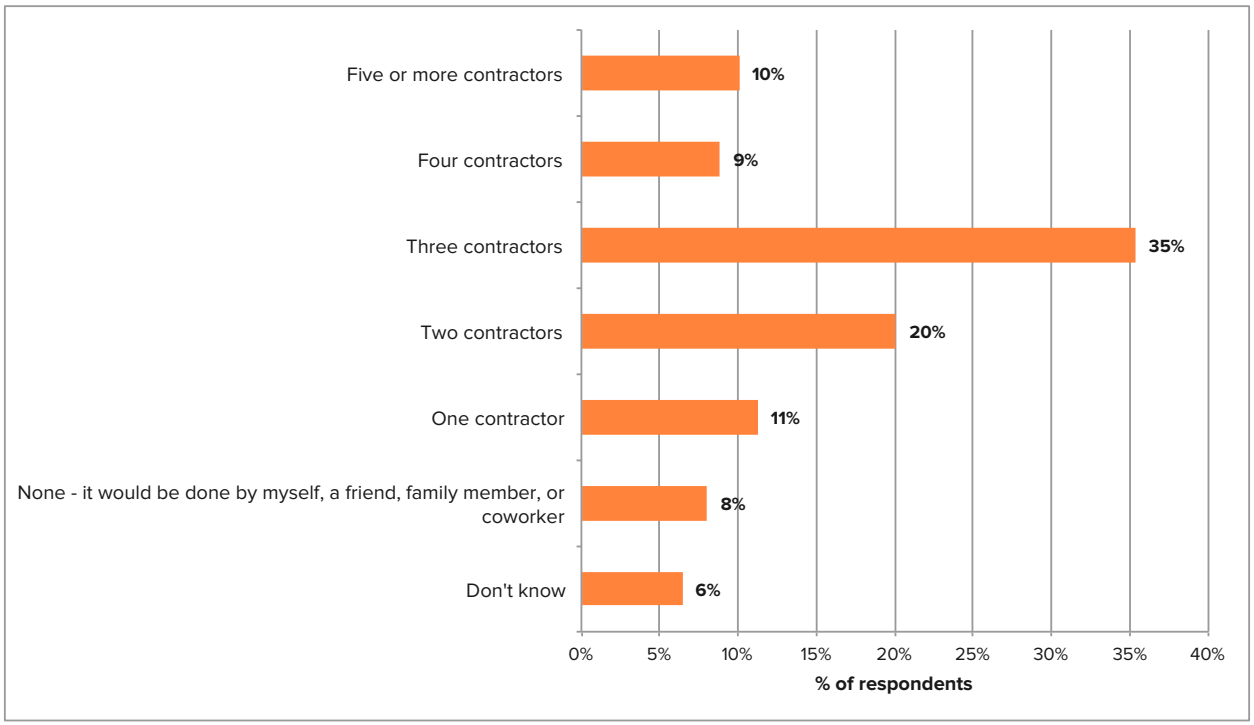
(n=246)

Steps 3 & 4: Evaluation of Alternatives and Purchase Decision

A majority of survey respondents indicated they would consider multiple contractors before selecting one to perform maintenance services, with the largest percentage of respondents choosing to consider three contractors (35% of respondents). Only 11% of respondents said they would only consider a single contractor, while 8% said they wouldn't have a contractor do the work at all (8%), or that they weren't sure how many contractors they would consider (6%). This is another indication that the HVAC services market is *competitive* and suggests that anything contractors can do to help differentiate themselves – like offer QM services – would be a great advantage.

In terms of composite size class, Class 3 customers (responsible for multiple locations) were more likely than Class 1 customers (responsible for only one location) to report that they would not consider any contractors but would instead have the maintenance performed by themselves, a friend, family member or co-worker (5 out of 25, or 20% of Class 3 customers vs. 1 out of 30, or 3% of Class 1 customers).[41]

Figure 7-8: Number of Contractors Respondents Would Consider Before Selecting One



(n=249)

When selecting a contractor to perform maintenance services, commercial customers appear to be fairly price-sensitive, though they recognize the importance of other contractor characteristics. A substantial percentage of respondents (45%) mentioned low cost as an important consideration in this process. Respondents also reported that a contractor's reputation was important (36% of

[41] This difference was significant using a Fisher exact test, $p < .05$.

respondents) and that the timing/availability of the contractor to perform the work was important (20% of respondents).

Nearly a fifth of respondents (18%) indicated that a *past relationship with a contractor* was an important factor in their selection process. If the customer is satisfied with their maintenance services and the contractor does *not* offer QM services, this scenario represents a potential barrier to greater QM participation. These customers would likely require a particularly attractive value proposition to convince them to switch to a new provider, or else to have more contractors provide QM services.

Among customers who did not work with a specific contractor, Class 3 customers (responsible for multiple locations) were significantly more likely than Class 1 customers (responsible for only one location) to mention "Contractor's licenses / certifications / experience" as an important factor (6 out of 19, or 32% of Class 3 customers vs. 2 out of 29, or 7% of Class 1 customers).[42]

[42] This difference was significant using a Fisher exact test, $p < .05$.

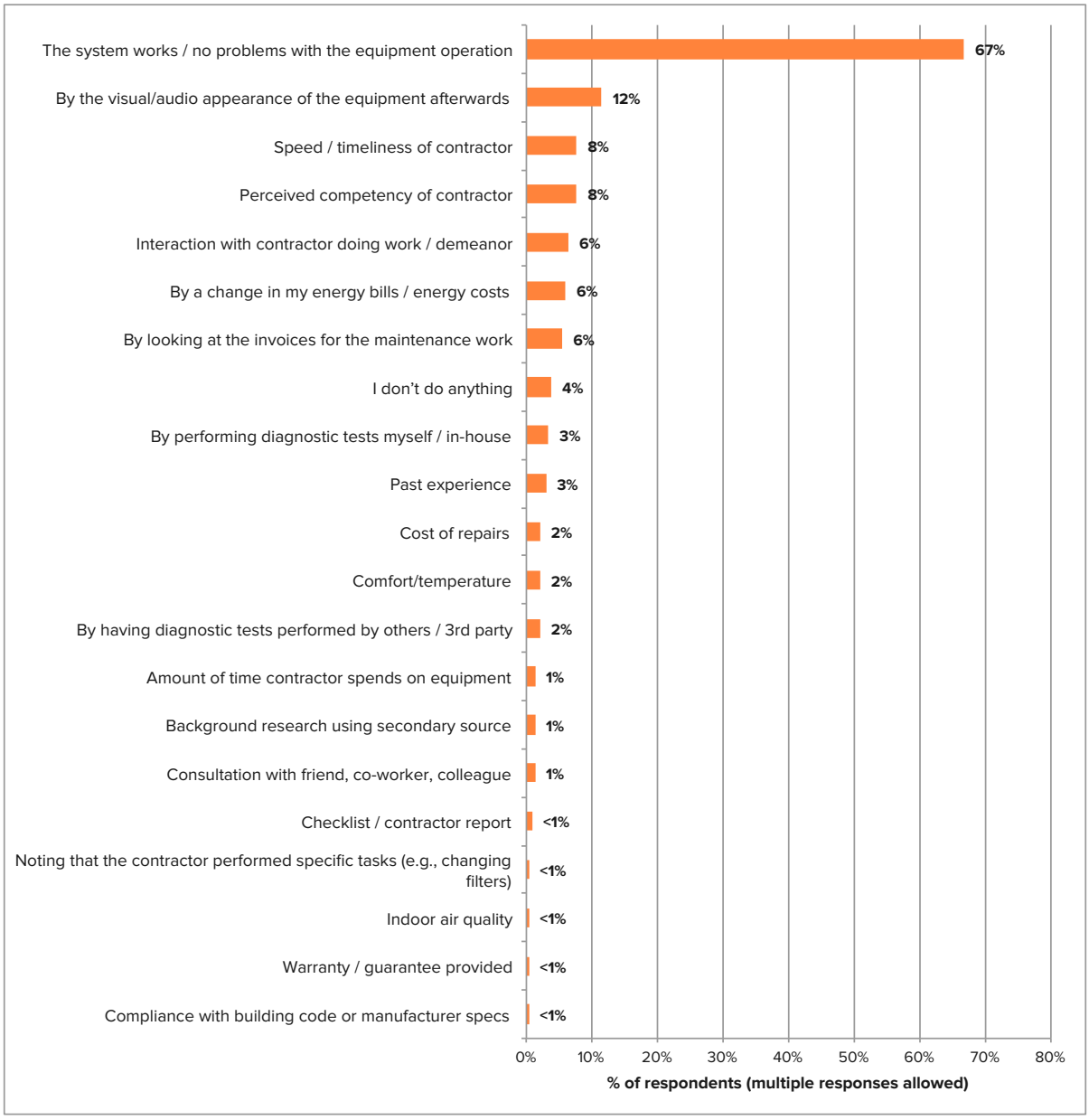
Figure 7-9: Factors Influencing the Selection of a Maintenance Contractor

(n=222)

Step 5: Post-Purchase Evaluation

In the final stage of the decision-making process, customers must evaluate the purchase they have made. When asked how they evaluate quality of maintenance, about two-thirds of survey respondents (67%) indicated they would simply note whether or not the system seemed to be working properly. An additional 12% said they would judge this maintenance by the way the equipment looked or sounded (this is consistent with preliminary findings from the IDIs, in which several participants mentioned they used this technique). It is worth noting that only 6% of respondents said they would judge maintenance quality by a change in their utility bills, while only 2% of respondents said they would have diagnostic tests performed by a third party.

Figure 7-10: Criteria Used to Judge the Quality of Maintenance Received



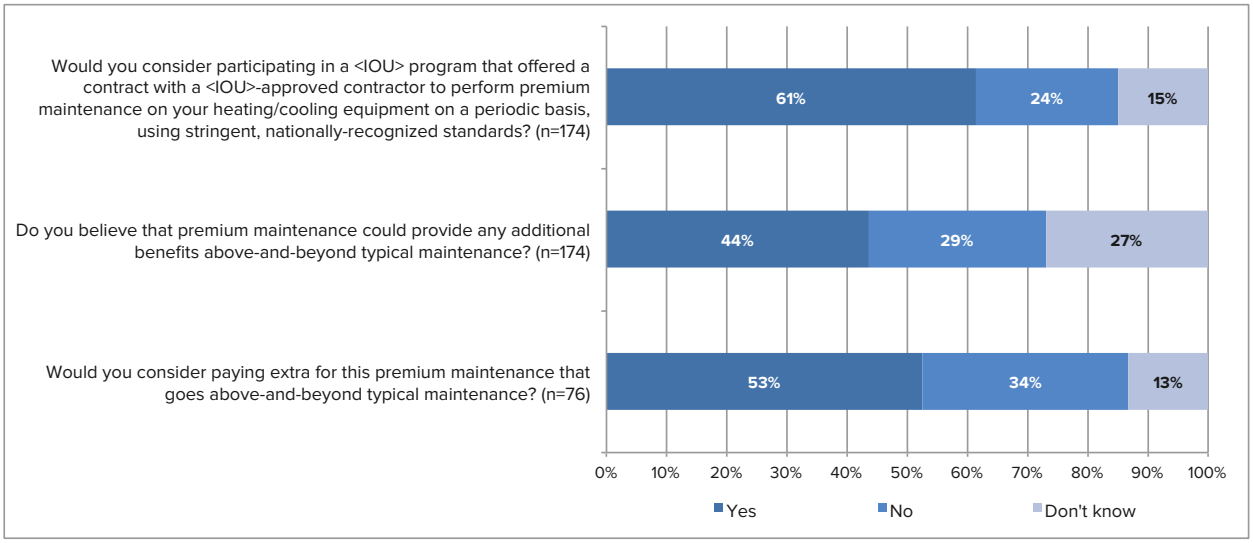
(n=222)

Receptivity to Quality Maintenance and Perceived Benefits

In order to better understand commercial customers' perceptions of the potential benefits of QM, we asked nonparticipants about their attitudes and beliefs regarding participation in premium, standards-based maintenance program. Overall, commercial customers seem receptive to the idea of participating in such a program but do not feel strongly that it would provide benefits *above-and-beyond* typical maintenance. Figure 7-11 shows that when asked whether they would consider participating in such a program, 61% of nonparticipating survey respondents said they would consider participation and 44% of respondents said they thought there would be benefits beyond typical maintenance. Over half of these respondents (53%) said they would consider paying extra for maintenance provided through such a program. There were no statistically significant differences by composite size class for this question.

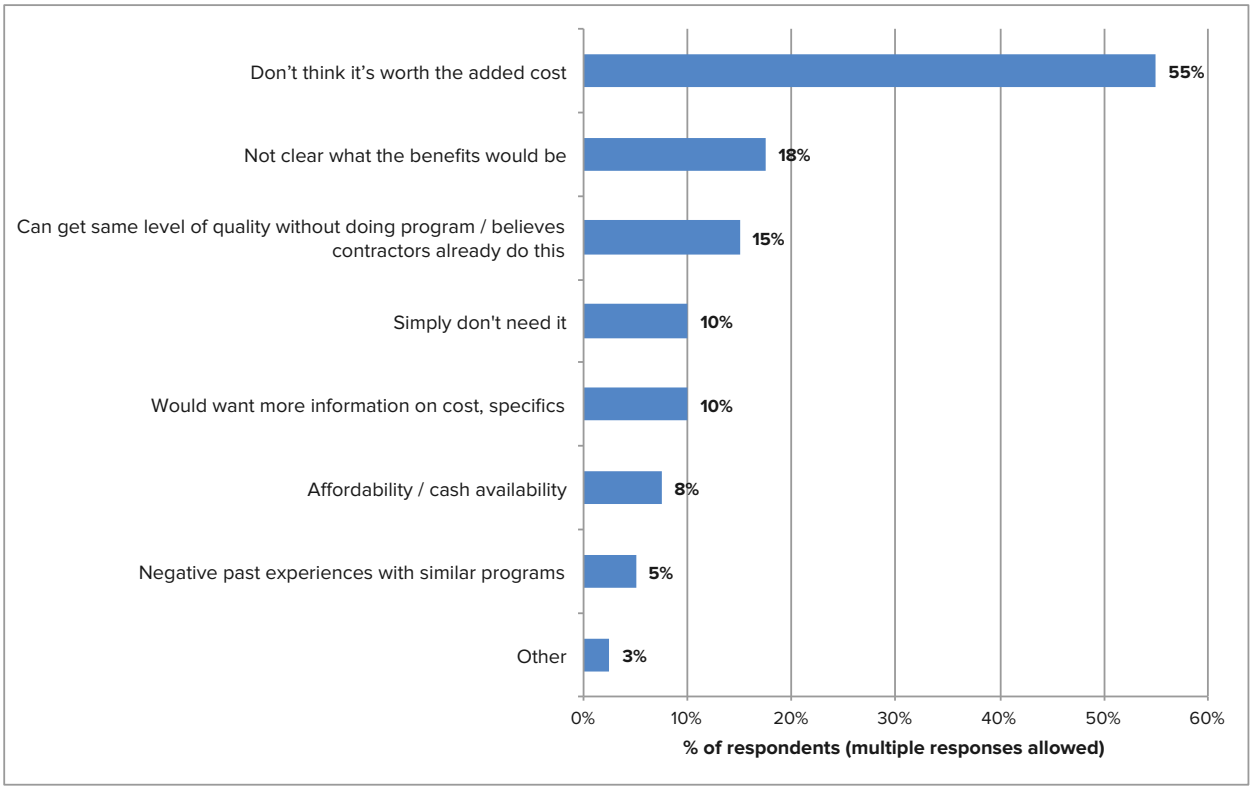
It is important to note that as with other programs and sectors, commercial customers generally seem unclear on the potential benefits of QM. Survey respondents exhibited a substantial amount of uncertainty when asked whether or not maintenance through a QM program provides benefits above-and-beyond typical maintenance, with over a quarter (27%) saying they didn't know (Figure 7-11).

Figure 7-11: Receptivity to Quality Maintenance Programs (nonparticipants only)



There are several reasons why commercial customers may be unwilling to pay extra money for QM. When survey respondents were asked why they would not pay extra money for a premium maintenance program, a majority (55%) indicated it simply wasn't worth the added cost (Figure 7-12). An additional 18% said it wasn't clear what the benefits might be, while 15% said they believe they could get the same level of service without participating. There were no statistically significant differences by composite size class for this question.

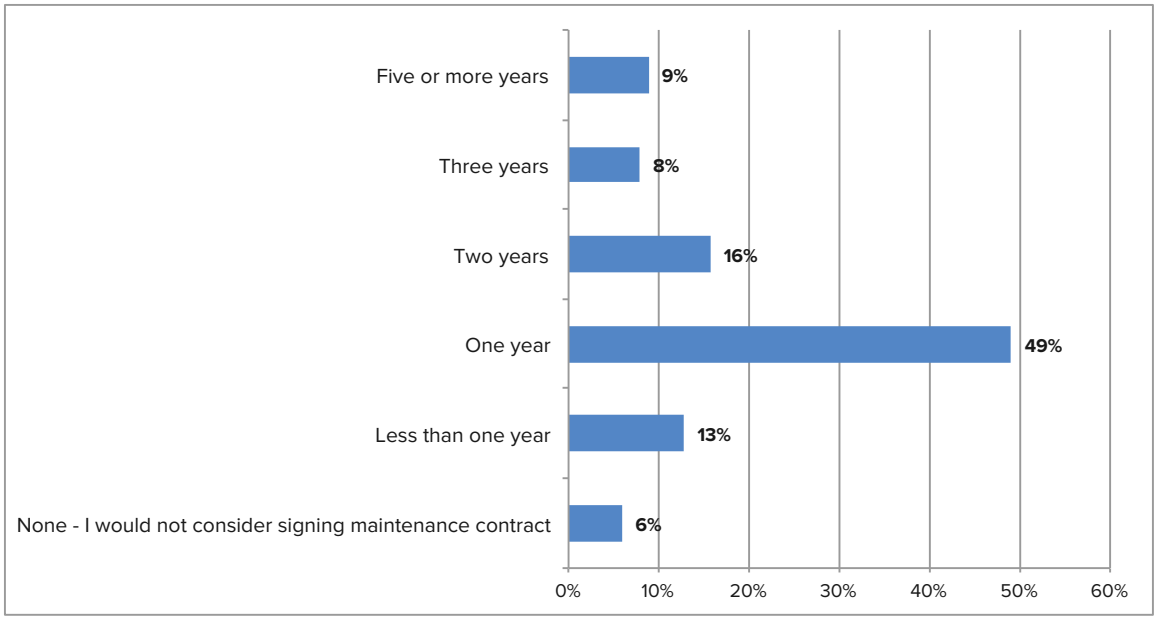
Figure 7-12: Nonparticipants' Reasons for Not Paying Extra for Quality Maintenance



(n=40)

Because maintenance contracts are an important component of QM programs, we asked program nonparticipants about the longest duration contract they would consider signing (Figure 7-13). Nearly half of them (49%) said they would not want to sign a contract longer than one year, while 13% said they would not even sign a contract that was under one year in duration. Additionally, 6% said they would not consider signing a contract *at all*. This unwillingness to sign a contract at least one year in duration is a potential barrier to increased interest in QM programs; however, this barrier appears to only apply to about 19% of the commercial customers we surveyed (13% plus 6%). There were no statistically significant differences by composite size class for this question.

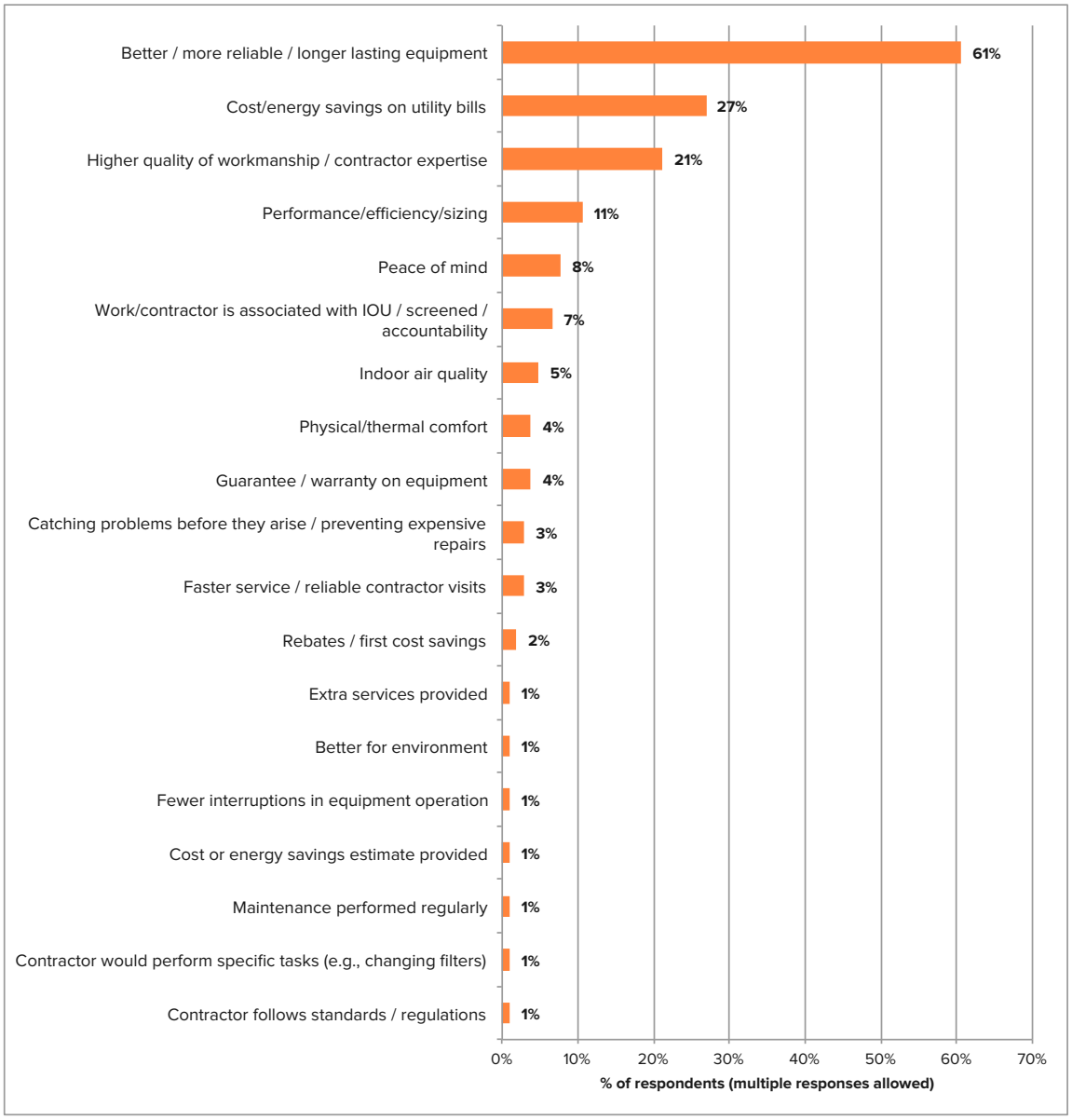
Figure 7-13: Longest Contract Nonparticipants Would Be Willing to Sign



(n=102)

In addition to gauging reasons why commercial customers may be unwilling to participate in a QM program, we also sought to understand the reasons why commercial customers might participate and the services they would be willing to pay for. We found that in general, commercial customers appear to be most concerned with the reliability and longevity of their equipment, but are also mindful of utility bills. As shown in Figure 7-14, 61% of survey respondents indicated a desire for better, more reliable, longer lasting equipment while 27% said they would like to see a savings on their monthly utility bills.[43] There were no statistically significant differences by composite size class for this question.

Figure 7-14: Perceived Benefits of Quality Maintenance Program

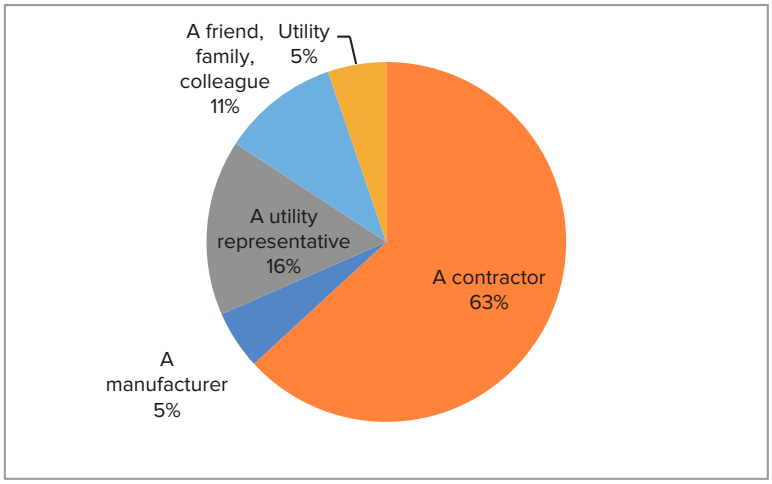


(n=104)

[43] To better understand the relative importance of reliability, longevity, and utility bill savings, we included all three of these factors in the discrete choice study described in the next subsection.

Because marketing and awareness play an important role in stimulating program awareness, we asked program participants where they had first heard about the program. Nearly two-thirds (63%) said they had heard about the program from a contractor, while a much smaller proportion had heard about it from a utility representative (16%) or other utility source (5%).

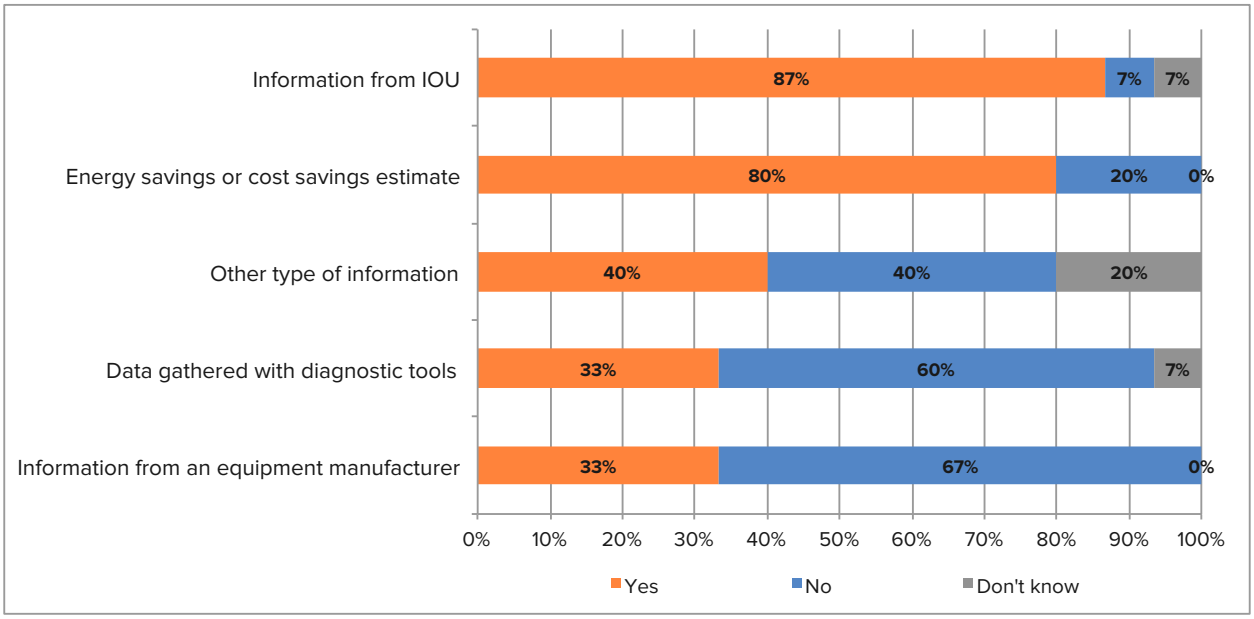
Figure 7-15: How Participants Had First Heard About QM Program



(n=20)

Of these participants, most (87%) said the contractor had provided them with information from an IOU prior to their participation, while almost as many (80%) said they had received a cost or energy savings estimate. Only a third of these respondents said they had been provided with diagnostic data (33%) or had received manufacturer-specific information (33%) from their contractor.

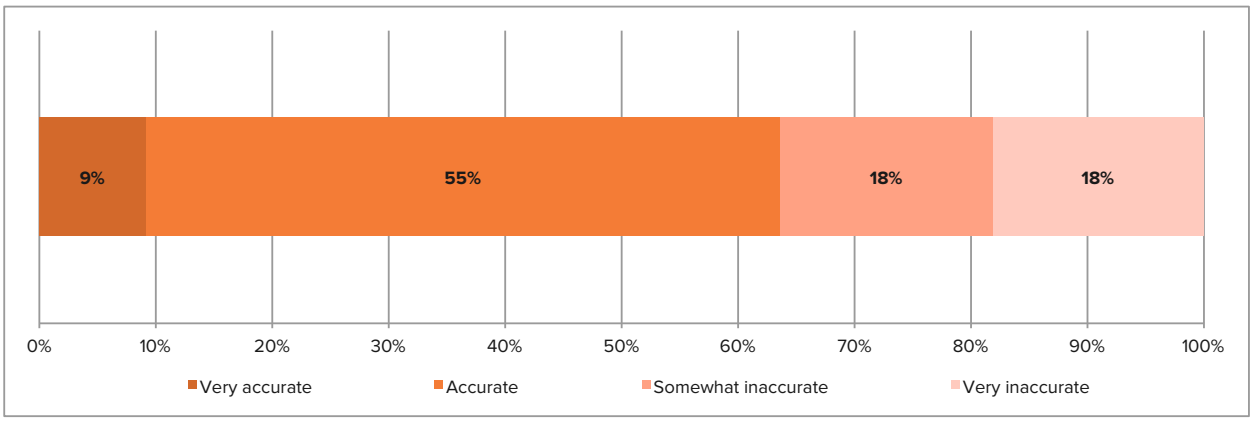
Figure 7-16: Information Provided By QM Contractor When Promoting Program



(n=20)

Participants generally thought the energy or cost savings estimates they had received from their contractor were accurate, with 64% indicating this estimate was either “very accurate” or “accurate” (Figure 7-17). However, over a third of these participants (36%) said the estimate had turned out to be either “somewhat inaccurate” (18%) or “very inaccurate” (18%).

Figure 7-17: Participants Post-Evaluation of Energy/Cost Savings Estimate Accuracy

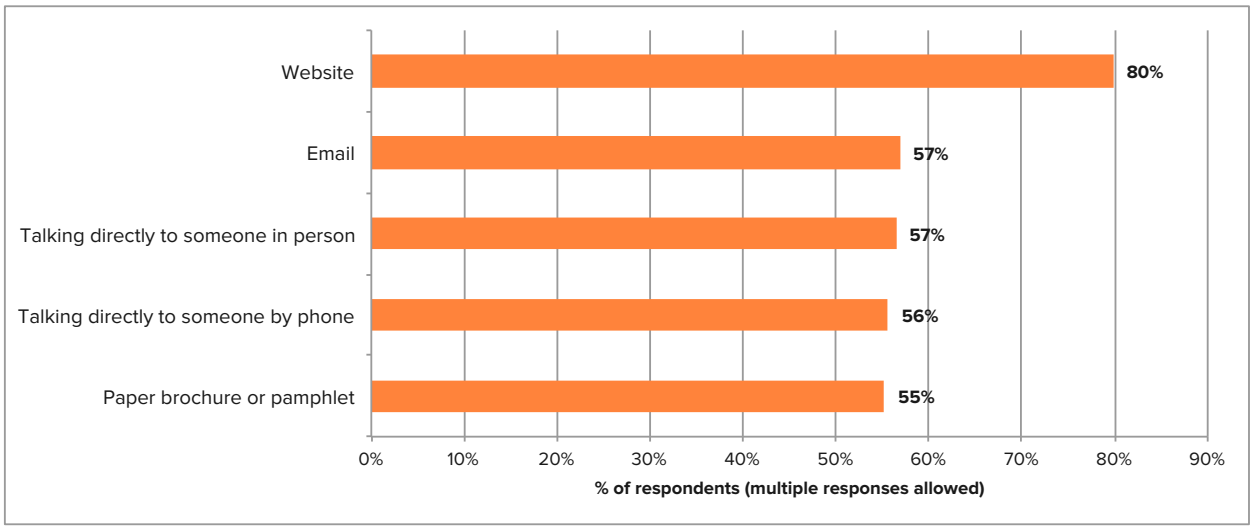


(n=11)

Key Educational Needs – Commercial Customers[44]

Figure 7-18 reveals that a majority (80%) of commercial respondents said they would be interested in receiving HVAC-related information in the form of a website; other favorable channels included email (57% of respondents) and talking directly to someone in person (57%). In terms of composite size class, Class 2 customers were significantly more likely than Class 1 customers to cite email as a preferred method for receiving more information (73% of Class 2 customers vs. 47% of Class 1 customers).[45]

Figure 7-18: Information Formats Preferred by Commercial Respondents

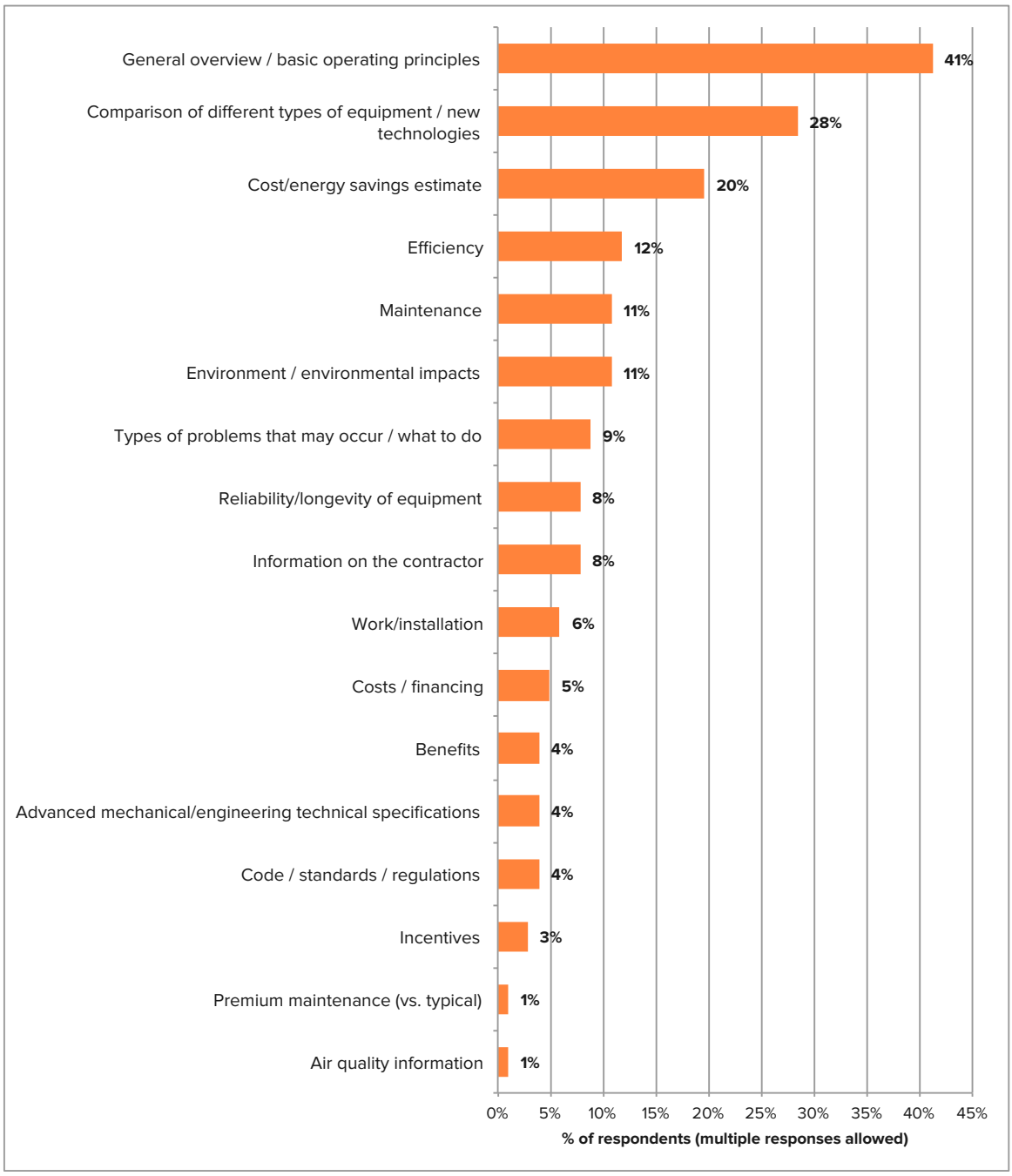


(n=248)

Forty-three percent of commercial survey respondents said they thought specific information on the installation and maintenance of heating/cooling equipment would be helpful to them. There were no statistically significant differences by composite size class for this question.
Figure 7-19 shows that when asked about what topics they would be most interested in, most commercial respondents (41%) indicated a general overview of HVAC equipment operation, while 28% mentioned being able to compare different units or technologies and 20% mentioned cost/energy savings estimates. There were no statistically significant differences by composite size class for this question.

[44] Note that this information is identical to the corresponding "Key Educational Needs" section in the commercial installation chapter.
[45] This difference was significant using a Fisher exact test, $p < .05$.

Figure 7-19: Information Topics Most Useful to Commercial Respondents



(n=102)

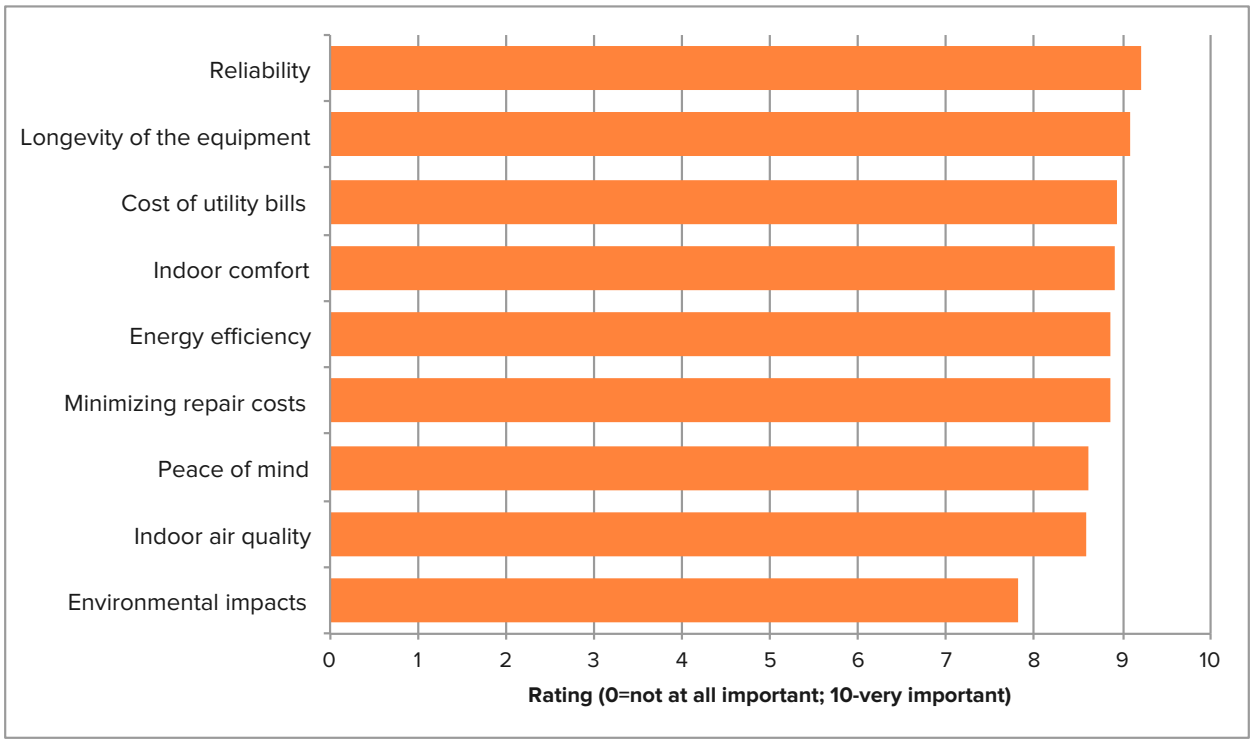
Estimating Customer Preferences for QM

In this section we discuss the results of the web-based discrete choice study conducted with a sample of program participants and nonparticipants. As we discuss throughout this report, decision-making is a complex process that requires people to contemplate and weigh an array of factors before deciding on a final course of action. The more complicated the choices are, and the greater the number of factors playing a part in the decision, the more complex the decision

making process becomes.

In the telephone survey, we used a traditional approach to assessing the variable effect that different factors might play in peoples' decisions. This approach consisted of asking survey respondents to rate or rank factors on a 0 to 10 scale, where 0="not at all important" and 10="very important". Figure 5-17 presents these results, showing that while reliability, longevity, cost of utility bills, indoor comfort, energy efficiency, and minimizing repair costs were scored the highest, all of the factors were reported to be relatively important; environmental impacts were rated the lowest, with a mean score of 7.8.

Figure 7-20: Commercial Telephone Survey Respondents' Ratings of Factors of HVAC Equipment



While the above results provide some insights into customers' preferences, as discussed in the Methods section, such an approach does not capture the complexity (i.e., trade-offs) inherent in the decision-making process. As such, we also conducted a discrete choice study. Table 7-1 shows the attributes and levels that were used for the commercial maintenance discrete choice study.

Table 7-1: Attributes and Levels for Commercial Maintenance Discrete Choice Study

ATTRIBUTES	MAINTENANCE LEVELS
System reliability	1 day of downtime during hottest time of year
	3 days of downtime during hottest time of year
	5 days of downtime during hottest time of year
System longevity	No longer than typical maintenance
	5 years longer than typical maintenance
	10 years longer than typical maintenance
Environmental impacts	No less impact than typical maintenance
	15% less impact than typical maintenance
	30% less impact than typical maintenance
Monthly cost savings	No savings over typical maintenance
	15% savings over typical maintenance
	30% savings over typical maintenance
Indoor air quality	No better quality than typical maintenance
	15% better than typical maintenance
	30% better than typical maintenance
Contract cost	0% more than typical maintenance contract
	50% more than typical maintenance contract
	100% more than typical maintenance contract
Contract length	1 year
	3 years
	5 years
Visits per year	2 visits/year
	4 visits/year
	6 visits/year

From the discrete choice data we were able to estimate a number of metrics that describe customer preferences for HVAC maintenance services that go beyond the simple telephone survey. The first metric we discuss is the importance scores associated with each of the attributes. The sum of importance scores for all attributes sum to 100%.[46] Thus, the *importance scores* represent a "decision weight," or each attribute's individual contribution to the overall decision (in this case, the decision to purchase an HVAC QM contract).

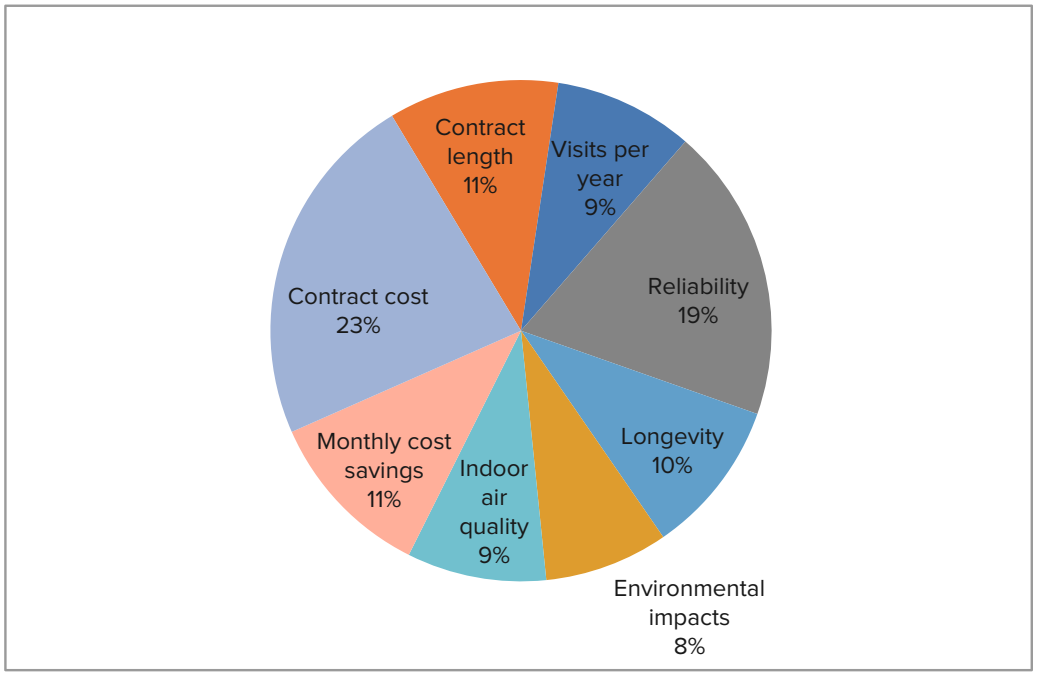
Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on

[46] These importance scores were computed from part-worth utilities derived using Sawtooth Software's Hierarchical Bayes (HB) functionality.

QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome.

Figure 7-21 shows that for commercial customers, "contract cost" emerged as the most dominant attribute in the maintenance decision, representing just under a quarter (approximately 23%) of the total decision weight. Reliability accounts for 19% of the decision weight, contract length 11%, monthly cost savings 11%, longevity 10%, indoor air quality and visits per year 9% each, and environmental impacts 8%.

Figure 7-21: Importance Scores for Maintenance Discrete Choice Module



(n=337)

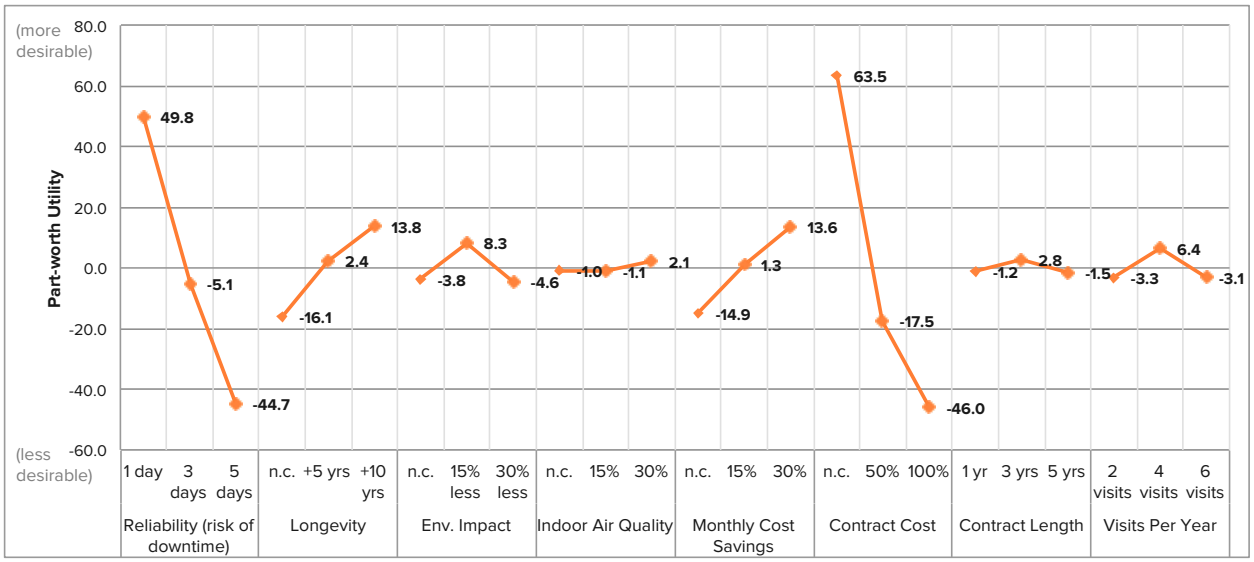
These importance scores can be further broken out into *preference scores* (referred to in discrete choice studies as "part-worth utilities") for each individual level of an attribute. Larger preference scores reflect a more "desirable" attribute level, as rated by the respondents. Figure 7-22 shows commercial respondents' preferences for individual levels of the eight attributes tested in the commercial maintenance discrete choice analysis. Examination of these preference scores adds insights that go beyond those provided by simple review of the importance scores in Figure 7-21 by helping to clarify the sensitivity or elasticity of respondents' preferences across levels *within* an attribute.

For example, the attribute "reliability" exhibits a steady and notable decrease in preference score from left to right, as the risk of downtime increases from one day to five days. With regards to longevity, preference scores increase as the longevity of the unit increases, and like with reliability, the increase is relatively consistent from level to level; however, the increase from

level-to-level is substantially less then it is for either reliability. Similar results are found with monthly cost savings.

Also from Figure 7-22, we see that the relationships between levels of other attributes are slightly more complicated. Instead of relatively consistent differences between all levels, we note some anomalies. For environmental impacts, we see the most preferred level as the middle level (15% reduction) with customers relatively indifferent between the endpoints. Interestingly we do not think this is an anomaly as we derived almost the exact same results in the commercial installation module. This might suggest that businesses feel some obligation to consider environmental impacts in their business decisions, but only to a point. With regards to indoor air quality, the commercial respondents were relatively indifferent to the three different levels. In contrast to the residential QM respondents who preferred the lowest levels for contract length (one year) and visits per year (two visits per year), the commercial customers seem to prefer more of the mid-range for these attributes, with the highest preferences scores associated with a three-year contract and four visits per year.

Figure 7-22: Commercial Respondents' Implicit Valuation of Individual Levels for Each Attribute



These results suggest that marketing strategies for commercial QM programs should focus on emphasizing how the program can improve the reliability of their HVAC system. Other components of the message might include longevity and monthly cost savings. Environmental considerations may also resonate with some customers who recognize that a "green" image is important. However, the contract cost will likely override any of the other attributes. In terms of attributes that are manipulable, though customers did not reveal strong differences in preference, higher preference scores are associated with QM contracts featuring a three-year duration and four visits per year. **It must be noted that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.**

7.3 Commercial Maintenance Decision-Making: Synthesis

In this section we first present a brief summary of the results discussed earlier in this chapter. We then provide synthesis of key themes and make several recommendations to drive greater customer receptiveness to commercial QM offerings.

Summary and Key Points: Commercial Maintenance Decision-making

Here we summarize key points from each decision step for commercial HVAC maintenance decision-making:

Problem/Need Recognition

- Many commercial customers understand the need for regular preventative maintenance, though many who have maintenance performed do so without a maintenance contract. Seventy-four percent of commercial survey respondents reported they have regular maintenance performed; however, among program nonparticipants who perform maintenance, only half (55%) of these respondents have a maintenance contract.
- There is some indication that customers responsible for three or fewer units at a single location (classified as Class 1 customers using the composite proxy variable developed earlier in this study) exhibit different behaviors than other types of customers. These Class 1 customers are less likely to have regular maintenance performed and less likely to understand the importance of contractor licenses and certifications.
- Program participants may act as "early adopters" because they have a better understanding of the benefits of regular maintenance. Compared with nonparticipants, program participants reported greater agreement with a number of statements regarding these benefits, such as "regular maintenance can help prolong the useful life of my equipment." This may indicate a need for targeted education and marketing pertaining specifically to benefits of regular maintenance, including prolonged equipment lifespan, greater reliability, and lower operating costs through monthly utility bill savings.

Information Search

- When seeking information about the proper maintenance of HVAC equipment, "a contractor" was cited as the most popular source (57% of respondents). Internet sources were also important (29% Internet search/non-utility website, 9% utility website).
- Manufacturers are a source of information for some commercial customers. Fifteen percent of commercial survey respondents indicated they would consult a manufacturer for information regarding proper maintenance of their HVAC systems.

Evaluation of Alternatives and Purchase Decision

- Commercial customers recognize that the HVAC maintenance services market is competitive, with over half of survey respondents (54%) indicating they would consider three or more contractors before selecting one to perform the work.
- When selecting a maintenance contractor, commercial customers rely mainly on price (45% of respondents) and reputation (36% of respondents).

Post-Purchase Evaluation

- Commercial customers' strategies for evaluating the quality of the maintenance they receive were very similar to those used by residential customers, with a majority of them (67%) simply noting whether or not there are noticeable operational problems. An additional 12% of respondents said they would judge maintenance quality be the *look* or *sound* of the equipment.
- Quality of maintenance is also judged by how quickly it gets done ("speed/timeliness" was mentioned by 9% of respondents) and by the "perceived competency" of the contractor (also mentioned by 9% of respondents).

Key Themes and Recommendations: Commercial Maintenance Decision-making

In this section we discuss several key themes from the commercial telephone and discrete choice surveys and then make recommendations aimed at stimulating greater demand for commercial QM program offerings.

Theme #1: **Overall, cost and reliability matter to everyone. However, there is a segment of commercial customers for which reliability matters as much as cost; there is another segment for which cost matters most.**[47] Overall, commercial respondents were highly sensitive to the price of the contract; however, they also attributed great importance to *reliability*. In the IDIs, many respondents reported that their core business concerns relied on the ability of their HVAC systems to function correctly. In some cases this core business concern was to ensure that building occupants were comfortable. In other cases it was a way to ensure that fundamental business operations were not disrupted or expensive equipment was protected from heat damage. For these customers, priority service in case of system failure was one of the most important motivating factors in their decision to enter into a maintenance agreement. Similarly, in the discrete choice survey, commercial respondents exhibited strong preferences for alternatives that had a lower risk of downtime (i.e., more reliable equipment).

Recommendation: Though cost matters, most commercial customers are also sensitive to improvements in system reliability. Messaging to these customers should focus on the increased reliability resulting from QM services (assuming that increased reliability is in fact a benefit attributable to QM). This is especially true for the segment of customers for which reliability matters as much as cost.

Theme #2: **Contractors are the most important source of HVAC maintenance information for commercial customers. Additionally, many customers have an existing relationship with a contractor and may be hesitant to switch.** When looking for information on proper installation or maintenance of HVAC equipment, more respondents indicated they would consult a contractor (57%) than any other

[47] If actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.

source. Additionally, many commercial customers have existing relationships with specific contractors.

Recommendation: Expand the contractor base by recruiting currently nonparticipating contractors. Ensure existing contractors have the resources, support, and information they need to effectively promote the program.

Theme #3: **There was very little indication that respondents associated the term "Quality Maintenance" with the maintenance contracts they had purchased, or with IOU programs.** There appears to be a need for more consistent terminology across QM programs, as many customers do not understand what the term "Quality Maintenance" represents. This problem may be compounded by the multitude of names for programs offering QM services across the IOUs.

Recommendation: Be consistent when referring to QM programs and services. If a program providing QM services does not have "Quality Maintenance" in the name, make sure that the two are closely associated in marketing and branding efforts (assuming that this term will continued to be used). This particularly applies to QM references on the Internet, given that four out of five (80%) commercial respondents who indicated that they could use additional information on proper HVAC installation/maintenance indicated the Internet as a preferred medium.

Theme #4: **Difficulty in judging the quality of the maintenance received is a barrier to stimulating greater demand by commercial customers for QM programs.** Even though the majority of small commercial customers who completed an interview reported being knowledgeable about HVAC operation—generally more so than the residential customers—several of them expressed lingering doubts that the maintenance agreement is worth the money they are paying for it. By its very nature, maintenance is difficult to judge because there is no immediate feedback on whether or not it is effective. Finding ways to combat this uncertainty could be greatly beneficial in improving customers' perceptions of the benefits of QM.

Recommendation: Differentiating QM from non-QM is important. Consider providing information on case studies of QM projects and/or short Internet video clips that show footage of maintenance being performed on HVAC equipment (so that commercial customers see what QM requires technicians to do onsite). There may also be value in emphasizing more tangible aspects associated with QM contracts, including the number of visits per year or perks such as priority service.

8. CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of key themes and recommendations based on the findings of all phases of this research study examining HVAC customer decision-making. The first section of this chapter distills the key findings across the study, using the research objectives as a framework for reporting. In the second section of this chapter, we discuss the importance of acknowledging potential differences between decision-makers responsible for varying numbers of HVAC units and locations. In the final section, EMI Consulting summarizes the key findings and recommendations by sector and program type.

8.1 Study Conclusions by Research Objective

The following key findings were distilled from the customer decision-making research and analysis across the two sectors (residential and commercial) and two program types (installation and maintenance.) These results are organized by research objective.

Research Objective #1: **Characterize the barriers and drivers behind QI/QM customer purchasing decision-making.** There are several notable barriers to generating greater customer interest in QI/QM services, including:

- **The *quality* of installation and maintenance is inherently difficult for many residential and small commercial customers to assess.** Substantial proportions of both residential and commercial customers reported not using sophisticated techniques to assess the quality of installation or maintenance of HVAC equipment in their homes or businesses. Unless the unit is obviously malfunctioning, many customers seem to assume that it must be operating well. This simplistic type of assessment makes it potentially more difficult to promote QI and QM, since many consumers may be unable to discern finer differences in the operation/efficiency of the equipment until an obvious problem materializes.
- **Customer interest in QI/QM is hampered by the lack of a clear value proposition.** A large percentage of both residential and commercial survey respondents appeared willing to participate in a program offering premium HVAC installation or maintenance services, but customers were generally less confident in stating that such premium services would offer any benefit above-and-beyond typical services. Even fewer customers said they were willing to pay extra for such services. A sizeable portion of customers indicated that it was simply not clear to them *what the benefits of participating might be*. Other customers indicated they would need additional information before making a decision regarding their participation in a QI/QM program. Collectively, these findings suggest that many customers do not have a sufficient basis on which to make an informed opinion of QI/QM.
- **Many customers are highly reliant on contractors for information and recommendations regarding HVAC installation and maintenance.** If contractors are not promoting QI/QM services, it is less likely that customers will know that it even exists as a service option. While there

may be other ways to publicize QI/QM to customers, it is critical that the contractors themselves participate in the process as QI/QM "brand messengers."

- **Many residential customers do not perform regular preventative maintenance on their HVAC systems.** Only 45% of residential customers who had not participated in a QI/QM program reported having regular preventative maintenance performed on their home heating/cooling systems. It is not clear if this is only a result of an unwillingness to pay for preventative maintenance, or if it also represents a lack of understanding regarding the importance of this service. In either case, this represents an additional barrier to achieving greater uptake for QM offerings, since it is exceedingly difficult to convince customers to buy a *premium* version of a service they do not already purchase. This is particularly important for smaller customers who rent their facility, and who are generally less likely to have regular maintenance performed at all.

While the drivers of HVAC purchases are highly diverse and dependent on the context (e.g., new construction vs. retrofit), the research team identified several key drivers for customers purchasing QI/QM services in place of "typical" services:

- **Among program participants, there is an association between QI/QM services and more efficient HVAC equipment operation.** Program participants were more likely than nonparticipants to indicate that they had installed new equipment because their existing equipment was not energy efficient. Nonparticipants were less concerned with energy efficiency, but were more likely to have installed equipment because their existing equipment simply did not function well.
- **Customers are motivated by cost savings on their utility bills.** Across all sectors and program types, customers were responsive to savings on their monthly utility bills. This was frequently cited as the most common perceived benefit of choosing QI/QM instead of "typical" installation or maintenance. Monthly cost savings also emerged as an important factor in the discrete choice analysis conducted as part of this study.[48]
- **Reliability of equipment operation is critically important for some customers.** Most residential and commercial customers are sensitive to improvements in system reliability, with a subset of commercial customers prioritizing system reliability above all other factors. Knowing that QI/QM services are likely to enhance the overall reliability of their HVAC systems is a major driver for these customers.[49] They may also recognize the value of additional benefits provided by the contractor with QM contracts, such as priority service.

[48] As discussed in the Methods section of this report, if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.
[49] As discussed previously, the sensitivity to system reliability is dependent on the assumption that QI/QM services are capable of making HVAC equipment operate more reliably.

Research Objective #2: **Describe possible strategies used by customers to guide their HVAC decisions.** Customers employ a wide variety of strategies to help guide their HVAC decisions relating to installation and maintenance; however, there are some general commonalities shared by many customers.

- **Information Search.** When first seeking out information about proper HVAC installation or maintenance, there is a large segment of customers that relies on contractors and the Internet for information; however, there is a small subset of customers who seek advice from friends, family members, or co-workers.
- **Evaluation of Alternatives.** When actually selecting a contractor, many customers are concerned about the upfront cost of the work, though the contractor's reputation (as judged by references or online ratings) and timing/availability are also important factors. Many customers also cited having existing relationships with contractors with whom they've done work in the past. These relationships imply that there may be an "inertia" that tends to resist changes in the broader market (for example, the spread of QI/QM services).
- **Post-Purchase Evaluation.** As described in the discussion on Research Objective #1, many customers (both residential *and* commercial) find it difficult to assess the quality of HVAC installation and maintenance services they receive. Instead, many rely on proxy measures such as the visual appearance of the system or the perceived competency of the contractor doing the work.

Research Objective #3: **Identify how the benefits of HVAC industry standards-based QI/QM are perceived by end-purchaser customers and how these perceptions align (or don't align) with contractor's views of the customer and customer decision-making.** General customer awareness and understanding of QI/QM is low, which makes it difficult to assess perceptions of these terms.[50] To facilitate the survey effort, we gave customers additional information on what QI/QM is (namely, a set of stringent, nationally-recognized standards that contractors must adhere to during installation or maintenance work). Using this definition, both residential and commercial customers typically associate three types of benefits with QI/QM: (1) the potential for cost savings on their monthly utility bills, (2) a higher level of workmanship or contractor expertise, and (3) more reliable equipment operation. However, there was not a clear indication that many customers understand that QI/QM are industry-standard best practices that require contractors to perform certain types of tasks *above-and-beyond* what is typically done. In fact, a small group of respondents indicated that they assumed contractors were already required to adhere to these standards' requirements – this was particularly pronounced among customers responsible for only a single location with three or fewer HVAC units.[51]

Despite the fact that some customers perceived QI/QM to have useful benefits,

[50] See Research Objective #4 for further discussion on customer awareness of QI/QM.
[51] In this study, this class of customers was defined using the composite class size variable as Class 1. See the Methods chapter for more information.

customers across sectors and program types were hesitant to pay extra money for these services. This aligns closely with contractors' views of the customer. Based on the results of a separate survey conducted by EMI consulting with HVAC contractors in California in 2012, 62% of contractors believed that customers are unwilling to pay for high quality installation services and 45% of contractors believed that customers are unwilling to pay for regularly-scheduled maintenance.[52]

Research Objective #4: **Identify branding and other strategies that might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QI/QM services.** The barriers to developing a self-sustaining market seem to stem largely from issues of branding and education. The results of this study suggest that QI and QM are "unknown quantities" for many residential and commercial customers in California.[53] Part of this problem may stem from an inability in conversation to know if one is referring to "quality installation" or "Quality Installation" (the first term is a colloquial phrase meaning "good" while the second term references a specific set of standards developed by industry experts). Even for those customers who may have heard of the terms "Quality Installation" or "Quality Maintenance," it is not clear they have a solid understanding of what these terms represent. When described to them, many customers say they would be willing to consider participating in an IOU program featuring these services (though few are willing to pay extra money for it). This general lack of awareness represents both a challenge and an opportunity for branding efforts to influence public perception of QI and QM as *the* nationally-recognized, standards-based approach to HVAC installation and maintenance.

Differentiating QI and QM from their "typical" counterparts is a challenging but necessary step toward achieving more widespread interest and demand among customers for these services. Much of this challenge stems from the notion that it appears difficult for many customers to *judge the quality* of HVAC equipment installation and maintenance work they receive. A substantial percentage of respondents to the telephone survey in this study indicated that they judge the quality of installation or maintenance they receive through *proxy measures*, such as "a neat or clean looking system" or the "perceived competency" of the contractor. Comparatively few respondents indicated judging these services by using diagnostic tests or by changes in their monthly utility bills. The problem of differentiation is compounded by a belief (expressed by a small but measurable minority of survey respondents) that contractors are *already* performing "quality work" (as previously mentioned, this notion was particularly common among customers responsible for only a single location with three or fewer HVAC units). Accordingly, some customers may view QI/QM as redundant and unnecessary.

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[52] EMI Consulting, "California HVAC Contractor & Technician Behavior Study." (2012, Phase I) CALMAC Study ID SCE0323.01.

[53] According to another recent study, only 16% of residential customers and 17% of small commercial customers recognized the term "quality installation." See NMR Group, "Baseline Characterization Market Effects Study of Investor-Owned Utility Residential and Small Commercial HVAC Quality Installation and Quality Improvement Program in California." (WO 054) CALMAC Study ID CPU0102.01.

For QI/QM to attract more interest in the market, customers need to develop a better understanding of what sets QI/QM services apart from their less expensive, commoditized "typical" counterparts. In other parts of this report we have suggested that branding and marketing efforts might focus on the incremental benefits of QI/QM – including the additional calculations, checks, and tests that contractors are required to do in order to comply with the standards. This task is made much more difficult by the lack of empirical evidence to help support quantitative claims of the magnitude of these incremental benefits.

Throughout the phases of this research study and across customer sectors, there was little indication that customers readily associate the terms "Quality Installation" or "Quality Maintenance" with IOU-sponsored programs. There is also little indication that *contractors* make this association. Adding to the confusion, many IOU programs have different names and do not emphasize the industry standards as a branding platform. While this may not be a problem for these specific programs, it does hinder the attainment of the two branding strategies identified in the HVAC Action Plan:[54]

1. Create a statewide Quality Installation and Quality Maintenance (QI/QM) brand that will be attached to systems/installations/contractors that meet quality standards; and,
2. Launch a consumer marketing and education campaign to support the brand and stimulate market demand.

In our recommendations, we argue that consistency in program nomenclature will help solidify customers' association between programs and the standards-based practices they represent. In addition, we agree with the conclusions drawn in the BBI California HVAC Action Plan Status Report, delivered in June 2013, that stated the State needs to:

> *Reopen discussions related to "QI and QM branding" with the purpose of focusing additional attention on the original intent of this CEESP/HVAC Action Plan goal, which was to accentuate/draw attention to/increase the perceived market value of existing ANSI-accredited HVAC standards … in the minds of manufacturers, distributors, engineers, contractors, technicians* ***and*** *end users.*

Research Objective #5:

Characterize the role that educational materials might play in the decision-making process. The research team identified several key educational needs voiced by customers in the telephone survey:

- Both residential and commercial customers appear to have a *fairly limited understanding* of HVAC units, with many indicating that they could use additional information regarding the basic operation of this equipment. While the research team did not interpret this to mean that

[54] California Public Utilities Commission. "The California Energy Efficiency Strategic Plan: HVAC Action Plan 2010-2012," March 2011. Available online: http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/.

customers want to better understand the laws of thermodynamics, it does suggest there is a need for educational materials that provide a basic explanation of the different types of units available, their relative advantages and disadvantages, and how the operation of these units may be adversely affected by substandard installation or maintenance work.

- This limited technical understanding, coupled with the diversity of HVAC equipment options available, makes comparing different types of equipment significantly more difficult. Not surprisingly, customers were also very interested in information enabling them to *compare different types* of HVAC technologies.
- A third educational need voiced by many residential and commercial customers related to the potential for *cost or energy savings* resulting from installation or maintenance services. This need closely parallels findings from the discrete choice survey, in which monthly cost savings carried substantial decision weight in both the installation and maintenance decision modules.[55]
- Additionally, the results of this study suggest that a substantial portion of customers either do not believe or are unaware that regular preventative maintenance provides benefits.[56] It is interesting to note that while some customers indicated that information on proper maintenance may be helpful to them, it was not mentioned as frequently as other information needs (described in the preceding bullets). Together these findings imply a need for educational materials that not only inform customers about the concept of regular maintenance, but also convince them that it is important and useful. Specifically, these materials might seek to strengthen the association between proper maintenance, lower utility bills, and more reliable equipment. For the segment of customers who do not currently have any maintenance performed, showing them the importance of regular preventative maintenance is a necessary first step toward convincing them that the *premium* version of maintenance (i.e., QM) is a worthwhile investment.

Noting that many customers rely on contractors and the Internet for information about proper HVAC installation and maintenance, it is not surprising that a "website" was the most preferred medium among both residential and commercial customers for receiving more information on these topics. (Other information formats were also acceptable to most customers, including talking to a person on the phone or in person, email, and paper brochures or pamphlets). In the Recommendations section of this report, we suggest creating a more robust web presence to promote QI/QM programs. As part of this effort, it may make sense to include information that specifically targets the educational needs described above.

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[55] As discussed in the Methods section of this report, if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.
[56] In the survey, program participants were more likely than program nonparticipants to agree with a number of positive statements regarding the benefits of regular preventative maintenance.

Research Objective #6: **Assess how logic models, along with a customer decision-making market model, can be used to develop and test how programs and the QI/QM market can be positively impacted.** Program theories aim to describe causal relationships between a program and the change the program is trying to affect. Logic models are often used to describe a program theory in terms of the types of resources a program uses to conduct a series of activities that result in specific outputs. Those outputs are hypothesized to lead to short-, intermediate-, and long-term outcomes. A program logic model provides a good way to identify monitoring and evaluation questions that test the strength of the links between activities and outcomes, and to better understand what other factors can have a moderating effect on those links.

A graphic market model captures the structure and functioning of the target market including clearly defining (1) market actors, including end-use customers, (2) their relationships with each other and (3) how public policy, global market trends and utilities interact with these relationships. It is essential to understand customer decision-making to "avoid a 'faulty understanding' of how the customer and the market will respond to program interventions." [57]

A market model should precede the development of the program theory, especially in market transformation programs. Quality installation and quality maintenance programs all share a market transformation goal as identified in the *California Long Term Energy Efficiency Strategic Plan (CLTEESP)* [58] which identifies one of the four HVAC goals as:

> *Quality Installation and maintenance becomes the industry and market norm. The marketplace understands and values the performance benefits of quality installation and maintenance.*

Despite the growing body of research in this realm, it is important that we acknowledge that programs of this nature are challenging. There is still much to learn and understand about the market dynamics and the most effective market intervention strategies to facilitate long-term adoption of QI/QM practices. Thus, tying market models to logic models is essential. As Siebold *et al* assert, "the complexity of market transformation programs appears to increase the importance of properly describing the market and tying program activities to an explicit change logic." [59]

[57] NMR Group, Inc. "A Review of Effective Practices for the Planning, Design, Implementation and Evaluation of Market Transformation Effects." November 2013. CALMAC Study ID: PGE0330.01.
[58] California Public Utilities Commission. "The California Energy Efficiency Strategic Plan," January 2011. Available online: http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/.
[59] Sebold, Frederick D., Alan Fields, Lisa Skumatz, Shel Feldman, Miriam Goldberg, Ken Keating, and Jane Peters. "A Framework for Planning and Assessing Publicly Funded Energy Efficiency." March 2001.

8.2 The Importance of Firm Size

In this subsection we re-summarize the approach used in this study to consider how characteristics of a customer's firm affect their decision-making. As discussed in more depth in Section 3.3, we explored the issue of firm size throughout this study by assigning commercial respondents to one of three composite size classes based on the number of locations and the number of units for which they were responsible, and then looking for differences between these groups. Table 8-1 shows some of the key firmographic differences between these three classes (note this is the same as Table 3-2).

Table 8-1. Characteristics of the Three Composite Size Classes

Characteristic	Class 1 (n = 96)	Class 2 (n = 37)	Class 3 (n = 115)
	1 location; <=3 units	*1 location; >3 units*	*>1 location*
Percent who own their facility	41%	70% [a]	55%
Percent who have regular preventative maintenance performed	63%	89% [b]	78% [b]
Percent in "Real Estate and Rental and Leasing, including Property Management" industry	3%	16% [c]	31% [c]

[a] Class 2 members were significantly more likely than Class 1 members to own their facility using a two proportions z-test, $p < .05$.
[b] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report having regular preventative maintenance performed on their HVAC equipment using a two proportions z-test, $p < .05$.
[c] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report membership in the industry "Real Estate and Rental and Leasing, including Property Management" using a two proportions z-test, $p < .05$.

Throughout the analyses performed in this study, we highlighted where significant differences existed between these three groups. Here we briefly recap some of the more important differences from a practical viewpoint:

- When selecting a contractor to perform installation work, Class 1 customers were significantly more likely than Class 3 customers to be concerned with contractor reliability (mentioned by 18% of Class 1 customers and 7% of Class 3 customers) and less concerned with cost (mentioned by 57% of Class 1 customers and 75% of Class 3 customers).
- When selecting a contractor to perform maintenance work, Class 3 customers were significantly more likely than Class 1 customers to mention the importance of contractor licensing and certifications as an important factor in the contractor selection process (mentioned by 32% of Class 3 customers and 7% of Class 1 customers).
- Class 1 customers were significantly more likely to mention that they would not be willing to pay extra for QI/QM because they believed that contractors were already required to abide by these standards (6 out of 28, or 21% of Class 1 customers vs. 1 out of 40, or 2.5% of Class 3 customers).

Collectively, these results suggest that customers responsible for only a single location (often rented and not owned) with three or fewer HVAC units represent a particular challenge for QI/QM programs. Targeted education and branding efforts may be particularly effective among this population.

8.3 Sector and Program Type Conclusions and Recommendations

In this section we summarize key themes and recommendations organized by sector and program type (i.e., installation vs. maintenance). Note that these themes and recommendations are identical to those in sector and program-specific chapters of this report.

Residential QI

In this subsection we present key themes and recommendations applicable to residential QI:

Theme #1: **Many residential customers have a limited understanding of HVAC equipment and operating principles.** Customers generally appear overwhelmed by the technical complexity of HVAC systems, with respondents reporting they use simplistic, non-technical methods to select contractors and evaluate the quality of their installation.

Recommendation: Provide basic information about how HVAC units work and the importance of proper installation (and maintenance) procedures in an easy-to-understand "infographic" format.

Theme #2: **Residential customers are highly dependent on Internet sources and contractors when it comes to obtaining information about HVAC equipment.**

Recommendation: Utilize the Internet to provide better information regarding what QI is and *how it is different* from typical installations. An expanded Internet presence would be helpful in generating more interest and awareness for QI and the programs that support it. This may also be helpful in convincing customers that QI is something worth asking for – even if the contractor does not initially promote it to them.

Theme #3: **Residential customers are receptive to the idea of QI but could use more information on the benefits.** Most residential customers appear willing to participate in a program that offers premium installation services for their HVAC equipment, but many are unclear as to what the specific benefits might be.

Recommendation: Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits of QI. However, it is critical that the potential benefits must not be overstated. If this information cannot be provided in this form, efforts should instead be made to provide concrete examples of success through case studies of real projects.

Theme #4: **Residential customers are sensitive to the up-front cost of HVAC installations. However, emphasizing monthly utility bill savings and system reliability improvements would likely resonate with customers.** Discrete choice results

suggest that customers are most sensitive to changes in their monthly utility bills and reliability.[60]

Recommendation: Branding efforts may benefit by focusing on cost savings for utility bill costs and reliability improvements resulting from QI (assuming that QI provides these benefits). Promoting the provision of easy-to-understand cost savings estimates of premium installation to customers could help strengthen the value proposition. Because customers are highly price sensitive to the cost of installation, the benefits of participation need to be translated into monthly cost savings. Additionally, there is evidence that this method could be effective – among program participants who received cost savings estimates, a majority indicated this estimate was either accurate or very accurate.

Residential QM

In this subsection we present key themes and recommendations applicable to residential QM:

Theme #1: **Many residential customers do not recognize the benefits of having regular, preventative maintenance performed on their HVAC systems.** Only 45% of nonparticipants have regular maintenance performed on their heating/cooling system, and are less likely to believe that regular maintenance has real benefits (such as longer lasting equipment).

Recommendation: Provide basic information about the benefits of preventative maintenance procedures in an easy-to-understand "infographic" format. This presentation should focus on making the benefits of maintenance *concrete* by focusing on monthly cost savings, system longevity, and system reliability. Highlighting differences between QM and non-QM services is important.

Theme #2: **Residential customers have relationships with contractors and may be unwilling to switch providers for a service like QM.** Two-thirds of customers who have maintenance performed regularly reported they typically work with a specific contractor. Reaching out to customers who are currently satisfied with their non-QM maintenance contracts will be difficult to reach because they are not "in the market" for new services.

Recommendation: Increase outreach efforts to contractors and leverage IOU marketing channels to make customers aware of QM as an option for obtaining maintenance services. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QM.

Theme #3: **Residential customers are extremely price-sensitive to the cost of a maintenance contract.**[61] In the discrete choice study, "contract cost" carried over two times the decision weight as the next most important attribute, "monthly cost savings."

[60] As discussed in the Methods section of this report, if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain.
[61] Ibid.

Preference for premium maintenance services dropped off with increasing contract cost, making this a difficult value proposition for many customers.

Recommendation: If possible, emphasize that price differences between QM and non-QM services are minimal. Additionally, if supported by empirical evidence, efforts may focus on the fact that the per-visit cost may be less for QM contracts than for non-QM contracts. (For example, a QM contract may cost more than a non-QM contract but if more visits are included in the QM contract, it is possible that the cost per visit is actually less than for the non-QM contract.)

Commercial QI

In this subsection we present key themes and recommendations applicable to commercial QI:

Theme #1: **Commercial customers are receptive to the idea of QI but could use more information on the benefits.** Most commercial customers we surveyed would be willing to participate in a program that offers premium installation services for their HVAC equipment, but many indicated they could use more information clarifying the benefits. Of those program nonparticipants who indicated they would not pay extra for QI, the most popular reasons were "not worth the added cost," "believes contractors already do this," and "not clear what the benefits would be."

Recommendation: Branding should emphasize the benefits of QI and how it goes above-and-beyond typical installations. Making these benefits seem real and concrete may be accomplished by providing specific, quantitative information on the benefits of premium, standards-based installation. However, it is critical that this information must not be overstated. If this information cannot be provided in this form, efforts should instead be made to provide concrete examples of success through case studies of real projects. Additionally, this messaging should strive to clarify the differences between QI services and traditional installation services.

Theme #2: **Commercial customers are particularly sensitive to improvements in the reliability of their HVAC systems.**[62] In the discrete choice survey, commercial respondents exhibited strong preferences for alternatives that minimized the risk of system downtime. In aggregate, commercial respondents attributed greater importance to reliability than to any other attribute tested.

Recommendation: When promoting the benefits of premium, standards-based installation, messaging to commercial customers could focus on the increased reliability resulting from these services (assuming that increased reliability is in fact a benefit attributable to QI). Additionally, this messaging could benefit from providing information that is more specific or concrete than just "greater reliability."

[62] If actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.

Theme #3: **Commercial customers are highly reliant on contractors for information about HVAC installations.** Nearly half (48%) of commercial respondents indicated they would consult a contractor for more information on proper HVAC installation (or maintenance). Additionally, of the commercial respondents who had participated in a QI/QM program, "contractor" was tied with "utility representative" as the source from which most customers had initially become aware of the program.

Recommendation: Increase outreach efforts to contractors. Consider providing an incentive to the customer for suggesting their contractor participate in the program. Make sure that contractors have the resources and collateral they need to effectively promote QI.

Commercial QM

In this subsection we present key themes and recommendations applicable to commercial QM:

Theme #1: **Overall, cost and reliability matter to everyone. However, there is a segment of commercial customers for which reliability matters as much as cost; there is another segment for which cost matters most.**[63] Overall, commercial respondents were highly sensitive to the price of the contract; however, they also attributed great importance to *reliability*. In the IDIs, many respondents reported that their core business concerns relied on the ability of their HVAC systems to function correctly. In some cases this core business concern was to ensure that building occupants were comfortable. In other cases it was a way to ensure that fundamental business operations were not disrupted or expensive equipment was protected from heat damage. For these customers, priority service in case of system failure was one of the most important motivating factors in their decision to enter into a maintenance agreement. Similarly, in the discrete choice survey, commercial respondents exhibited strong preferences for alternatives that had a lower risk of downtime (i.e., more reliable equipment).

Recommendation: Though cost matters, most commercial customers are also sensitive to improvements in system reliability. Messaging to these customers should focus on the increased reliability resulting from QM services (assuming that increased reliability is in fact a benefit attributable to QM). This is especially true for the segment of customers for which reliability matters as much as cost.

Theme #2: **Contractors are the most important source of HVAC maintenance information for many commercial customers. Additionally, many customers have an existing relationship with a contractor and may be hesitant to switch.** When looking for information on proper installation or maintenance of HVAC equipment, more respondents indicated they would consult a contractor (57%) than any other source. Additionally, many commercial customers have existing relationships with specific contractors.

[63] If actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic.

Recommendation: Expand the contractor base by recruiting currently nonparticipating contractors. Ensure participating contractors have the resources, support, and information they need to effectively promote the program.

Theme #3: **There was very little indication that respondents associated the term "Quality Maintenance" with the maintenance contracts they had purchased, or with IOU programs.** There appears to be a need for more consistent terminology across QM programs, as many customers do not understand what the term "Quality Maintenance" represents. This problem may be compounded by the multitude of names for programs offering QM services across the IOUs.

Recommendation: Be consistent when referring to QM programs and services. If a program providing QM services does not have "Quality Maintenance" in the name, make sure that the two are closely associated in marketing and branding efforts (assuming that this term will continued to be used). This particularly applies to QM references on the Internet, given that four out of five (80%) commercial respondents who indicated that they could use additional information on proper HVAC installation/maintenance indicated the Internet as a preferred medium.

Theme #4: **Difficulty in judging the quality of the maintenance received is a barrier to stimulating greater demand by commercial customers for QM programs.** Even though the majority of small commercial customers who completed an interview reported being knowledgeable about HVAC operation—generally more so than the residential customers—several of them expressed lingering doubts that the maintenance agreement is worth the money they are paying for it. By its very nature, maintenance is difficult to judge because there is no immediate feedback on whether or not it is effective. Finding ways to combat this uncertainty could be greatly beneficial in improving customers' perceptions of the benefits of QM.

Recommendation: Differentiating QM from non-QM is important. Consider providing information on case studies of QM projects and/or short Internet video clips that show footage of maintenance being performed on HVAC equipment (so that commercial customers see what QM requires technicians to do onsite). There may also be value in emphasizing more tangible aspects associated with QM contracts, including the number of visits per year or perks such as priority service.

APPENDIX A: LITERATURE REVIEW

Prior to conducting the qualitative and quantitative research efforts described previously in this report, it was important for the project team to conduct a thorough review of the existing literature on HVAC customer decision-making. While our preliminary research confirmed our hypothesis that very little research has been done on decision-making drivers for HVAC consumers, we wanted to thoroughly review the research that *had* been conducted, both on the supply-side of the HVAC market and the EMI searched relevant HVAC and evaluation conference proceedings (i.e., multiple years of ASHRAE, ACCA, ACEEE, AESP, and IEPEC), regional report databases (CALMAC and NEEA), Google Scholar, and JSTOR for appropriate articles. Our search terms included:[1]

- HVAC market
- HVAC customer benefits
- HVAC purchasing decisions
- HVAC customer decision making
- HVAC contractor selling
- HVAC efficiency selling and
- HVAC marketing efficiency[2]

We used the search results in an iterative process. Our initial keyword searches produced a total of 12 sources, only four of which were relevant to customer decision-making behaviors. We then reviewed the literature cited in each of the articles to ensure we captured all relevant articles. The next two sections summarize the research published since Chimack *et al.*'s review. Studies that describe the contractor's perspective are reviewed first, followed by a review of studies from the customer's perspective.

1.1 Literature Review

In our literature review we found that a reactive maintenance program, in which "no actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached," is standard industry practice. Our review also revealed useful resources regarding contractors' motivations and the barriers that the traditional contractor business model presents to market transformation, the review demonstrated that there had been very little research into customers' behavior and decision-making. However, we did utilize contractors' perceptions of customer motivations as a guide for our work, as we examined the accuracy of "common knowledge" in the contractor community, such as the perceptions that: motivated by thermal comfort and cost; unwilling to pay more for higher quality maintenance and installation; unwilling to purchase QI/QM without evidence that they can save money; the role that trust plays in the customer-contractor relationship.

The next step of our research was also informed by Barriga, et al's report on customer behavior, and examined the findings therein, including: belief that HVAC systems are simple, low-tech

[1] Given the iterative nature of our search and the small number of articles that were found we chose not to use "quality installation" and "quality maintenance" as search terms. These terms were not commonly found in the literature and would have limited the results dramatically.
[2] When we searched for "HVAC," "HVAC customers," and "HVAC contractors," the results were too broad for our purposes and we narrowed our search terms down to the list here.

devices; the difference in priorities between small commercial and residential customers; the impact of a split incentive on small commercial customers; the lack of connection between low performing HVAC systems and high energy bills; and the belief that HVAC maintenance is unnecessary. This research will guide our development of research questions and gain further insight into what drives HVAC customer decisions as we move ahead into later stages of the *HVAC QI/QM Customer Decision-Making Study.*

Contractor Perspective

Because contractors play an instrumental role in selling QI/QM to customers, they have the ability to dramatically affect the customer decision-making process. In our literature review we found several significant barriers to contractors selling QI/QM programs to customers: (1) lack of contractor awareness of incentive programs, (2) lack of understanding of the QI/QM standards, (3) uncertainty of energy savings associated with QI/QM, (4) the importance of trust in the contractor/customer relationship and contractors' hesitation around selling "unnecessary" service, and (5) the widespread perception among contractors that customers are not interested in higher quality services and, instead, are primarily motivated by thermal comfort and cost (both minimizing repair costs and cost efficiency, which may include energy costs, potential productivity losses, etc.).

One major barrier to customers' purchasing QI/QM services is the lack of contractors actively selling these services to customers. The majority of contractors surveyed in the post-2006 literature we found were not even aware of existing QI/QM programs.

Another substantial barrier is that contractors are not familiar with or do not understand the relevant QI/QM standards. In EMI's 2012 study of Southern California HVAC contractors and technicians, more than half (58%) of contractors and technicians recognized neither quality maintenance nor quality installation as industry standards or utility programs,[3] and when asked to define the terms "quality maintenance" and "quality installation" *only 1%* of contractors mentioned the ACCA and ASHRAE Standards that form the basis for many QI/QM program.[4] In the same 2012 study the authors found when observing 16 technicians in that field that "technical performance of…field-observed technicians providing typical 'maintenance' services was below the standards of ACCA 4, utility 'quality maintenance' program goals, and industry best practices as judged by [an] expert technician."[5]

The majority of contractors surveyed in an unpublished 2012 report by Barriga, Heinemeier, and Flynn expressed skepticism regarding the return on investment of higher quality maintenance and installation services. This skepticism is a major factor in contractors' unwillingness to sell higher quality services. These contractors requested evidence that demonstrates HVAC QI/QM reduces energy cost. It is likely that contractors emphasized the importance of demonstrated savings because of contractors' belief that the addition cost of the maintenance service was the

[3] "Of installation contractors that conduct work in the residential sector but had not participated in a QI program, 58% of respondents said they had not participated in a QI program because they were not aware that utilities offer such programs…58% of maintenance contractor respondents who had not participated in a QM program stated that they were unaware that utilities offer these types of programs." EMI, 2012
[4] EMI, 2012
[5] "During field observations, almost all of the technicians attempted some basic maintenance tasks, such as checking the thermostat, inspecting filters, inspecting the metering device, and inspecting refrigerant line insulation, but few performed the tasks correctly." EMI, 2012

main driver of HVAC customer decisions,[6] and that customers would be unwilling to take a gamble on costlier maintenance without being sure this extra cost would ultimately save customers money.

The level of trust required for a successful contractor/customer relationship was a recurring theme in the literature reviewed. According to contractors, because of low levels of knowledge and understanding about HVAC systems, customers are unable to verify whether or not a repair is actually needed.[7] This power dynamic makes customers vulnerable to contractors—particularly to unscrupulous contractors—and means creating trust with customers is a high priority for many contractors. Because contractors put a great deal of work into creating and maintaining trust, they are largely unwilling to compromise that trust by trying to sell what they perceive as "extra" services: "a primary barrier [to selling QI/QM] was that technicians do not want to seem 'pushy,' especially if customers can care for equipment that is in relatively good condition themselves."[8]

Another barrier to contractors actively selling QI/QM services is the prevailing belief among contractors that customers are simply not interested in purchasing high quality maintenance or installation and, instead, are primarily concerned with thermal comfort, minimizing repair costs, and cost efficiency (i.e. overall costs that could include energy costs, potential productivity losses, etc.) rather than having their system functioning optimally. Two-thirds (62%) of contractors surveyed in EMI's 2012 study said that their customers were not willing to pay for high quality installation services.[9] When asked to rank their customers' priorities, contractors perceived occupant comfort, reliability, minimizing repair costs, and cost as the highest customer priorities, with longevity of the unit, energy efficiency, and peace of mind ranked as lower customer priorities.[10]

Customer Perspective

While we found four sources that explicitly addressed *contractor* behaviors and attitudes in our literature review, only one of these sources also addressed HVAC *end-purchaser customer* behavior, which demonstrates the necessity for further research into what truly drives HVAC customer decisions. The only article in our literature review that focused on HVAC customer behavior was Barriga, Heinemeier, and Flynn's unpublished Western Cooling Efficiency Center 2012 report *Understanding Maintenance Behavior in Residential and Light Commercial End Users*. The beliefs and attitudes presented in the report represent several barriers to customer adoption of QI/QM, including: (1) differing motivations for residential and small commercial customers (and the possible drawback of a split incentive for small commercial customers), (2) lack of knowledge about how HVAC systems work and the impact a malfunctioning system can have on an energy bill, and (3) the widespread perception that HVAC maintenance does not require professional service.

Barriga et al. found that economic considerations were a major driver for both small commercial and residential customers. However, contractor perceptions over-simplify the complex and varied motivations of their customers. For example, while the impact of thermal comfort and air quality

[6] California Energy Commission, 2005
[7] Barriga et al., 2012
[8] EMI, 2012
[9] EMI, 2012
[10] EMI, 2012

on household well-being is generally the highest priority for a residential customer, profit is often a higher priority than customer and employee well-being for a small commercial customer.[11] Another significant consideration in determining motivations for small commercial customers is the split incentive barrier, as energy costs are paid by tenants rather than building owners.[12]

Residential customers tend to associate HVAC maintenance with extremely simple tasks that they can perform themselves, such as changing filters. Residential customers do not associate low performance with high energy bills and the necessity for professional service. Instead, residential customers tend to associate HVAC service with failures rather than prevention.[13] Overall, small commercial customers expressed a stronger preference for preventative as opposed to reactive HVAC maintenance than residential customers, yet much like residential customers, small commercial customers do not necessarily hire professionals to perform HVAC service. In fact, the majority of residential and small commercial customers surveyed engage in some form of what Barriga et al. described as "'informal maintenance behaviors,"[14] such as do-it-yourself basic maintenance or using the discounted or bartered maintenance services of a friend, family member, or customer.

The prevalence of informal maintenance behaviors may be related to the widespread customer belief that HVAC systems do not require extensive maintenance. When one participant introduced the small commercial focus group to the idea of the car as a model of customer-motivated maintenance habits, the other participants were better able to grasp the importance of HVAC maintenance. However, Barriga et al.'s research on the terminology residential customers associated with HVAC systems offers more useful insight into customer attitudes towards HVAC maintenance. This study found that most residential customers "do not believe air conditioners need to be maintained, and they do not think they are a technologically complex piece of equipment." Customers think of HVAC systems "more like a refrigerator (a no maintenance appliance) than a car (the model for maintenance habits)."[15]

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APPENDIX B: FOCUS GROUP SCREENER

1. OBJECTIVES AND STUDY INFORMATION

1.1 Research Objectives

The EMI Team will conduct two focus groups for this study – one with customers who had installed a new air conditioning system within the last two years and one with customers who have regular maintenance performed on their air conditioning service. There will be an emphasis for the second study on customers who have an existing maintenance contract. The installation focus groups will be with residential customers, and the maintenance focus group will include a mix of both residential and small commercial customers. The objectives of these focus groups include:

1. Determine the language and key concepts that customers use to discuss energy efficiency and HVAC QI/QM
2. Characterize what customers understand and believe regarding HVAC QI/QM
3. Understand the customer value propositions regarding the purchase of QI/QM
4. Understand the potential barriers--those already existing in the program theory and logic model as well as others—to purchasing QI/QM
5. Characterize the drivers behind QI/QM/high efficiency customer purchasing decision-making at each of the five stages
6. Assess what branding and other strategies might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QM/QI services
7. Understand the role that educational materials may play in the decision-making process

1.2 Study Information for Screening Purposes

Below is a list of information that interviewers may need when recruiting for this study.

Maintenance contract definition**:** Service maintenance contracts are agreements between **[RESIDENTIAL: "you"/ COMMERCIAL: "your business"]** and a heating and cooling (HVAC) service provider where you pay a set fee for which you get guaranteed maintenance services for your HVAC system. Typical contracts include regular check-ups (annual or semi-annual), and some even include parts and service for problems found during regular check-ups along with emergency service visits.

We obtained your phone number from SCE because you recently participated in an energy efficiency program. We are an independent firm conducting research with customers for SCE with a goal of improving SCE's program services.

2. SCREENER

2.1 Introduction:

1. Hi, I'm calling on behalf of Southern California Edison. We'd like to ask you a few quick questions to determine your eligibility and interest in participating in a paid focus group [**Evening (5pm & 7pm) of May 21st**]. The goal of the focus group is for SCE to better understand customer perspectives on the installation and maintenance of heating and cooling equipment in the Southern California Edison service area. If you are eligible, we will pay you $100 to participate in a 90-minute session, which will include a light dinner. Do you have couple of minutes?

   ____ No (**terminate,** or call back if so requested)
   ____ Yes (continue)

2. Is/Are [**RESIDENTIAL: "you"/ COMMERCIAL: "your business"**] a customer of Southern California Edison?
   ____ No (**terminate**) ____ Yes (continue)

3. Do you own or lease [**RESIDENTIAL: "your home"/ COMMERCIAL: "the building you operate your business in"**]?
   ____ Own (continue) ____ Lease (continue)

4. Are you the person responsible for making decisions about the purchase or maintenance of heating and cooling equipment at your [home/business]?
   ____Yes (continue)
   ____No (ask if decision-maker is available; if yes, continue with right person and begin with #1 above; if no, ask for decision-maker's name and a good time to call back)

5. Did you have a new air conditioning or heating system installed in your [home/business] in the past two years?
   ____ No (continue) ____ Yes (continue)

6. Do you have regular maintenance performed on your air conditioning or heating system?
   ____ No (continue) ____ Yes (continue)

7. Do you recall recently having a maintenance contract for your air conditioning or heating system at any time in the past two years?
   ____ No (continue) ____ Yes (continue)

CONTINUE IF #5, 6, OR 7 = YES.
IF #5 & 6 = NO, **TERMINATE**.

2.2 Small Commercial Customers Only:

8. How many employees does your company have at this location?
   _____ Record number (continue)

9. Do you have someone specifically responsible for facility maintenance on staff, including your business's heating and cooling maintenance?
   ____ No (continue) ____ Yes (continue)

10. How would you best characterize your building based on the following categories:

____ Retail/office
____ Non-retail

11. How many square feet is included at your business address (best guess is fine)?
_____ Record number (continue)

2.3 All:

12. Are you available to attend an evening focus group in **[Riverside, CA]** on **[May 21st]**?
You would be compensated $100 for your time and be provided with a light dinner.
____ No (**terminate**) ____Yes (continue)

2.4 End:

13. Record respondent's sex (don't ask - best guess is fine):
____ Female (continue) ____ Male (continue)

IF COMPLETED: "Thank you for answering my questions. We'd like you to participate in one of our focus groups. We will send out an email with details of the focus group in a couple of days to confirm your participation on **May 21st**. Have a nice day."

IF TERMINATED AT ANY POINT: "Thank you. Given our specific requirements, we're sorry to say that we won't be able to invite you to this round of focus groups. Have a nice day."

APPENDIX C: RESIDENTIAL INSTALLATION MODERATOR GUIDE

1. INTRODUCTION

This document is designed to serve as a guide for conducting a focus group with residential customers who have installed a new heating and cooling (HVAC) system within the last two years. The ordering of questions may change depending on the flow of the session, and not all questions may be asked.

1.1 Research Objectives

Our purpose in conducting a focus group with Program participants (and engaging in other data collection activities related to this program) is to meet the following research objectives, specifically focusing on QI:

1. Determine the language and key concepts that customers use to discuss energy efficiency and HVAC QI/QM
2. Characterize what customers understand and believe regarding HVAC QI/QM
3. Understand the customer value propositions regarding the purchase of QI/QM
4. Understand the potential barriers--those already existing in the program theory and logic model as well as others—to purchasing QI/QM
5. Characterize the drivers behind QI/QM/high efficiency customer purchasing decision-making at each of the five stages of the customer decision making model
6. Assess what branding and other strategies might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QM/QI services
7. Understand how educational materials impact the decision-making process

1.2 Methodology

The EMI Team will conduct the focus group in the SCE service territory with residential customers who have installed an HVAC system within the last two years. The list of potential participants will come from utility program participant data.

The EMI Team will recruit 8 to 10 customers with varied demographics to ensure adequate representation of perspectives while still making the group-size manageable. EMI will provide participants with a $100 incentive as a “thank-you” for their time, along with snacks and refreshments during the session.

The focus group will last approximately 90 minutes.

SCE Decision Making Study – Installation Focus Group

Name	Date	Signature for Incentive Payment

EMI CONSULTING

2. FOCUS GROUP PROCEEDINGS

2.1 Section A: Introductions (10 minutes)

Good afternoon and welcome. Thank you for taking the time to join our discussion. My name is Danny Molvik. I have been contracted by Southern California Edison (SCE) to conduct this focus group and will be the moderator this evening. This group should last for about an hour and a half.

This is a diverse group of residential customers—but the one thing you all have in common is that you have each installed a heating or air conditioning (HVAC) system in the past two years. The purpose of the group is to understand (1) the key concepts that you use to discuss HVAC systems, (2) the factors considered when purchasing a HVAC system, and (3) how you assess the quality of the HVAC system installation. The results of the focus group will be valuable in helping SCE design future HVAC quality installation programs and helping California meet it growing energy needs.

Rules:

The first thing to keep in mind today is there are no right or wrong answers, just opinions. Your opinion is the most valuable thing you can contribute to this group. Please be honest in your opinions and feel free to share your point of view even if it differs from what others have said. Here are a few ground rules for our time together today:

- Only one person may talk at a time.
- Responding directly to the comments of others is encouraged; responses do not necessarily have to be directed to me.
- As facilitator, my role is to guide the conversation and not to provide answers to questions that are raised.
- All participants must contribute to the group, though each participant does not need to contribute to all questions.
- No participant or group of participants should dominate the group discussion.
- I may interrupt you while you are talking if we need to move on to another person or topic area or to assist the flow of discussion. No offense is intended.
- Please turn off all cell phones.
- But most importantly, please try and have some fun!

Everything said here is confidential, which means that your names will not be associated with your comments. Also, I'd like to videotape the proceedings. Staff members working on this project at EMI and SCE will be the only people to see the recording, and information shared with others will only be in aggregated form. Many good ideas flow rather quickly in a focus group and a recording would help me catch all the thoughts and ideas that surface in these dynamic discussions. Do I have everyone's permission to record this session?
[Get verbal confirmation]

[Include if SCE representatives attend] In addition, representatives from Southern California Edison (SCE) are present and may occasionally interject if they want me to probe deeper into a particular statement or topic that comes up in our discussion this evening.

[Write the definition of HVAC on the white board and possibly discuss if needed.]

Does anyone have any questions before we begin?

First, I would like each of you to introduce yourself: providing the group with your name, when you installed your new heating or cooling system, and your general familiarity with HVAC systems.

2.2 Section B: General Topic Discussion

Topic 1: General Understanding & Terminology (25 minutes)

We want to understand the language that customers use to talk about heating and cooling concepts, specifically identifying the key terms used to discuss these topics.

Questions:

1. When you think about heating and cooling in your house, what do you think about?
    a. What comes to mind first?
    b. What thoughts do you have about the amount of energy your system uses in comparison to other systems (lighting, refrigeration, appliances) in your home/business?
    c. How important is the energy efficiency of your HVAC system to you? Why?

2. How familiar are you with how your HVAC system works?
    a. How important is it that you understand how the system operates in order to make decisions about purchasing a new HVAC system?

3. What led to your decision to purchase and have a new HVAC system installed?
    a. Was your old system broken, or just not functioning optimally?
    b. If so, why not just get it repaired?
    c. What decision factors did you need to consider?

4. Have you heard of the term “quality installation (QI)”?
    a. If so, where did you hear of it? What was the context?
    b. What is your understanding of what the terms refer to?
    c. What is your understanding of the value of QI?

5. How important is the quality of the installation of your HVAC system?
    a. What are the benefits of a high quality installation?
    b. How do you judge the quality of installation you received on your system?
    c. [Optional] What aspects are critical to quality installations?
    d. Did you select a contractor based on the expected quality of installation?
    e. Did the contractor discuss or walk you through any specifics of the installation process?

Activity: White board on Decision-Making Factors (25 minutes)

Next, I would like you to think about the decision-making process when you purchased your new HVAC system. Think about reasons why you selected a particular contractor and reasons why you selected your specific HVAC system. On the poster board that we have here on the wall, we would like to capture all of the factors that you considered when purchasing your new HVAC system. I'm going to start this activity by just having you call out the factors that come to mind. To better organize the answers, I’ll organize them into reasons that you selected a particular contractor and those reasons why you chose a specific brand, model, or type of HVAC system. I’ll record your responses as you call them out. Who wants to suggest the first reason?

Please remember that there is no right or wrong answer. We are interested in your honest opinions, and not what might be considered the socially desirable.

[Once all reasons offered by participants have been recorded, pass out the index cards—one for each participant. Use this time to take a picture of the poster board, and remember to take the poster board home if possible.]

On the cards just passed out, I would like you to write down the top three reasons that you personally considered when purchasing your new HVAC system. This can include any of the reasons we have listed together on the wall, or something that has not yet been discussed. And the reasons can be related to the contractor, the system, or both. Also, please make sure to write your name on the top of the card.

[Collect the cards, and briefly take note of the most selected reason across residential customers.]

Potential primer reasons for participants, if needed

HVAC System

1. System cost
2. The warranty provided by the contractor/manufacturer
3. Energy efficiency rating of the system
4. Rebate availability
5. System sizing
6. Online ratings (Consumers Report, etc.)
7. My contractor recommended the HVAC system
8. Immediate availability
9. Other _____

Contractor

1. Price of installation
2. Contractor guarantee
3. Reputation of the contractor
4. Used the contractor before
5. Number of systems installed by the contractor
6. Personal recommendation
7. Timing/availability
8. Online ratings (Angie's list, utility, etc.)
9. Other _____

[Total up the responses for each of the factors to use as a basis for the next section of the conversation.]

Topic 2: Factors Driving Decision-Making (20 minutes)

Now that we collected the range of factors that you considered when purchasing your new HVAC system, I'd like to learn a little more about how you prioritized the factors identified on the cards.

Questions:

1. It appears that the most widely selected reasons considered when purchasing a new HVAC system were **[fill in with ranking results].**
    a. Can someone share why you selected one or more of these factors?
    b. Why are these more important than other factors?
    c. How did you prioritize the factors?
    d. Are these the same factors that you weighed before purchasing your HVAC system?
2. The factors prioritized as least important **[fill in with ranking results—pay particular attention to any unexpected outcomes]**.
    a. Can anyone share why these items are less important in the decision-making process?

   b. Do others feel the same way? If not, why?
   c. How did it impact your decision-making process
   d. Is there anything that made the decision difficult?
3. Is there anything listed on the poster board that you had not really thought about before today? Why? What are your thoughts?

Topic 3: Importance of Educational Materials (10 minutes)

We want to understand what types of educational or marketing materials might be most useful for customers who are considering purchasing and installing a new HVAC system.

Questions:

1. If you wanted to learn more about quality installations of HVAC systems, where would you go?
   a. Who would you expect or want to provide this material? (Utility, contractor, etc.)
2. How important were educational materials in your decision to select a particular contractor or HVAC system?
   a. What materials did you see?
   b. What do you recall from those materials?
   c. How much did you like the materials that you saw? Why?

[Optional – if time permits] Closing Activity: HVAC Obituary (10 minutes)

[Another way to better understand what participants truly value about their HVAC system is to get respondents to imagine that they no longer have their system in their home or business. The obituary activity is a useful way for inducing this thought process.]

Before we close this evening, I would like each of you to imagine that your HVAC system no longer exists and write a one or two sentence obituary on the index card for your HVAC system. To give you an idea of what to include, you could write about what the system did for you and/or what you will miss most. When you are finished, remember to write your name on the card.

[Once everyone has completed writing, ask each participant to read his or her response and explain the meaning. Make sure to collect all the cards at the end.]

2.3 Section C: Closing

Now that the session is wrapping up, I want to thank you for helping us better understand the factors that you consider when purchasing and having a new HVAC system installed.

1. Do you have any thoughts that we might not have addressed that are related to the purpose of this focus group?
2. Is there anything that we might have missed?
3. Do you have any other final comments or questions?

Again, thank you for your time and participation this evening.

APPENDIX D: SMALL COMMERCIAL QM IN-DEPTH INTERVIEW GUIDE

1.1 Introduction

This document is designed to serve as a guide for conducting an in-depth interview (IDI) by telephone with small commercial customers who have regular maintenance performed on their heating, ventilation, and air conditioning (HVAC) system, with a particular focus on customers with an existing maintenance service contract.

Research Objectives

Our purpose in conducting a telephone IDI with Program participants is to meet the following research objectives, specifically focusing on QM:

1. Determine the language and key concepts that customers use to discuss energy efficiency and HVAC QI/QM
2. Characterize what customers understand and believe regarding HVAC QI/QM
3. Understand the customer value propositions regarding the purchase of QI/QM
4. Understand the potential barriers--those already existing in the program theory and logic model as well as others—to purchasing QI/QM
5. Characterize the drivers behind QI/QM/high efficiency customer purchasing decision-making at each of the five stages
6. Assess what branding and other strategies might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QM/QI services
7. Understand how educational materials impact the decision-making process

Fielding Instructions

EMI Consulting will conduct the telephone interviews in-house with small commercial customers who have participated in an SCE HVAC quality maintenance program. The list of potential participants will come from utility program participant data.

EMI Consulting will complete interviews with 10 customers with varied firmographics to ensure adequate representation of perspectives. EMI will provide participants with a $75 gift card as a “thank-you” for their time.

The following instructions assume the interviewer is utilizing program contact information provided by SCE.

- Attempt each record three times on different days of the week and at different times.
- Leave messages on the first and third attempt.
- Experienced interviewers should attempt to convert "soft" refusals (e.g., "I'm not interested", immediate hang-ups) at least once.
- The interview is considered complete when all sections have either been addressed or passed over via skip logic.

- Calling hours are 9 AM to 5 PM local time unless otherwise specifically requested by the customer.

NOTE: This is a topic guide designed to guide the conversation. Depending on the experience of each respondent, some specific probes may not apply.

Interview Instructions

Before scheduling or proceeding with the interview, respondents must successfully pass the screening portion (below).

1.2 Screening Questions

S1. Hello, I'm calling on behalf of Southern California Edison. I'd like to ask you a few quick questions to determine your eligibility and interest in participating in a paid telephone interview. The goal of this interview is for SCE to better understand customer perspectives on the maintenance of heating and cooling equipment in the Southern California Edison service area. If you are eligible, we will pay you $75 to participate in a 25-35 minute phone interview.

1. No **[TERMINATE]**
2. Yes

S2. [Are/Is] [you/your business] a customer of Southern California Edison?

1. No **[TERMINATE]**
2. Yes

S3. Do you own or lease the building you operate your business in?

1 Own
2 Lease
-8. Don't know
-9. Refused

S4. Are you the person responsible for making decisions about the purchase or maintenance of heating and cooling equipment at your business location?

1 Yes
2 No **[Ask if decision-maker is available; if yes, continue with right person and begin with S1 above; if no, ask for decision-maker's name and a good time to call]**

S5. Do you have regular maintenance performed on your air conditioning or heating system?

1. No
2. Yes

S6. Do you recall recently having a maintenance contract for your air conditioning or heating system at any time in the past two years?

1. No
2. Yes (IF YES, ASK: "Do you recall the name of that program? _____)

[IF S5 or S6 = YES, CONTINUE.]
[IF S5 and S6 = NO, TERMINATE]

(IF TERMINATED AT ANY POINT: "THANK YOU. GIVEN OUR SPECIFIC REQUIREMENTS, UNFORTUNATELY YOU ARE NOT ELIGIBLE FOR THIS TELEPHONE INTERVIEW. THANK YOU FOR YOUR TIME.")

1.3 Survey/Interview

Section A: Firmographics (small commercial only)

A1. How many employees does your company have at this location?

_____ (ENTER NUMBER OF EMPLOYEES)

A2. Do you have someone specifically responsible for facility maintenance on staff, including your business's heating and cooling maintenance?

0. No
1. Yes

A3. How would you best characterize your building? [DO NOT READ RESPONSES]

1. Retail / office
2. Not retail / office
3. Other _____ (RECORD RESPONSE)

A4. How many square feet are included at your business address?

_____ (ENTER NUMBER OF SQUARE FEET)

Section B: General Understanding and Background

B1. When you think about heating and cooling in your business, what do you think about?

a. What comes to mind first?
b. What thoughts do you have about the amount of energy your system uses?
c. How important is the energy efficiency of your HVAC system to you? Why?

B2. How familiar are you with how your HVAC system works? [Listen for and record particular language used by respondent.]

a. How important is it that you understand how the system operates in order to make decisions about the maintenance?

B3. What is the purpose of maintenance?

a. What is included in maintaining your system?
b. How often do you need to maintain your system?
c. Is that something that you currently do, or have done on your own?
d. What motivates you to perform maintenance on your system?
e. When would you need to hire someone for maintenance work?
f. How important do you think it is that you regularly maintain your HVAC system?
g. What do you think are some of the possible benefits of regular maintenance to your HVAC system?
h. How do you judge the quality of maintenance that your are receiving during service visits?

B4. Do you recall anything that the contractor said that convinced you to purchase the agreement? If so, what did they say?

B5. Have you heard of the term “quality maintenance (QM)” with respect to your heating or cooling system?

a. If so, where did you here of it? What was the context?
b. What is your understanding of what the term refers to?
c. What is your understanding of the value of QM?

Section C: Factors Driving Decision-making

C1. I would like to talk about possible reasons that we believe may motivate individuals to purchase a maintenance contract for the HVAC system for their business.

a. What was the primary reason (or primary reasons) you chose to purchase a maintenance contract for your HVAC system? **[RECORD REASON (S)]**
b. Were there other reasons you chose to purchase a maintenance contract? **[RECORD REASON (S)]**

C2. I am going to provide a list of possible considerations that may be taken into account when someone is deciding to purchase a HVAC maintenance contract – you may have mentioned some of these already. I would like you to rate the importance of each of these potential reasons on a scale from 0 to 10, with zero being not at all important and 10 being very important. [**RECORD RESPONDENT'S RATING FOR EACH ITEM BELOW**].

a. ____ Maintain HVAC system efficiency
b. ____ Maintain inside air quality
c. ____ Maintain inside comfort
d. ____ Prolong the life of the system
e. ____ Keep operating costs down (i.e., reduce energy bills)
f. ____ Regularly scheduled service calls
g. ____ Save money on service visits
h. ____ Prepaid service repairs (parts and labor)
i. ____ For priority service in case of system failure
j. ____ Included with purchase of new system
k. ____ Peace of mind

C5. What factors are you most willing to spend money on? Why? [**RECORD FACTORS**]

a. What services do you really want or need for your HVAC system?
b. Do you want additional services as part of your maintenance? If so, what?

C6. Was there anything that we just discussed that you had not really thought about before this conversation?

Section D: Importance of Educational Materials

D1. If you wanted to learn more about quality maintenance of HVAC systems, where would you go? [**RECORD SOURCES**]

a. Who would you expect or want to provide this material? (e.g., utility, contractor, etc.)

D2. How important were educational or marketing materials in your decision to participate in HVAC maintenance?

a. What materials did you see?
b. What do you recall from those materials?
c. How much did you like the materials that you saw? Why?

Section E: Closing

Now that the session is wrapping up, I just have a few questions left.

E1. Do you have any thoughts that we might not have addressed?

E2. Is there anything that we might have missed?

E3. Do you have any other final comments or questions?

E4. Thank you. Those are all the questions I have today. So we can email you your $75 Amazon gift card, please verify the spelling of your name and provide the email address where you would like it sent.

Name: _____

Email Address: _____

Your gift card will be sent within 2 weeks.

[**THANK AND TERMINATE**]

APPENDIX E: TELEPHONE SURVEY INSTRUMENT

Background

As part of the *HVAC Residential and Small Commercial Customer Decision Making Study*, EMI Consulting is conducting a telephone survey to characterize consumer decision-making processes associated with purchases of HVAC quality installation/quality maintenance (QI/QM) among residential and small commercial customers in California. As described in the sample design memorandum, target values for Participants/Non-Participants and Residential/Small Commercial are shown in Table 1.

Table 1. Telephone Survey Sample Design

Customer Type	Residential Customers	Small Commercial Customers	Total Customers
QI/QM Participants	250	75	**325**
QI/QM Non-Participants	100	175	**275**
TOTAL	**350**	**250**	**600**

Objectives

As stated in the research plan, the objectives of this telephone survey include the following:

1. To characterize the drivers behind QI/QM high efficiency customer purchasing decision-making,
2. To describe any possible strategies used by customers to guide their HVAC decisions,
3. To identify how the benefits of HVAC industry standards-based QI/QM are perceived by customers,
4. To identify branding strategies that might increase customer understanding of QI/QM value propositions to drive greater receptiveness to contractor QI/QM offerings and eventually proactively demand QI/QM in a manner that contractors understand and can fulfill with the appropriate QI/QM services, and
5. To characterize the role of educational materials in the decision-making process.

Fielding Instructions

- Attempt each record five times on different days of the week and at different times.
- The surveyor should leave a message on the 2nd and 4th attempts if he/she reaches the voicemail of the specific contact person (that is, after screening questions have verified that this is the person we want to reach). The message should state that the surveyor is calling on behalf of <IOU> regarding a paid research study and that the respondent will receive a follow-up call from the surveyor. If a group mailbox is reached, the surveyor should not leave a message.

- If given another number to call at a different branch of the company (not a direct transfer), check the new number against the sample to ensure it is not a duplicate. If it is a duplicate, delete record from file.
- Surveyors should attempt to convert "soft" refusals at least once.
- For residential customers, calling hours are 9 AM to 8 PM PT, Monday through Friday.
- For commercial customers, calling hours are 9 AM to 6 PM PT, Monday through Friday.
- If at any point, the respondent has doubts or concerns about the study, let them know they can speak to:
    - IF <IOU> = "SOUTHERN CALIFORNIA EDISON": Jesse Emge at 626-302-0273 or by email at jesse.emge@sce.com.
    - IF <IOU> = "PACIFIC GAS & ELECTRIC": Mary Anderson at 415-973-6261 or by email at m3ak@pge.com
    - IF <IOU> = "SAN DIEGO GAS & ELECTRIC": Kris Miller at 858-654-1138 or by email at KMiller@semprautilities.com.
- **Do not read response sets unless specified.**

Variables Used

Variable Name	Description	Type
<CONTACT>	Respondent name	Text
<FIRM>	Company name	Text
<PARTICIPANT>	Yes; No	Text
<SECTOR>	Residential; Commercial	Text
<IOU>	Respondent's utility (SCE, PG&E, or SDG&E)	Text
<ADDRESS>	Address of respondent's facility	Text
<NEWCONTACT>	New contact person's name determined during telephone recruiting	Text
<APPOINT>	Appointment time determined during telephone recruiting	Text
<NEWPHONE>	Phone number or extension given during telephone survey	Text

Section A: Introduction and Screening Questions

A1. **[IF <CONTACT> IS BLANK, SKIP TO A6]**
Hello, this is <INTERVIEWER> calling on behalf of <IOU>. This is not a sales call. May I speak with <CONTACT>? **[DO NOT READ RESPONSES]**

[IF NEEDED: "<IOU> IS LOOKING FOR FEEDBACK FROM CUSTOMERS REGARDING THEIR PERSPECTIVES ON THE INSTALLATION AND MAINTENANCE OF HEATING AND COOLING EQUIPMENT."**]**

1. No, that person is not available **right now** **[SKIP TO A4]**
2. Any other no
3. Yes, that would be me **[SKIP TO A3]**
4. Yes, let me transfer you **[SKIP TO A6]**

-8. Don't know
-9. Refused **[SKIP TO COMMENT1]**

A2. <IOU> wants me to speak with the person responsible for making decisions about the installation and maintenance of heating and cooling equipment **[IF <SECTOR> = RESIDENTIAL: "for your home"; IF <SECTOR> = COMMERCIAL: "for your organization. If you represent a property management firm or landlord, this would include the properties that you manage ."].** Again, this is not a sales call. Can you refer me to that individual? **[DO NOT READ RESPONSES]**

[IF NEEDED: "<IOU> IS LOOKING FOR FEEDBACK FROM CUSTOMERS REGARDING THEIR PERSPECTIVES ON THE INSTALLATION AND MAINTENANCE OF HEATING AND COOLING EQUIPMENT."**]**

1. No, that person is not available right now **[SKIP TO A4]**
2. No, unable to refer to someone who can help **[SKIP TO COMMENT1]**
3. Yes, that would be me **[SKIP TO A6B]**
4. Yes, let me transfer you to him/her **[SKIP TO A6]**

-8. Don't know **[SKIP TO COMMENT1]**

A3. Are you the person responsible for making decisions about the installation and maintenance of heating and cooling equipment **[IF <SECTOR> = RESIDENTIAL: "for your home"; IF <SECTOR> = COMMERCIAL: "for your organization. If you represent a property management firm or landlord, this would include the properties that you manage."]? [DO NOT READ RESPONSES]**

[IF NEEDED: "<IOU> IS LOOKING FOR FEEDBACK FROM CUSTOMERS REGARDING THEIR PERSPECTIVES ON THE INSTALLATION AND MAINTENANCE OF HEATING AND COOLING EQUIPMENT."**]**

1. No, that person is not available right now **[IF PROVIDED, RECORD NAME OF NEW PERSON AS <NEWCONTACT>]**
2. No, unable to refer to someone who can help **[SKIP TO COMMENT1]**
3. Yes, that would be me **[RECORD NAME AS <NEWCONTACT>, SKIP TO A6B]**
4. No, let me transfer you to him/her **[SKIP TO A6]**

-8. Don't know **[SKIP TO A5]**

A4. When would be a good day and time for me to call back? **[DO NOT READ RESPONSES]**

1. **[RECORD DATE AND TIME TO CALL AS <APPOINT>]**

-8. Don't know **[SKIP TO COMMENT1]**

A5. Is there a better phone number or an extension you recommend I use when I call back? **[DO NOT READ RESPONSES]**

1. Yes **[RECORD PHONE NUMBER WITH EXTENSION, IF APPLICABLE, AS <NEWPHONE>] [SKIP TO COMMENT2]**

-8. Don't know **[SKIP TO COMMENT2]**

A6. Hello, this is <INTERVIEWER>, calling on behalf of <IOU>. This is not a sales call. I am interested in speaking with the person responsible for making decisions about the installation and maintenance of heating and cooling equipment **[IF <SECTOR> = RESIDENTIAL: "for your home"; IF <SECTOR> = COMMERCIAL: "for your organization.**

If **you represent a property management firm or landlord, this would include the properties that you manage.”]**. I was transferred to you. Is this your role? **[DO NOT READ RESPONSES]**
[IF NEEDED: “<IOU> IS LOOKING FOR FEEDBACK FROM CUSTOMERS REGARDING THEIR PERSPECTIVES ON THE INSTALLATION AND MAINTENANCE OF HEATING AND COOLING EQUIPMENT.”]

1. Yes **[IF NAME IS NOT SIMILAR TO <CONTACT>, RECORD NAME AS <NEWCONTACT>]**
2. No, let me transfer you **[REPEAT A6 AFTER BEING TRANSFERRED]**
3. No, and I have no one to refer you to **[SKIP TO COMMENT1]**

A6B. **[ASK IF <SECTOR> = COMMERCIAL]**
Does your organization own or operate facilities in the State of California?
1 . Yes **[SKIP TO A7]**
2. No **[SKIP TO COMMENT3]**
-8. Don’t know **[SKIP TO COMMENT3]**

A6C. **[ASK IF <SECTOR> = RESIDENTIAL]**
Do you reside in the State of California?

1 . Yes
2. No **[SKIP TO COMMENT3]**
-8. Don’t know **[SKIP TO COMMENT3]**

A7. <IOU> is interested in better understanding how customers think about the installation and maintenance of heating and cooling equipment. They would like you to complete a short telephone survey, which should only take about 20 minutes. For taking the time to complete the survey, we will send you a $25 Amazon gift. Your responses will be kept anonymous. May I continue? **[DO NOT READ RESPONSES]**

1. Yes
2. Not now, but can at a later date or time **[RECORD DATE AND TIME TO CALL AS <APPOINT>, SKIP TO COMMENT2]**
3. Not at all interested **[SKIP TO COMMENT1]**

[DO NOT READ COMMENTS UNLESS DIRECTED:]

[COMMENT1: “OK. THANK YOU FOR YOUR HELP AND HAVE A GREAT DAY!”] **[TERMINATE]**

[COMMENT2: “GREAT. I WILL CALL BACK THEN. THANKS FOR YOUR TIME AND HAVE A GREAT DAY! **[END CALL]** **[CALLBACK AT <APPOINT>]**

[COMMENT3: I’M SORRY TO BOTHER YOU, BUT I REALLY NEED TO TALK TO PEOPLE ASSOCIATED WITH CALIFORNIA, BUT THANKS FOR YOUR TIME!] **[TERMINATE]**

[READ FOR ALL RESPONDENTS: “Throughout this survey we are going to be asking you about your heating/cooling equipment. What we are referring to is **permanently-installed** heating/cooling systems. Some people may refer to these as “ H.V.A.C. systems." This does NOT INCLUDE any room air conditioners, space heaters, or non-permanent, plug-in heating/cooling devices.”]

Section B: Heating/Cooling Unit Information

B1. **[ASK IF <SECTOR> = COMMERCIAL]**
For how many locations in California do you manage the installation or maintenance of heating/cooling equipment for your organization? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
-8. Don't know / not sure

B2A. **[ASK IF <SECTOR> = COMMERCIAL]**
What is the total number of heating/cooling **units** in California for which you make decisions for your organization? If more than one unit, a rough estimate is fine. **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE] [IF 0 UNITS, TERMINATE]**
-8. Don't know / not sure

B2B. **[ASK IF <SECTOR> = RESIDENTIAL]**
How many heating/cooling units do you have at your home ? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE] [IF 0 UNITS, TERMINATE]**
-8. Don't know / not sure

B2C. **[IF B2A = 1 or B2B = 1]**
Is this unit for heating only, for cooling only, or for both heating and cooling? **[DO NOT READ RESPONSES]**

1. Heating only
2. Cooling only
3. Both heating and cooling
-8. Don't know / not sure

B2D. **[IF B2A > 1 or B2B > 1]**
How many of these units are for heating?

1. [RECORD NUMBER OF UNITS; NUMERIC VALUE ONLY]
-8. Don't know / not sure

B2E. **[IF B2A > 1 or B2B > 1]**
How many of these units are for cooling?

1. [RECORD NUMBER OF UNITS; NUMERIC VALUE ONLY]
-8. Don't know / not sure

B3A. **[ASK IF B2A = 1 OR B2B = 1]**
Approximately how old is your heating/cooling equipment, in number of years? **[DO NOT READ RESPONSES]**

1. Less than 5 years old
2. 6-10 years old
3. 11-15 years old
4. >15 years old
-8. Don't know / not sure

B3B. **[ASK IF B2A > 1 OR B2B > 1]**
Approximately how old is your *oldest* heating/cooling equipment, in number of years? A rough estimate is fine. [DO NOT READ RESPONSES]

1. Less than 5 years old
2. 6-10 years old
3. 11-15 years old
4. >15 years old
-8. Don't know / not sure

B4A. Have you ever had new heating/cooling equipment **installed** **[IF <SECTOR> = COMMERCIAL**: "for your current organization or properties you manage in California?"; **IF <SECTOR> = RESIDENTIAL:** "at your current home?" [**DO NOT READ RESPONSES**]

1. Yes
2. No **[SKIP TO B5A]**
-8. Don't know / not sure **[SKIP TO B5A]**

B4B. What was the **main** reason you had this heating/cooling equipment installed? **[DO NOT READ RESPONSES; ONE RESPONSE ONLY]**

1. Didn't have any equipment at the time
2. Existing equipment failed completely
3. Existing equipment did not function well
4. Existing equipment contributed to high utility bills/to save money
5. Existing equipment was not energy efficient
6. Existing equipment had high repair/service costs
7. A contractor recommended upgrading
8. Because of an incentive or rebate
9. I was concerned about my equipment's impact on the environment
11. System was just old/obsolete
12. Health reasons
13. Safety reasons
14. Comfort reasons
15. Wanted different size/type
16. Generic upgrade
17. New facility/remodel
18. To comply with code requirements
97. Other [**RECORD VERBATIM**]

B5A. Do you have periodic, preventative maintenance performed on your heating/cooling equipment? This does not include maintenance you might have done to fix a problem or repair a unit that is not operating correctly. **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO B13]**
-8. Don't know / not sure **[SKIP TO B13]**

B5B. **[ASK IF B2A > 1 or B2B > 1]**
How many of your heating/cooling units receive periodic, preventative maintenance? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
-8. Don't know / not sure

B6. Who typically performs maintenance on this equipment? **[READ RESPONSES 1-4]**

1. A professional contractor, heating/cooling technician, or other specialist
2. **[IF <SECTOR> = COMMERCIAL]** An in-house professional (for example, a technician on staff) **[SKIP TO B11]**
3. A nonprofessional (for example, yourself, a friend, or family member) **[SKIP TO B11]**
4. A mix of both professional and nonprofessional
5. A mix of both outside professional and in-house professional
-8. Don't know / not sure **[SKIP TO B11]**
-9. Refused **[SKIP TO B11]**

B7A. Is this maintenance covered under a maintenance contract? By maintenance contract, I mean an agreement or plan you have with a contractor or technician who provides periodic maintenance to your equipment for a fixed fee. **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO B11]**
-8. Don't know / not sure **[SKIP TO B11]**

B7B. **[ASK IF B2A > 1 or B2B > 1]**
How many of these units are covered under a maintenance contract? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
-8. Don't know / not sure

B8. How long is the term of this maintenance contract in years? **[DO NOT READ RESPONSES]**

1. Less than one year
2. One year
3. Two years
4. Three years
5. Four years

6. Five years
7. Six to ten years
8. More than ten years
9. There was no specific time period associated with the contract
-8. Don't know / not sure

B9. How many visits per year are covered by the contract? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
-8. Don't know / not sure

B10A. **[IF B2A = 1 OR B2B = 1: "**What is the approximate annual cost for just the maintenance contract, not including un-covered labor and/or parts? A rough estimate is fine."] **[DO NOT READ RESPONSES]**
[IF B2A >1 OR B2B>1: "What is the approximate annual cost for just the maintenance contract, not including un-covered labor and/or parts? If your maintenance contract covers more than one unit, can you please estimate how much it is per unit? A rough estimate is fine."] **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
2. No cost – maintenance covered under warranty
-8. Don't know / not sure

B10B. Approximately, how much extra do you spend annually for labor and parts that are not covered under the maintenance contract? A rough estimate is fine.
[IF B2A >1 OR B2B>1: "If your maintenance contract covers more than one unit, please estimate how much it is per unit."]
[DO NOT READ RESPONSES]

1. **[RECORD NUMERIC VALUE]**
2. No cost – maintenance covered under warranty
-8. Don't know / not sure

B11. **[ASK IF B5A = 1 and B7A ≠ 1]**
How many times per year is this maintenance performed? **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
-8. Don't know / not sure

B12A. **[ASK IF B5A = 1 and B7A ≠ 1]**
[IF **B2A = 1 OR B2B = 1: "**Approximately how much money do you spend *annually* on the maintenance of your heating/cooling system? This would include any necessary parts and labor. A rough estimate is fine]. **[DO NOT READ RESPONSES]**

B12B. **[IF B2A >1 OR B2B>1: "**Approximately how much money do you spend *annually* **per unit** on the maintenance of your heating/cooling systems? This would include any necessary parts and labor. A rough estimate is fine]. **[DO NOT READ RESPONSES]**

1. **[RECORD NUMERIC VALUE]**
2. No cost – maintenance covered under warranty

-8. Don't know / not sure

B13. **[ASK IF <PARTICIPANT> = YES]**
Our records show that ***in 2012 or 2013*** you participated in a <IOU> program that provided a rebate for the installation or maintenance of heating/cooling equipment. Do you recall participating in this program? **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO C1]**
-8. Don't know / not sure **[SKIP TO C1]**

B14. Was this for installation, for maintenance, or both? **[DO NOT READ RESPONSES]**

1. Installation only
2. Maintenance only
3. Both
-8. Don't know / not sure

Section C: Installation Decision Processes

C1. On a scale from 0 to 10, with 0 being "not at all important" and 10 being "very important," please rate how important each of the following things are to you, as they relate to your heating/cooling equipment: **[READ LIST ONE AT A TIME AND RECORD RATING FOR EACH ITEM]**

[RANDOMIZE RESPONSE OPTIONS]

A. ___ Reliability
B. ___ Cost of utility bills
C. ___ Longevity of the equipment
D. ___ Indoor comfort
E. ___ Minimizing repair costs
F. ___ Peace of mind
G. ___ Energy efficiency
H. ___ Indoor air quality
I. ___ Environmental impacts

C2. Assume your heating/cooling equipment is starting to have problems and you will need to replace it in the near future.

How many contractors would you consider before choosing one to install new heating/cooling equipment? **[DO NOT READ RESPONSES]**

1. One contractor
2. Two contractors
3. Three contractors
4. Four contractors
5. Five contractors
6. More than five contractors

7. None – I would do it myself, or have a friend, family member, or coworker do it **[SKIP TO C4 – NOTE THAT C4 IS LOCATED AFTER C7]**
-8. Don't know / not sure

C3. What would influence your selection of an installation contractor? **[DO NOT READ RESPONSES]**

1. Low cost/price of installation
2. Good value / quality of work / performance
3. Contractor's guarantee or warranty
4. Reputation of contractor / references / ratings (e.g., BBB, Angie's List)
5. Contractor is associated with <IOU>
6. Timing / availability of contractor
7. Past relationship with contractor
8. Already have in-house contractor/technician on staff
9. Type / brand of equipment being installed
11. Contractor's licenses/certifications/experience
12. Professionalism/appearance/conduct of contractor
13. Other services provided with installation (energy analysis, maintenance contract, etc.)
14. Quality/reliability/efficiency of equipment being installed
15. Payment options available
16. No choice in contractor selection due to circumstances or org. rules
17. Maintenance provided with installation of unit
18. Friend / family member / personal referral
19. Contractor associated with store/retailer
20. Reliability of contractor
21. Contractor is local / geographic location
97. Other **[RECORD VERBATIM]**

C5. If you needed information regarding the proper installation of heating/cooling equipment, where or to whom would you go to get this information? **[DO NOT READ RESPONSES; ALLOW MULTIPLE RESPONSES]**

1. A contractor
2. A manufacturer
3. A utility website
4. A utility representative / phone line
5. A utility mailing, brochure or pamphlet
6. A website not run by the utility **[PLEASE SPECIFY NAME OF WEBSITE]**
7. A store **[PLEASE SPECIFY NAME OF STORE]**
8. A friend, family, colleague
9. Consumer Reports
11. Internet search / Google
12. Manufacturer website
13. BBB/Consumer Reports/Angie's List/Yelp/Youtube
14. Other HVAC-specific site
15. Yellow Pages
16. State or government website
17. Property management company or leasing agent
18. An outside consultant (non-contractor)
19. Best Buy / Sears / Costco / Home Depot / Lowes / Distributor

20. Internal organizational or corporate reference
21. Contractor -NOS
22. Manufacturer - NOS
23. Utility - NOS
24. TV
95. Not sure
97. Other **[RECORD VERBATIM]**

C6. I am now going to read a short list of factors that might influence your selection of new heating/cooling equipment. Please rate each of these on a scale from 0 to 10, with 0 being "not at all important," and 10 being "very important." **[READ LIST ONE AT A TIME AND RECORD RATING FOR EACH ITEM]**
[RANDOMIZE ITEMS A-I]

A. ___ Up front cost of the equipment and installation
B. ___ Timing / convenience of the installation
C. ___ Equipment brand
D. ___ The manufacturer warranty
E. ___ Energy efficiency rating of the equipment
F. ___ Utility rebate availability
G. ___ Appropriate system sizing
H. ___ Some other 3rd party ratings or reviews (such as Consumer Reports)
I. ___ Contractor's recommendation

C7. What criteria would you use to judge the *quality* of the installation of new heating/cooling equipment? **[DO NOT READ RESPONSES; ACCEPT MULTIPLE RESPONSES]**

1. By the visual appearance of the equipment afterwards
2. The system works / no problems with the equipment operation
3. By having diagnostic tests performed by others / 3rd party
4. By performing diagnostic tests myself / in-house
5. By a change in my energy bills / energy costs
6. By looking at the invoices for the installation work
9. Comfort/temperature
10. Past experience
11. Perceived competency of contractor
12. Consultation with friend, co-worker, colleague
13. Background research using secondary source
14. Compliance with building code or manufacturer specs
15. Checklist / contractor report
16. Interaction with contractor doing work / demeanor
17. Cost of work
18. Warranty / guarantee provided
19. Speed / timeliness
20. Indoor air quality
21. Amount of time spent on equipment
22. Noting that the contractor performed specific tasks (e.g., changing filters)
23. Watching technicians work
96. I wouldn't do anything
97. Other **[RECORD VERBATIM]**

98. Not applicable

C4. **[ASK IF C2 <> 1]**
Now imagine your equipment failed on an extreme weather day.

Would you consider multiple contractors or would simply go with the first one that could get the work done?

1. I would consider multiple contractors
2. I would go with the contractor that could get it done first
3. Neither – I would do it myself, or have a friend, family member, or coworker do it
-8. Don't know / not sure

Section D: Program-specific Decision Processes: Installation

D1. Again assuming that you had to install new heating/cooling equipment, would you consider participating in an <IOU> program that offered a premium installation conducted by a <IOU>-approved contractor, following a set of stringent, nationally-recognized industry standards?

1. Yes
2. No
-8. Don't know / not sure

D2. Do you believe that this type of premium installation could provide any additional benefits *above-and-beyond* a typical installation?

1. Yes
2. No **[SKIP TO D5]**
-8. Don't know / not sure **[SKIP TO D5]**

D3. What do you think those benefits might be?

1. Cost/energy savings on utility bills
2. Rebates / first cost savings
3. Higher quality of workmanship / contractor expertise
4. Better / more reliable / more efficient equipment
5. Work/contractor is associated with <IOU> / screened / accountability
6. Guarantee / warranty on equipment
7. Contractor follows standards / regulations
8. Physical comfort in the home
9. Peace of mind

11. Indoor air quality
12. Better / more personalized relationship with contractor
13. Faster service / reliable contractor visits
14. Contractor would perform specific tasks (e.g., changing filters)
15. n/a
16. n/a
17. Better information on work being performed
18. Cost or energy savings estimate provided
19. Fewer interruptions in equipment operation
20. Better for environment
21. Safety
22. Extra services provided / follow up services
23. Performance/efficiency/sizing
95. Not sure
98. Not applicable
97. Other **[RECORD VERBATIM]**

D4A. Would you consider paying extra for this premium installation that goes above-and-beyond a typical installation?

1. Yes
2. No **[SKIP TO D4C]**
-8. Don't know / not sure **[SKIP TO D4C]**

D4B. Why would you be willing to pay extra for this type of installation? **[PRE-CODE; DO NOT READ RESPONSES]**

1. Cost/energy savings on utility bills
2. Rebates
3. Higher quality of workmanship / contractor expertise
4. Better / more reliable equipment
5. Work/contractor is associated with <IOU> / screened
6. Guarantee / warranty on equipment
7. Contractor follows standards / regulations / specifications
8. Physical / thermal comfort in the home
9. Peace of mind
11. Indoor air quality
12. Better relationship with contractor
13. Faster service / reliable contractor visits
17. Better information on work being performed
18. Cost or energy savings estimate provided
19. Fewer interruptions in equipment operation
20. Better for environment
21. Safety
22. Extra services provided
23. Performance/efficiency
95. Not sure
98. Not applicable
97. Other **[RECORD VERBATIM]**

[ALL SKIP TO D5]

D4C. Why would you not consider paying extra for this type of installation? **[DO NOT READ RESPONSES; ALLOW MULTIPLE OPTIONS]**

1. Don't think it's worth the added cost
2. Not clear what the benefits would be
3. Don't think the timing would work
4. Think it would be too much hassle
5. Negative past experiences with similar programs
7. Other program offers same or better solution
8. Internal approval processes prevent participation
9. Can get same level of quality without doing program / believes contractors already do this
10. Would want more information on cost, specifics
11. Lack of contractor selection
12. Simply don't need it
13. Affordability / cash availability
98. Not applicable
97. Other

D5. **[ASK IF <PARTICIPANT> = YES AND B13=1 AND B14 = 1 OR 3; OTHERWISE SKIP TO E1]** You indicated that you participated in a <IOU> program that provided a rebate for the installation of heating/cooling equipment. Are you aware that this program consisted of a premium installation performed by a <IOU>-approved contractor following a set of stringent, nationally-recognized industry standards? **[DO NOT READ RESPONSES]**

1. Yes
2. No
-8. Don't know / not sure

D6. From whom did you first hear about this installation program? **[DO NOT READ RESPONSES; ONE RESPONSE ONLY]**

1. A contractor
2. A manufacturer
3. A utility website
4. A utility representative
5. A utility mailing, brochure or pamphlet
6. A website not run by the utility **[PLEASE SPECIFY NAME OF WEBSITE]**
7. A store **[PLEASE SPECIFY NAME OF STORE]**
8. A friend, family, colleague
11. Internet search / Google
12. Manufacturer website
13. BBB/Consumer Reports/Angie's List/Yelp/Youtube
14. Other HVAC-specific site
15. Yellow Pages
16. State or government website
17. Property management company or leasing agent
18. An outside consultant (not the primary contractor)
19. Best Buy / Sears / Costco / Home Depot / Lowes / Distributor
20. Internal organizational or corporate reference
21. Contractor -NOS
22. Manufacturer - NOS

23. Utility - NOS
24. TV
25. Non-utility mailing or publication NOS
26. HERO program
95. Not sure
97. Other **[RECORD VERBATIM]**

D7. **[IF D6 ≠ 1]** At any time, did the contractor who installed this equipment promote this program to you? **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO E1]**
-8. Don't know / not sure **[SKIP TO E1]**

D8. When promoting this program… **[READ RESPONSES; RECORD YES, NO, OR DON'T KNOW FOR EACH RESPONSE OPTION]**

A. ___ Did the contractor provide information from <IOU>?
B. ___ Did the contractor provide information from an equipment manufacturer?
C. ___ Did the contractor show you any data gathered with diagnostic tools?
D. ___ Did the contractor provide any estimate of savings – either in terms of energy or money – expected to result from this installation?
E. ___ Did the contractor provide you with any other type of information and if so, what was it? **[RECORD VERBATIM]**

D9. **[ASK IF D8.D = YES]**
You indicated that the contractor provided an estimate of savings for this installation. To date, how accurate do you think this estimate was? **[READ RESPONSES; ONE RESPONSE ONLY]**

1. Very accurate
2. Somewhat accurate
3. Just about right
4. Somewhat inaccurate
5. Very inaccurate
-8. Don't know / not sure

Section E: Maintenance Decision Processes

E1. I am now going to read you a short list of statements regarding periodic **maintenance** on heating/cooling systems. Please rate each one on a scale from 0 to 10 with 0 being "completely disagree" and 10 being "completely agree." **[READ RESPONSES AND RECORD RATING; RANDOMIZE ORDER OF RESPONSE OPTIONS]**

A. ___ Maintenance can improve indoor air quality
B. ___ Maintenance can increase indoor comfort
C. ___ Maintenance can improve energy efficiency
D. ___ Maintenance can save money on monthly utility bills
E. ___ Maintenance can prolong the life of the equipment

F. ___ Maintenance can prevent expensive repairs
G. ___ Maintenance can improve a system's reliability
H. ___ Maintenance can help reduce the environmental impacts of my equipment
I. ___ **[READ IF <SECTOR> = COMMERCIAL]** Maintenance can help make sure my normal business operations are not interrupted

E2. For the next few questions, assume you need or want maintenance done on your existing heating/cooling equipment.

If you needed information regarding the maintenance of heating/cooling equipment, where or to whom would you go to get this information? **[DO NOT READ RESPONSES; ALLOW MULTIPLE RESPONSES]**

1. A contractor
2. A manufacturer
3. A utility website
4. A utility representative / phone line
5. A utility mailing, brochure or pamphlet
6. A website not run by the utility **[PLEASE SPECIFY NAME OF WEBSITE]**
7. A store **[PLEASE SPECIFY NAME OF STORE]**
8. A friend, family, colleague
9. Consumer Reports
11. Internet search / Google
12. Manufacturer website
13. BBB/Consumer Reports/Angie's List/Yelp/Youtube
14. Other HVAC-specific site
15. Yellow Pages
16. State or government website
17. Property management company or leasing agent
18. An outside consultant (not the primary contractor)
19. Best Buy / Sears / Costco / Home Depot / Lowes / Distributor
20. Internal organizational or corporate reference
21. Contractor -NOS
22. Manufacturer - NOS
23. Utility - NOS
24. TV
95. Not sure
97. Other **[RECORD VERBATIM]**

E3. Do you have a specific contractor or technician that you usually work with who maintains your heating/cooling system?

1. Yes
2. No **[SKIP TO E5]**
-8. Don't know / not sure **[SKIP TO E5]**

E4. **[ASK ONLY IF E3 = 1, ELSE SKIP TO E5]**
How many contractors did you consider before choosing the one you work with? **[DO NOT READ RESPONSES]**

1. One contractor
2. Two contractors
3. Three contractors
4. Four contractors
5. Five contractors
6. More than five contractors
7. None - it would be done by myself, a friend, a family member, or a coworker **[SKIP TO E6]**

-8. Don't know / not sure

E4b. What influenced your selection of your maintenance contractor?

1. Low cost/price of installation
2. Good value / quality of work / performance
3. Contractor's guarantee or warranty
4. Reputation of contractor / references / ratings (e.g., BBB, Angie's List)
5. Contractor is associated with <IOU>
6. Timing / availability of contractor
7. Past relationship with contractor
8. Already have in-house contractor/technician on staff
9. Type/brand of equipment being installed
11. Contractor's licenses/certifications/experience
12. Professionalism/appearance/conduct of contractor
13. Other services or information provided
15. Payment options available
16. No choice in contractor selection due to circumstances or org. rules
17. Maintenance provided with installation of unit
18. Friend / family member / personal referral
19. Contractor associated with store/retailer
20. Reliability/dependability/honesty of contractor
98. Not applicable
97. Other **[RECORD VERBATIM]**

E5. **[ASK ONLY IF E3 = 2 or -8; ELSE SKIP TO E6]**
How many contractors do you think you would you consider before choosing one to conduct maintenance on your heating/cooling equipment? **[DO NOT READ RESPONSES]**

1. One contractor
2. Two contractors
3. Three contractors
4. Four contractors
5. Five contractors
6. More than five contractors
7. None - it would be done by myself, a friend, family member, or coworker **[SKIP TO E6]**

-8. Don't know / not sure

E5b. What would influence your selection of a maintenance contractor?

1. Low cost/price of installation
2. Good value / quality of work
3. Contractor's guarantee or warranty
4. Reputation of contractor / references / ratings (e.g., BBB, Angie's List)
5. Contractor is associated with <IOU>
6. Timing / availability of contractor
7. Past relationship with contractor
8. Already have in-house contractor/technician on staff
9. Type/brand of equipment being installed
11. Contractor's licenses/certifications/experience
12. Professionalism/appearance/conduct of contractor
13. Other services or information provided
15. Payment options available
16. No choice in contractor selection due to circumstances or org. rules
17. Maintenance provided with installation of unit
18. Friend / family member / personal referral
19. Contractor associated with store/retailer
20. Reliability/dependability/honesty of contractor
98. Not applicable
97. Other **[RECORD VERBATIM]**

E6. What criteria would you use to judge the *quality* of the maintenance you receive on your heating/cooling equipment? **[DO NOT READ RESPONSES; ALLOW MULTIPLE RESPONSES]**

1. By the visual / audio appearance of the equipment afterwards
2. The system works / no problems with the equipment operation
3. By having diagnostic tests performed by others / 3rd party
4. By performing diagnostic tests myself / in-house
5. By a change in my energy bills / energy costs
6. By looking at the invoices for the maintenance work
9. Comfort/temperature
10. Past experience
11. Perceived competency of contractor
12. Consultation with friend, co-worker, colleague
13. Background research using secondary source
14. Compliance with building code or manufacturer specs
15. Checklist / contractor report
16. Interaction with contractor doing work / demeanor
17. Cost of repairs
18. Warranty / guarantee provided
19. Speed / timeliness
20. Indoor air quality
21. Amount of time spent on equipment
22. Noting that the contractor performed specific tasks (e.g., changing filters)
23. Watching technicians work
96. I don't do anything
98. Not applicable
97. Other [**RECORD VERBATIM**]

Section F: Program-specific Decision Processes: Maintenance

F1A. Would you consider participating in a <IOU> program that offered a contract with a <IOU>-approved contractor to perform premium maintenance on your heating/cooling equipment on a periodic basis, using stringent, nationally-recognized standards?

1. Yes
2. No **[SKIP TO F2]**
-8. Don't know / not sure **[SKIP TO F2]**

F1B. If this program required you to sign a maintenance contract, what is the longest contract term you would consider? **[READ RESPONSES; ONE RESPONSE ONLY]**

1. Less than one year
2. One year
3. Two years
4. Three years
5. Five years
6. More than five years
7. None – I would not consider signing a maintenance contract
-8. Don't know / not sure

F2. Do you believe that premium maintenance could provide any additional benefits *above-and-beyond* typical maintenance?

1. Yes
2. No **[SKIP TO F5]**
-8. Don't know / not sure **[SKIP TO F5]**

F3. What do you think those benefits might be?

1. Cost/energy savings on utility bills
2. Rebates / first cost savings
3. Higher quality of workmanship / contractor expertise
4. Better / more reliable equipment
5. Work/contractor is associated with <IOU> / screened / accountability
6. Guarantee / warranty on equipment
7. Contractor follows standards / regulations
8. Physical / thermal comfort in the home
9. Peace of mind

11. Indoor air quality
12. Better relationship with contractor
13. Faster service / reliable contractor visits
14. Contractor would perform specific tasks (e.g., changing filters)
15. Catching problems before they arise / preventing expensive repairs
16. Maintenance performed regularly
17. Better information on work being performed
18. Cost or energy savings estimate provided
19. Fewer interruptions in equipment operation
20. Better for environment
21. Safety
22. Extra services provided
23. Performance/efficiency/sizing
95. Not sure
98. Not applicable
97. Other **[RECORD VERBATIM]**

F4A. Would you consider paying extra for this premium maintenance that goes above-and-beyond typical maintenance?

1. Yes
2. No **[SKIP TO F4C]**
-8. Don't know / not sure **[SKIP TO F4C]**

F4B. Why would you be willing to pay extra for this type of maintenance? **[PRE-CODE; DO NOT READ RESPONSES]**

1. Cost/energy savings on utility bills
2. Rebates
3. Higher quality of workmanship / contractor expertise
4. Better / more reliable equipment
5. Work/contractor is associated with <IOU> / screened
6. Guarantee / warranty on equipment
7. Contractor follows standards / regulations / specifications
8. Physical / thermal comfort in the home
9. Peace of mind
11. Indoor air quality
12. Better / more personalized relationship with contractor
13. Faster service / reliable contractor visits
14. Contractor would perform specific tasks (e.g., changing filters)
15. Catching problems before they arise / preventing expensive repairs
16. Maintenance performed regularly
17. Better information on work being performed
18. Cost or energy savings estimate provided
19. Fewer interruptions in equipment operation
20. Better for environment
21. Safety
22. Extra services provided
23. Performance/efficiency
95. Not sure
98. Not applicable
97. Other **[RECORD VERBATIM]**

[ALL SKIP TO F5]

F4C. Why would you not consider paying extra for this type of maintenance? **[DO NOT READ RESPONSES; ALLOW MULTIPLE OPTIONS]**

1. Don't think it's worth the added cost
2. Not clear what the benefits would be
3. Don't think the timing would work
4. Think it would be too much hassle
5. Negative past experiences with similar programs
7. Other program offers same or better solution
8. Internal approval processes prevent participation
9. Can get same level of quality without doing program / believes contractors already do this
10. Would want more information on cost, specifics
11. Lack of contractor selection
12. Simply don't need it
13. Affordability / cash availability
98. Not applicable
97. Other **[RECORD VERBATIM]**

F5. **[ASK IF <PARTICIPANT> = YES B13=1 AND AND B14 = 2 OR 3; OTHERWISE SKIP TO G1A]**
You indicated that you participated in a <IOU> program that provided a rebate for the maintenance of heating/cooling equipment. Are you aware that this program consisted of premium maintenance performed by a <IOU>-approved contractor following a set of stringent, nationally-recognized industry standards? **[DO NOT READ RESPONSES]**

1. Yes
2. No
-8. Don't know / not sure

F6. From whom did you first hear about this maintenance program? **[DO NOT READ RESPONSES; ONE RESPONSE ONLY]**

1. A contractor
2. A manufacturer
3. A utility website
4. A utility representative
5. A utility mailing, brochure or pamphlet
6. A website not run by the utility **[PLEASE SPECIFY NAME OF WEBSITE]**
7. A store **[PLEASE SPECIFY NAME OF STORE]**
8. A friend, family, colleague
9. Consumer Reports / BBB
11. Internet search / Google
12. Manufacturer website
13. BBB/Consumer Reports/Angie's List/Yelp/Youtube
14. Other HVAC-specific site
15. Yellow Pages
16. State or government website
17. Property management company or leasing agent
18. An outside consultant (non-contractor)
19. Best Buy / Sears / Costco / Home Depot / Lowes / Distributor
20. Internal organizational or corporate reference
21. Contractor -NOS

22. Manufacturer - NOS
23. Utility - NOS
24. TV
95. Not sure
97. Other **[RECORD VERBATIM]**

F7. **[IF F6 ≠ 1]** At any time, did the contractor who conducted this maintenance promote this program to you? **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO G1A]**
-8. Don't know / not sure **[SKIP TO G1A]**

F8. When promoting this program… **[READ RESPONSES; RECORD YES, NO, OR DON'T KNOW FOR EACH RESPONSE OPTION]**

A. ___ Did the contractor provide information from <IOU>?
B. ___ Did the contractor provide information from an equipment manufacturer?
C. ___ Did the contractor show you any data gathered with diagnostic tools?
D. ___ Did the contractor provide any estimate of savings – either in terms of energy or money – resulting from this maintenance?
E. ___ Did the contractor provide you with any other type of information? **[RECORD VERBATIM]**

F9. **[ASK IF F8.D = YES]**
You indicated that the contractor provided an estimate of energy savings for this maintenance. To date, how accurate do you think this estimate was? **[READ RESPONSES; ONE RESPONSE ONLY]**

1. Very accurate
2. Somewhat accurate
3. Just about right
4. Somewhat inaccurate
5. Very inaccurate
-8. Don't know / not sure

Section G: Educational Materials and Understanding

G1A. When thinking about installation or maintenance options for heating/cooling equipment, is there any type of information or educational material that would be useful to you? **[DO NOT READ RESPONSES]**

1. Yes
2. No **[SKIP TO G2]**
-8. Don't know / not sure **[SKIP TO G2]**

G1B. What general topics would you want this information or material to cover? **[PRE-CODE; DO NOT READ RESPONSES]**

1. General overview / basic operating principles / technical information
2. Comparison of different types of equipment
3. Cost/energy savings estimate

4. Types of problems that may occur / what to do
5. Code / standards / regulations
6. Information on the contractor
7. Environment / environmental impacts
8. Air quality information
10. Premium maintenance (vs. typical)
11. Advanced mechanical/engineering technical specifications
12. Work/installation
13. Reliability/longevity of equipment
14. Efficiency
15. Maintenance
16. Performance
17. Benefits
18. Costs / financing
19. Incentives
96. Nothing
97. Other **[RECORD VERBATIM]**

G2. If you had a question about the proper installation or maintenance of heating/cooling system(s), what source or sources would you consult to find more information? **[DO NOT READ RESPONSES; ALLOW MULTIPLE RESPONSES]**

1. A contractor
2. A manufacturer
3. A utility website
4. A utility representative / phone line
5. A utility mailing, brochure or pamphlet
6. A website not run by the utility **[PLEASE SPECIFY NAME OF WEBSITE]**
7. A store **[PLEASE SPECIFY NAME OF STORE]**
8. A friend, family, colleague
9. Consumer Reports
11. Internet search / Google
12. Manufacturer website
13. BBB/Consumer Reports/Angie's List/Yelp/Youtube
14. Other HVAC-specific site
15. Yellow Pages
16. State or government website
17. Property management company or leasing agent
18. An outside consultant (not the primary contractor)
19. Best Buy / Sears / Costco / Home Depot / Lowes / Distributor
20. Internal organizational or corporate reference
21. Contractor –NOS
22. Manufacturer – NOS
23. Utility – NOS
24. TV
26. Trade or professional group (e.g., ASHRAE)
27. Government source NOS
95. Not sure
97. Other **[RECORD VERBATIM]**

G3. In what *format* would you most prefer to obtain this information? How about a…

[READ RESPONSES; ALLOW MULTIPLE RESPONSES]

1. Paper brochure or pamphlet
2. Website
3. Email
4. Talking directly to someone by phone
5. Talking directly to someone in person
96. Nothing
97. Other **[RECORD VERBATIM]**

Section H: Demographics (Residential only)

H1. **[ASK IF <SECTOR> = RESIDENTIAL, OTHERWISE SKIP TO I1]**

Great! Now I just have a few more quick questions and then we're done.

Which of the following best describes your home? **[READ RESPONSES; ONE RESPONSE ONLY]**

1. Single-family free-standing
2. Single-family attached (duplex, triplex, townhouse)
3. Condominium
4. Apartment building with fewer than 10 units
5. Apartment building with more than 10 units
6. A mobile home
7. Other **[RECORD VERBATIM]**
-8. Don't know / not sure
-9. Refused

H2. Do you own or rent your home? **[DO NOT READ RESPONSES]**

1. Own **[SKIP TO H3]**
2. Rent
3. Other **[PLEASE SPECIFY]** **[SKIP TO H3A]**
-8. Don't know **[SKIP TO H3]**

H2B. Does your household pay its own utility bills or are they part of your lease agreement?

1. Pay our own utility bills
2. Part of lease **[SKIP TO H4]**
-8. Don't know / not sure **[SKIP TO H4]**

H3A. Do you know what percentage of your overall summer utility bill is accounted for by cooling costs? If so, what is it? A rough estimate is fine. **[DO NOT READ RESPONSES]**

1. Yes [SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY]
-8. Not sure
-9. Refused

H3B. Do you know what percentage of your overall winter utility bill is accounted for by heating costs? If so, what is it? A rough estimate is fine. **[DO NOT READ RESPONSES]**

1. Yes **[SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY]**
-8. Not sure
-9. Refused

H4. What is your approximate annual household income before taxes? **[READ RESPONSES 1-4]**

1. Less than $50K
2. $50K to $99K
3. $100K to $249K
4. Greater than $250K
-8. Don't know / not sure
-9. Refused

H5. Is Southern California Gas the natural gas provider for your home? **[DO NOT READ RESPONSES]**

1. Yes
2. No
-8. Don't know / not sure

Section I: Firmographics (commercial only)

I1. **[ASK IF <SECTOR> = COMMERCIAL, OTHERWISE SKIP TO J1]**
Great! Now I just have a few more quick questions and then we're done.

What is your role or position at your organization? **[DO NOT READ RESPONSES]**

1. Proprietor/Owner
2. President/CEO/Executive Director
3. Chief Financial Officer
4. Facilities or Building Manager
5. Energy Manager
6. Other Facilities/Maintenance Position
7. Other financial/administrative position
8. Manager
10. Senior Level Management / Partner / VP
11. Superintendent
97. Other **[RECORD VERBATIM]**

I2. Does your organization own or lease its facilities? **[DO NOT READ RESPONSES]**

1. Own **[SKIP TO I3]**
2. Lease/rent
3. Both own and lease/rent
4. Other **[RECORD VERBATIM]** **[SKIP TO I3]**
-8. Don't know **[SKIP TO I3]**

I2B. Does your organization pay its own utility bills or are they part of your lease agreement?

1. Pay our own utility bills
2. Part of lease **[SKIP TO I4]**
-8. Don't know / not sure **[SKIP TO I4]**

I3A. Do you know what percentage of your organization's summer utility bill is accounted for by cooling costs? If so, what is it? A rough estimate is fine. **[DO NOT READ RESPONSES]**

1. Yes **[SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY]**
-8. Don't know / not sure
-9. Refused

I3B. Do you know what percentage of your organization's winter utility bill is accounted for by heating costs? If so, what is it? A rough estimate is fine. **[DO NOT READ RESPONSES]**

1. Yes **[SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY]**
-8. Don't know / not sure
-9. Refused

I4. Approximately how many employees does your organization employ? If you have more than one facility, we are interested in how many employees overall, at all facilities. A rough estimate is fine. **[DO NOT READ RESPONSES]**

1. **[SPECIFY NUMBER OF EMPLOYEES; NUMERIC VALUE ONLY]**
-8. Don't know / not sure
-9. Refused

I5. **[IF B1=1:** "In square feet, approximately how much heated and/or air-conditioned space is your facility? A rough estimate is fine".]
[IF B1>1: "In square feet, approximately how much heated and/or air-conditioned space is your average facility? A rough estimate is fine".]
[DO NOT READ RESPONSES]

1. **[RECORD NUMBER OF SQUARE FEET; NUMERIC VALUE ONLY]**
-8. Don't know / not sure
-9. Refused

I6. How would you best describe the industry in which your organization operates? **[DO NOT READ RESPONSES; ONE RESPONSE ONLY]**

1. Agriculture, Forestry, Fishing and Hunting
2. Mining, Quarrying, and Oil and Gas Extraction
3. Utilities
4. Construction
5. Manufacturing
6. Wholesale Trade
7. Retail Trade
8. Transportation and Warehousing
9. Information
10. Finance and Insurance

11. Real Estate and Rental and Leasing, including Property Management
12. Professional, Scientific, and Technical Services
13. Management of Companies and Enterprises
14. Administrative and Support and Waste Management and Remediation Services
15. Educational Services
16. Health Care and Social Assistance
17. Arts, Entertainment, and Recreation
18. Accommodation and Food Services
19. Other Services (except Public Administration)
20. Public Administration
21. Public Assembly or Religious Facility
97. Other **[RECORD VERBATIM]**

I7. Is Southern California Gas the natural gas provider for any of your organization's facilities? **[DO NOT READ RESPONSES]**

1. Yes
2. No
-8. Don't know / not sure

Section J: Closing

J1. Thank you. Those are all the questions I have today. So we can email the $25 Amazon gift card, please verify the name and email address where you would like it sent. Your gift card will be sent within 3 weeks.

NAME [SPECIFY]
EMAIL [SPECIFY]

J2. We will be conducting a brief follow-up web survey in the coming weeks that covers some similar information. <IOU> really values your input and wants to know if it is OK if we send you a link to this web survey? If you complete that survey, we will send you an **additional** $25 gift card. **[DO NOT READ RESPONSES]**

1. Yes, please send me the web survey **[ASK IF SAME EMAIL ADDRESS AS IN J1; IF NOT, SPECIFY EMAIL ADDRESS FOR WEB SURVEY]**
2. No, I am not interested

[THANK AND TERMINATE]

APPENDIX F: DISCRETE CHOICE SURVEY QUESTIONS FOR NON-TELEPHONE SURVEY RESPONDENTS

Scrn1. Please indicate your **[IF <SECTOR> = RESIDENTIAL:** "home's"**; IF <SECTOR> = COMMERCIAL:** "your organization's"**]** electric utility provider?

[SHOW IF <SECTOR> = COMMERCIAL: "If you represent a property management firm or landlord, this would include the properties that you manage**"].**

1. Pacific Gas and Electric Company (PG&E)
2. Southern California Edison (SCE)
3. San Diego Gas and Electric (SDG&E)
4. Other (specify) **[TERMINATE]**

-8. Don't know **[TERMINATE]**

[SHOW IF <SECTOR>=COMMERCIAL]
Scrn2. Is Southern California Gas the natural gas provider for your home?

1. Yes
2. No

-8. Don't know / not sure

[SHOW IF <SECTOR>=COMMERCIAL]
Scrn3. Is Southern California Gas the natural gas provider for any of your organization's facilities?

1. Yes
2. No

-8. Don't know / not sure

Scrn4. Are you the person responsible for making decisions about the installation and maintenance of heating and cooling equipment **[IF <SECTOR> = RESIDENTIAL:** "for your home"**; IF <SECTOR> = COMMERCIAL:** "for your organization. If you represent a property management firm or landlord, this would include the properties that you manage"**]?**

1. Yes.
2. No **[TERMINATE]**

<<< INSERT DISCRETE CHOICE MODULES HERE >>>

B4A. Have you ever had new heating/cooling equipment installed [**IF <SECTOR> = COMMERCIAL**: "for your current organization or properties you manage in California"; **IF <SECTOR> = RESIDENTIAL:** "at your current home"] ?

1. Yes
2. No
-8. Don't know / not sure

B5A. Do you have periodic, preventative maintenance performed on your heating/cooling equipment? This does not include maintenance you might have done to fix a problem or repair a unit that is not operating correctly.

1. Yes
2. No [**SKIP TO B13**]
-8. Don't know / not sure [**SKIP TO B13**]

B7A. Is this maintenance covered under a maintenance contract? By maintenance contract, I mean an agreement or plan you have with a contractor or technician who provides periodic maintenance to your equipment for a fixed fee.

1. Yes
2. No
-8. Don't know / not sure

B13. In the last 3 years, [**IF <SECTOR> = RESIDENTIAL:** "have you"**; IF <SECTOR> = COMMERCIAL:** "has your organization"] participated in a utility-sponsored program that provided a rebate for the installation or maintenance of heating/cooling equipment?

1. Yes
2. No [**SKIP TO H1**]
-8. Don't know / not sure [**SKIP TO H1**]

B14. Was this for installation, for maintenance, or both?

1. Installation only
2. Maintenance only
3. Both
-8. Don't know / not sure

Section H: Demographics (Residential only)

H1. [**ASK IF <SECTOR> = RESIDENTIAL, OTHERWISE SKIP TO I1**]

Great! Now I just have a few more quick questions and then we're done.

Which of the following best describes your home?

1. Single-family free-standing
2. Single-family attached (duplex, triplex, townhouse)
3. Condominium
4. Apartment building with fewer than 10 units
5. Apartment building with more than 10 units
6. A mobile home
7. Other (specify)
-8. Don't know / not sure
-9. Refused

H2. Do you own or rent your home?

1. Own [**SKIP TO H3**]
2. Rent
3. Other (specify) [**SKIP TO H3**]
-8. Don't know [**SKIP TO H3**]

H2B. Does your household pay its own utility bills or are they part of your lease agreement?

1. Pay our own utility bills
2. Part of lease [**SKIP TO H4**]
-8. Don't know / not sure [**SKIP TO H4**]

H3A. Do you know what percentage of your overall summer utility bill is accounted for by cooling costs? If so, what is it? A rough estimate is fine.

1. Yes [**SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY**]
-8. Don't know / not sure

H3B. Do you know what percentage of your overall winter utility bill is accounted for by heating costs? If so, what is it? A rough estimate is fine.

1. Yes [**SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY**]
-8. Don't know / not sure

H4. What is your approximate annual household income before taxes?

1. Less than $50K
2. $50K to $99K
3. $100K to $249K
4. Greater than $250K
-8. Don't know / not sure
-9. Refused

Section I: Firmographics (commercial only)

I1. [**ASK IF <SECTOR> = COMMERCIAL, OTHERWISE SKIP TO J1**]
Great! Now I just have a few more quick questions and then we're done.

What is your role or position at your organization?

1. Proprietor/Owner
2. President/CEO/Executive Director
3. Chief Financial Officer
4. Facilities or Building Manager
5. Energy Manager
6. Other Facilities/Maintenance Position
7. Other financial/administrative position
8. Manager
9. Other (specify)
-8. Don't know / not sure
-9. Refused

I2. Does your organization own or lease its facilities?

1. Own **[SKIP TO I3]**
2. Lease/rent
3. Both own and lease/rent
4. Other (specify) **[SKIP TO I3]**
-8. Don't know **[SKIP TO I3]**

I2B. Does your organization pay its own utility bills or are they part of your lease agreement?

1. Pay our own utility bills
2. Part of lease **[SKIP TO I4]**
-8. Don't know / not sure **[SKIP TO I4]**

I3A. Do you know what percentage of your organization's summer utility bill is accounted for by cooling costs? If so, what is it? A rough estimate is fine.

1. Yes [**SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY**]
-8. Don't know / not sure

I3B. Do you know what percentage of your organization's winter utility bill is accounted for by heating costs? If so, what is it? A rough estimate is fine.

1. Yes [**SPECIFY % OF MONTHLY BILL; NUMERIC VALUE ONLY**]
-8. Don't know / not sure

I4. Approximately how many employees does your organization employ? If you have more than one facility, we are interested in how many employees overall, at all facilities. A rough estimate is fine.

1. [**SPECIFY NUMBER OF EMPLOYEES; NUMERIC VALUE ONLY**]
-8. Don't know / not sure
-9. Refused

I5. In square feet, approximately how much heated and/or air-conditioned space is your facility? If you have more than one facility, approximately how much heated and/or air-conditioned space is your *average facility*? A rough estimate is fine.

1. **[RECORD NUMBER OF SQUARE FEET; NUMERIC VALUE ONLY]**
-8. Don't know / not sure

I6. How would you best describe the industry in which your organization operates? **[DO NOT READ RESPONSES; ONE RESPONSE ONLY]**

1. Agriculture, Forestry, Fishing and Hunting
2. Mining, Quarrying, and Oil and Gas Extraction
3. Utilities
4. Construction
5. Manufacturing
6. Wholesale Trade
7. Retail Trade
8. Transportation and Warehousing
9. Information
10. Finance and Insurance
11. Real Estate and Rental and Leasing, including Property Management
12. Professional, Scientific, and Technical Services
13. Management of Companies and Enterprises
14. Administrative and Support and Waste Management and Remediation Services
15. Educational Services
16. Health Care and Social Assistance
17. Arts, Entertainment, and Recreation
18. Accommodation and Food Services
19. Other Services (except Public Administration)
20. Public Administration
21. Other (specify)
-8. Don't know / not sure

APPENDIX G: COMMENTS AND RESPONSE TO DRAFT REPORT

Comments from 2/24/15 and EMI Consulting's responses to them are outlined below:

Comment 1. *I think the interpretations of the results of the discrete choice analyses need to go much further than they current do in recognizing the sensitivity of the results to the range of values assumed for each parameter. In its current form, the report seems to simply assume that the range of parameter values assumed for each discrete choice analysis is a realistic representation of what is (or would be) actually experienced by program participants. This comment applies to all of the discrete choice analyses, but to offer just one concrete example: we learn that, if CQM reduces down-time by 1-5 days, but increases the cost of a maintenance contract by 50-100%, the importance of these two variables to customer acceptance will swamp that of all others, and thus marketing should emphasize them. However, as I think I noted back when this analysis was getting planned, we have no evidence as to whether these are realistic values. (It has proven difficult to even document savings from CQM much less how much effect it has on downtime, and a doubling of contract cost seems like it is probably on the high end.) If the analysis had assumed smaller values for these parameters, both Figure 7-22 and the recommendations immediately following it would look very different than they do. I recognize that in order to perform these analyses you needed to make some assumptions about parameters for which little is known, so I don't mean to criticize you for the values you chose. However, I think it is highly problematic to interpret the results as if the values you chose were a reliable reflection of reality. One approach might be to point out the potential variations in implications of the results depending on the true range of the parameter values. (For example: if QM contract costs proved to be on the high end of what we assume, then we would recommend the following; if true effects on downtime were toward the low end of what we assumed, then we would recommend the following. In order to be useful, such an approach would need to incorporate some reasoning regarding the relative likelihood of various parameter ranges occurring in the real world.)*

Response: We agree that additional explanation is warranted regarding the sensitivity of the discrete choice results to the range of values assumed for each parameter (i.e., each level of the attributes included in the discrete choice study), particularly given the substantial uncertainty surrounding what values are considered realistic. In the report we initially address this concern in the Methods section (p. 12):

(Excerpt from the Methods chapter) "Here we note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. For example, consider two different sets of levels for the attribute "monthly cost savings." The first set contains the levels "no change from baseline," "15% savings," and "30% savings." The second set contains the levels "no change from baseline," "50% savings," and "80% savings." All other attributes remaining unchanged, "monthly cost savings" would become more important in relation to other attributes if the second set of levels (featuring 50% and 80% savings) were used instead of the first set. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team utilized a number of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was as realistic as possible given the best information available. In addition to referencing the standards themselves, we utilized a number of other sources (some shown in Table 2.8) to help inform level selection for each attribute used in the installation and maintenance discrete choice modules. We caution that to a degree, the variation and uncertainty in many of these published values carries through to the discrete choice survey."

Additionally, in each chapter presenting the results of the discrete choice survey by sector and focus (i.e., installation vs. maintenance), we include a reminder that the interpretation of the results should be tempered by an understanding that the choice of values for the levels will influence the relative weights, and include a reference to the broader discussion included in the Methods chapter:

(Excerpt from each of the Results chapters) "**Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute.** This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome."

Comment 2. *For the commercial portions of the report, I would argue for more sensitivity to the effects of skewed size distributions. All indications here are that, as with most analyses of C&I end-users, a small fraction of the respondents control the lion's share of the HVAC units. To simply analyze the results without any weighting by size may thus be quite misleading from the perspective of reflecting the overall population of units and thus of potential savings. One possibility for dealing with this issue might be to weight some of the analyses by size. Another possibility might be to break down some of the responses by size category, in order to assess whether larger end-users showed different response patterns than small ones.*

Response: We agree that the commercial portions of the report would benefit from additional consideration of the size of respondents' facilities. We note here that the unit of analysis for this study was the *customer* (or the *decision-maker*) and not the *facility*. We determined that the most effective way to include a size consideration in our analyses was to break out customers by the size and number of facilities for which they are responsible, and to point out where differences existed between these groups. Accordingly we devised a classification system that divides respondents into different classes based on two dimensions: (1) the number of facilities for which they are responsible, and (2) the number of units for which they are responsible (the number of units was closely correlated to the square footage of respondents' individual facilities). This composite classification was based on the notion that a customer making decisions for ten HVAC units at ten *different* locations might be fundamentally different than a customer making decisions for ten HVAC units all contained at *one* location. Thus we felt a weighting scheme based only by size or only by number of units may in fact overlook some of the nuances between these types of customers. Using these two dimensions, we separated customers into three composite "size classes": (1) Class 1 customers are responsible for only a single location with no more than three HVAC units, (2) Class 2 customers are responsible for a single location but with more than three units, and (3) Class 3 customers are responsible for more than one location with any number of units. In each section of the results chapters, we then referenced any statistically significant differences between these groups in their responses to individual questions. As described on pages 25 and 26 of the report:

(Excerpted from pages 25-26 of the report) "To account for any possible difference between commercial customers who are responsible for different size facilities, the research team developed a composite "size class" index based on two dimensions of respondents' facilities: (1) the number of locations for which a customer was responsible for making HVAC decisions, and (2) the number of HVAC units for which a customer was responsible for making HVAC decisions. Upon examination of the data, the research team determined that there were three basic classes to which customers should be assigned using this composite index variable. The first group of customers was responsible for only a single location and had relatively few (using the median

value of three or fewer) HVAC units. The second group of customers was also responsible for a single location, but had responsibility for a comparatively greater number of units (more than three units). The third class of customers was responsible for multiple locations. Table 3-2 shows the breakdown of commercial respondents into one of these three Classes using the composite index variable.

Table 3-2: Class Assignment of Commercial Respondents Using Composite Class Size Variable

Composite Size Class	Description	n	Percent of total (n = 248)
1	Single location, <=3 units	96	39%
2	Single location, >3 units	37	15%
3	More than one location	115	46%

Note. One decision-maker indicated he was not sure about the number of units for which he was responsible and was not included in this analysis.

After assigning commercial respondents to one of the classes based on the number of locations and the number of units for which they were responsible, the research team looked at any potential firmographic differences between the classes. We found several meaningful and statistically significant differences between the groups, which are detailed in Table 3-3.

- Class 2 customers were the most likely (70%) to own their facilities while Class 1 customers were the least likely (41%); Class 3 customers fell in between the other two classes (55%).
- This same trend was true for the percentage of each class performing regular maintenance on their HVAC equipment (89% of Class 2 customers vs. 78% of Class 3 customers vs. 63% of Class 1 customers).

We then looked at any potential industry classification differences between classes. The only statistically significant difference between classes in terms of industry classification was the higher percentage of Class 2 and Class 3 customers who indicated they belonged to the "Real Estate and Rental and Leasing, including Property Management" industry classification, with Class 3 customers the most likely to choose this category (31%).

In general, throughout the analysis of the survey data, we highlight statistically significant differences between the composite size classes."

Table 3-3: Characteristics of the Three Composite Size Classes

Characteristic	Class 1 (n = 96)	Class 2 (n = 37)	Class 3 (n = 115)
	1 location; <=3 units	*1 location; >3 units*	*>1 location*
Percent who own their facility	41%	70% [a]	55%
Percent who have regular preventative maintenance performed	63%	89% [b]	78% [b]
Percent in "Real Estate and Rental and Leasing, including Property Management" industry	3%	16% [c]	31% [c]

[a] Class 2 members were significantly more likely than Class 1 members to own their facility using a two proportions z-test, $p < .05$.
[b] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report having regular preventative maintenance performed on their HVAC equipment using a two proportions z-test, $p < .05$.
[c] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report membership in the industry "Real Estate and Rental and Leasing, including Property Management" using a two proportions z-test, $p < .05$.

Comments from 4/3/15 and EMI Consulting's responses to them are outlined below:

Comment 1. *Regarding the discrete choice analysis: I think the repeated caveats on the sensitivity of the results to the parameter range assumptions are helpful. But again, the potentially significant effects of this sensitivity don't seem to find their way into the conclusions regarding the implications of the discrete choice analysis. Also, the references to having carefully examined the literature to make sure the ranges are realistic, and the references to specific sources in the literature, seem to telegraph that the authors believe the literature has pinned down reliable ranges. This may explain why the conclusions regarding the discrete choice analyses have not been caveated more. But did the authors really encounter solid industry research on, say, the incremental effects of quality maintenance on likely downtime? Having seen that we have a hard time in CA even quantifying the near-term savings from QM, I'm somewhat skeptical that this is the case.*

Response: We agree that some additional language regarding the interpretation and use of the discrete choice results is warranted, particularly in the Conclusions and Recommendations section. We first bolstered the initial discussion of this concern in the Methods section:

(Excerpt from the Methods chapter, p. 12)
"Two important caveats are warranted regarding the use and interpretation of the discrete choice study results:

- **It is critical to acknowledge the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute.** For example, consider two different sets of levels for the attribute "monthly cost savings." The first set contains the levels "no change from baseline," "15% savings," and "30% savings." The second set contains the levels "no change from baseline," "50% savings," and "80% savings." All other attributes remaining unchanged, "monthly cost savings" would become more important in relation to other attributes if the second set of levels (featuring 50% and 80% savings) were used instead of the first set. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered.
- **We also caution that to a degree, the variation and uncertainty regarding many of these levels carries through to the discrete choice survey.** The research team utilized a number of sources on QI/QM and on general HVAC equipment operation to help inform the values for individual levels in the discrete choice study. We took great care to make sure that the set of levels chosen for each attribute was as realistic as possible *given the best information available at the time*. In addition to referencing the standards themselves, some of these sources are shown in Table 2.8. However, in many cases we had to rely on incomplete or highly uncertain values in the published literature, particularly given the scarcity of empirical data supporting operational improvements associated with QI/QM. What this means is that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain."

We also re-emphasized the cautious interpretation of the discrete choice results in each of the Results chapters:

(Excerpt from each of the Results chapters, pp. 48, 70, 92, 120)

"Here we again note the importance of the choice of levels in designing a discrete choice study, and caution that the range between the lowest and highest levels for each attribute has the ability to influence the resulting weight (importance) assigned to that attribute. This reflects the fact that an attribute's importance is a direct function of the difference between preference for the lowest and highest levels tested. Thus choosing levels for the attributes in a discrete choice study is a critical task and must be carefully considered. For the discrete choice exercises in this research study, the research team selected levels from a scan of existing published literature on QI/QM, taking great care to make sure that the set of levels chosen for each attribute was representative of the range of values in reality, or as close as may currently be estimated given the information available (see the Methods chapter for more information). Thus we caution that any interpretation of discrete choice results should be tempered by the recognition that the choice of levels will influence the final outcome."

(Excerpt from each of the Results chapters, pp. 50, 72, 94, 122)
"It must be noted that if actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic."

Additionally, at a number of locations throughout the report, we have inserted footnotes referencing this discussion of the uncertainty surrounding QI/QM:

(Footnotes excerpted from pp. 53, 74, 96, 124, 127, 135, 136, 137)
"If actual improvements resulting from QI/QM do not closely parallel the choice of level values in this study, the validity of the discrete choice results becomes highly uncertain. Please refer to the Methods section for a more in-depth discussion on this topic."

Finally, we inserted language into the recommendations dealing specifically with findings from the discrete choice study (in italics):

Residential QI Recommendation #4: "Branding efforts may benefit by focusing on cost savings for utility bill costs and reliability improvements resulting from QI (*assuming that QI provides these benefits*). Promoting the provision of easy-to-understand cost savings estimates of premium installation to customers could help strengthen the value proposition. Because customers are highly price sensitive to the cost of installation, the benefits of participation need to be translated into monthly cost savings. Additionally, there is evidence that this method could be effective – among program participants who received cost savings estimates, a majority indicated this estimate was either accurate or very accurate."

Commercial QI Recommendation #2: When promoting the benefits of premium, standards-based installation, messaging to commercial customers could focus on the increased reliability resulting from these services (*assuming that increased reliability is in fact a benefit attributable to QI*). Additionally, this messaging could benefit from providing information that is more specific or concrete than just "greater reliability."

Commercial QM Recommendation #1: Though cost matters, most commercial customers are also sensitive to improvements in system reliability. Messaging to these customers should focus on the increased reliability resulting from QM services (*assuming that increased reliability is in fact a benefit attributable to QM*). This is especially true for the segment of customers for which reliability matters as much as cost.

Comment 2. *Regarding the effects of business size: I think it was a sensible response to my comments on this to classify respondents into three types based on how many units they control across how many sites. However, it looks to me like, as one would expect, respondents representing larger businesses tended to be somewhat more sophisticated and attentive in their understanding of HVAC issues (though admittedly not systematically different in their receptivity to QM/QC). But this tendency does not seem to find its way into the conclusions and recommendations or the ES. Yet it seems like a potentially important issue given that larger businesses are where the bulk of the units are.*

Response: We agree that the commercial portions of the report, particularly the Conclusions and Recommendations section, would benefit from additional consideration of the size of respondents' facilities. We first made a few minor clarifications to the explanation of the analysis by firm size below:

(Excerpted from pages 25-26 of the report)

"To account for any possible difference between commercial customers who are responsible for different size facilities, the research team developed a composite proxy variable based on two dimensions of respondents' responsibilities: (1) the number of locations for which a customer was responsible for making HVAC decisions, and (2) the number of HVAC units for which a customer was responsible for making HVAC decisions.[1] Upon examination of the data, the research team determined that there were three basic classes to which customers should be assigned using this composite proxy variable. The first group of customers was responsible for only a single location and had relatively few (using the median value of three or fewer) HVAC units. The second group of customers was also responsible for a single location, but had responsibility for a comparatively greater number of units (more than three units). The third class of customers was responsible for multiple locations, with any number of units. Table 3-2 shows the breakdown of commercial respondents into one of these three Classes using the composite proxy variable.

Table 3-2. Class Assignment of Commercial Respondents Using Composite Class Size Variable

Composite Size Class	Description	n	Percent of total (n = 248)
1	Single location, <=3 units	96	39%
2	Single location, >3 units	37	15%
3	More than one location	115	46%

Note. One decision-maker indicated he was not sure about the number of units for which he was responsible and was not included in this analysis.

After assigning commercial respondents to one of the classes based on the number of locations and the number of units for which they were responsible, the research team looked at any potential firmographic differences between the classes. We found several meaningful and statistically significant differences between the groups, which are detailed in Table 3-3:

- Class 2 customers were the most likely (70%) to own their facilities while Class 1 customers were the least likely (41%); Class 3 customers fell in between the other two classes (55%).

[1] We note here that the unit of analysis for this study was the *customer* (or the *decision-maker*) and not the *facility*. We determined that the most effective way to include a size consideration in our analyses was to break out customers by the size and number of facilities for which they are responsible, and to point out where differences existed between these groups. Accordingly we devised a classification system that divides respondents into different classes based on two dimensions: (1) the number of facilities for which they are responsible, and (2) the number of units for which they are responsible (the number of units was closely correlated to the square footage of respondents' individual facilities). This composite classification was based on the notion that a customer making decisions for ten HVAC units at ten *different* locations might be fundamentally different than a customer making decisions for ten HVAC units all contained at *one* location. Thus we felt a weighting scheme based only by size or only by number of units may in fact overlook some of the nuances between these types of customers.

- This same trend was true for the percentage of each class performing regular maintenance on their HVAC equipment (89% of Class 2 customers vs. 78% of Class 3 customers vs. 63% of Class 1 customers).

We then looked at any potential industry classification differences between classes. The only statistically significant difference between classes in terms of industry classification was the higher percentage of Class 2 and Class 3 customers who indicated they belonged to the "Real Estate and Rental and Leasing, including Property Management" industry classification, with Class 3 customers the most likely to choose this category (31%).

Table 3-3. Characteristics of the Three Composite Size Classes

Characteristic	Class 1 (n = 96)	Class 2 (n = 37)	Class 3 (n = 115)
	1 location; <=3 units	*1 location; >3 units*	*>1 location*
Percent who own their facility	41%	70% [a]	55%
Percent who have regular preventative maintenance performed	63%	89% [b]	78% [b]
Percent in "Real Estate and Rental and Leasing, including Property Management" industry	3%	16% [c]	31% [c]

[a] Class 2 members were significantly more likely than Class 1 members to own their facility using a two proportions z-test, $p < .05$.
[b] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report having regular preventative maintenance performed on their HVAC equipment using a two proportions z-test, $p < .05$.
[c] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report membership in the industry "Real Estate and Rental and Leasing, including Property Management" using a two proportions z-test, $p < .05$.

In general, throughout the analysis of the survey data, we highlight statistically significant differences between the composite size classes."

We also inserted a new section into the Conclusions/Recommendations chapter (as Section 8.2) to call additional attention to the distinction between decision-makers responsible for different numbers of units and locations:

(Excerpted from Conclusions/Recommendations chapter, page 133 of the report)
"In this subsection we re-summarize the approach used in this study to consider how characteristics of a customer's firm affect their decision-making. As discussed in more depth in Section 3.3, we explored the issue of firm size throughout this study by assigning commercial respondents to one of three composite size classes based on the number of locations and the number of units for which they were responsible, and then looking for differences between these groups. Table 8-1 shows some of the key firmographic differences between these three classes (note this is the same as Table 3-2).

Table 8-1. Characteristics of the Three Composite Size Classes

Characteristic	Class 1 (n = 96)	Class 2 (n = 37)	Class 3 (n = 115)
	1 location; <=3 units	*1 location; >3 units*	*>1 location*
Percent who own their facility	41%	70% [a]	55%
Percent who have regular preventative maintenance performed	63%	89% [b]	78% [b]
Percent in "Real Estate and Rental and Leasing, including Property Management" industry	3%	16% [c]	31% [c]

[a] Class 2 members were significantly more likely than Class 1 members to own their facility using a two proportions z-test, $p < .05$.
[b] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report having regular preventative maintenance performed on their HVAC equipment using a two proportions z-test, $p < .05$.
[c] Class 1 members were significantly less likely than either Class 2 or Class 3 members to report membership in the industry "Real Estate and Rental and Leasing, including Property Management" using a two proportions z-test, $p < .05$.

Throughout the analyses performed in this study, we highlighted where significant differences existed between these three groups. Here we briefly recap some of the more important differences from a practical viewpoint:

- When selecting a contractor to perform installation work, Class 1 customers were significantly more likely than Class 3 customers to be concerned with contractor reliability (mentioned by 18% of Class 1 customers and 7% of Class 3 customers) and less concerned with cost (mentioned by 57% of Class 1 customers and 75% of Class 3 customers).
- When selecting a contractor to perform maintenance work, Class 3 customers were significantly more likely than Class 1 customers to mention the importance of contractor licensing and certifications as an important factor in the contractor selection process (mentioned by 32% of Class 3 customers and 7% of Class 1 customers).
- Class 1 customers were significantly more likely to mention that they would not be willing to pay extra for QI/QM because they believed that contractors were already required to abide by these standards (6 out of 28, or 21% of Class 1 customers vs. 1 out of 40, or 2.5% of Class 3 customers).

Collectively, these results suggest that customers responsible for only a single location (often rented and not owned) with three or fewer HVAC units represent a particular challenge for QI/QM programs. Targeted education and branding efforts may be particularly effective among this population."