Process Evaluation of the PG&E 2006-2008 Home Energy Efficiency Survey (HEES) Program

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Final Report

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1. EXECUTIVE SUMMARY

This is the executive summary for the process evaluation of the Pacific Gas and Electric 2006-08 Home Energy Efficiency Survey (HEES) Program.

1.1 PROGRAM BACKGROUND

The 2006-2008 Home Energy Efficiency Survey (HEES) program, branded as the SmartEnergy Analyzer, is a non-resource acquisition program that provides residential customers with a mail-in, on-line, or telephone energy audit of their homes. The 2006-2008 program is within the umbrella of PG&E's Education and Training initiatives, but will become its own resource acquisition program with energy saving goals in the 2009-2011 program cycle.

The audit tool uses a series of questions combined with actual or estimated participant billing data to determine energy efficiency opportunities within the participant's home, and offers behavioral tips and appliance upgrade recommendations and the associated energy bill savings. The audit results pair recommendations with phone numbers to call and websites to visit to access appropriate appliance rebate programs and other energy efficiency programs. Overall, the HEES program aims to increase customer awareness of energy efficiency measures, induce customer energy efficiency behavioral changes, and prompt participation in other energy efficiency programs.

In addition to energy efficiency recommendations, the tool presents an analysis of the customer's annual energy use attributed to each of their major appliances, as well as a graphical comparison of their household energy consumption in comparison with other similar households. The tool creates these estimates using one year of energy usage data.

1.2 RESEARCH METHODS

The research objectives that were addressed by this study included:

- Estimate the expected savings for this program
- Examine the user-friendliness and accessibility of HEES
- Investigate if the recommendations algorithm is appropriate
- Determine the effectiveness of the survey for CSI customers
- Analyze the effectiveness of the primary marketing strategies
- Identify important respondent demographic differences across HEES modes and the HEES recommendations that they implement

The major research activities were a participant survey and a billing analysis.

Participant Phone Survey

ECONorthwest fielded a participant phone survey through Freeman Sullivan in February 2009. The usable participant sample with phone numbers and billing information was 3,761 data points, from which we were able to achieve 601 completes (out of our goal of 800). Survey completes were collected in two sample batches, which contained program participants that had

completed a survey between March 2007 and December 2008. The survey took between 15 and 20 minutes to complete.

Billing Analysis

A two-stage modeling framework was developed to examine the estimated change in electricity usage between the baseline and post-period and to estimate the proportion of any estimated energy savings attributable to the HEES program. The statistical models developed for this project are as follows:

1. **Billing Regressions** were estimated to estimate the change in household electricity and natural gas consumption from the baseline period to the post-survey period

2. An **Attribution Model** was estimated to statistically estimate the relationship of any change (reduction) in electricity and natural gas consumption to the HEES program.

1.3 STUDY FINDINGS

Based on the billing analysis, HEES program participants reduced their electricity usage on average by 2.3 percent after their participation, representing the gross savings associated with the program. They directly attributed 20 percent of that to the HEES program (a conservative estimate of net program savings), based on statistical analysis of data of participant self-reported attribution collected by ECONorthwest through a telephone survey of a subset of HEES participants. Using coincident factors developed from several California-based analyses of household electricity use, we estimate that a reduction of 0.02 to 0.10 kW is directly attributable to the HEES program.

HEES program participants reduced their natural gas usage on average by 2.2 percent after their participation. This result, however, is not statistically significantly different from zero at the 95 percent level of confidence. We cannot, therefore, conclude with statistical confidence that natural gas savings were achieved for the overall program. HEES participants directly attributed 32 percent of that to the HEES program.

Energy savings estimates were not statistically significantly different between on-line and mail survey participants.

Table 1 below presents the gross and net savings estimates from this evaluation. We estimate gross electricity savings per participant of 241 kWh +/- 147 kWh and total electricity savings of 1.1 million kWh +/- 675,000 kWh. We estimate net savings per participant of 48 kWh +/- 15 kWh and total net savings for the HEES program of 218,000 kWh +/- 36,000 kWh.

For demand, we estimate gross savings per participant of 0.10 kW +/- 0.6 kW and total demand savings of 470 kW +/- 287 kW. We estimate net demand savings of 0.02 kW +/- 0.006 kW per participant and total net demand savings of 93 kW +/- 15 kW.

For natural gas we estimate gross savings per participant of 15 therms +/- 19 therms and total demand savings of 7,363 therms +/- 9,185 therms. As noted above, we cannot conclude with a suitable level of statistical confidence that gas savings were achieved for the overall program.

Nevertheless, we estimate net gas savings of 5 therms +/- 1.4 therms per participant and total net gas savings of 2,297 +/- 705 therms that are statistically significant.

Table 1: Gross and Net 2006-2008 HEES Program Savings Estimates

	Gross Savings Estimates (+/- 95% Confidence Interval)		Net Savings Estimates (+/- 95% Confidence Interval)	
	Per 2006-2008 Participant	**Total 2006-2008**	**Per 2006-2008 Participant**	**Total 2006-2008**
Electricity	241 (+/-147) kWh	1,103,480 (+/-674,598) kWh	48 (+/-15) kWh	218,489 (+/-35,744) kWh
Demand	0.10 (+/-0.06) kW	470 (+/-287) kW	0.02 (+/-0.006) kW	93 (+/-15) kW
Gas	15 (+/-19) therms	7,363 (+/-9,185) therms	5 (+/-1.4) therms	2,297 (+/-705) therms

SOURCE: ECONorthwest analysis of data from PG&E

The HEES program attracts a knowledgeable segment of customers, mostly single-family homeowners who are most easily poised to take action on energy efficiency recommendations. The mail survey attracts a broader demographic pool than the on-line survey.

Participants receive on average 30 recommendations in their HEES report. They reportedly followed 50 percent of the recommendations, though they said they had already done 70 percent of those prior to HEES, 22 percent as a result of HEES and 8 percent partially attributable to HEES. One interpretation of the billing analysis findings is that HEES participants are not attributing actions they took after receiving their HEES report to the program (since gross savings were 5 times that of savings attributable to the program).

For the remainder of recommendations that were not implemented, participants said they were not applicable or too expensive.

For recommendations implemented as a result of HEES, participants typically installed their measures within 1 month of reviewing their HEES report, and they were satisfied with the measures they took as a result of the program.

The HEES program is leading to a substantial amount of follow-up action, including participation in other PG&E programs and installation of energy efficiency equipment.

Satisfaction with the HEES survey and report process and results was very high, and participants offered very few suggestions to improve the program.

There was some evidence that mail-in participants were more likely to install behavioral measures and on-line and CSI participants more likely to do equipment purchases as a result of HEES. On-line participants were more likely to go to the PG&E website to learn more about energy efficiency programs, more likely to buy energy efficient equipment and more likely to get a PG&E rebate after participating in HEES.

1.4 CONCLUSIONS

The study conclusions are organized around the original research questions identified at the start of the study.

- **Estimate the expected savings for this program**

We estimate gross program savings of 2.5 percent and net savings of 0.5 percent of the average participant's energy bill in the year following their participation. The net savings estimate is conservative, reflecting only the savings that participants directly attributed to the program.

The survey results indicate that the HEES program leads to a substantial amount of follow-up action, including participation in other PG&E programs and energy equipment measure installation, particularly among on-line survey participants.

- **Examine the user-friendliness and accessibility of HEES**

HEES participants gave high satisfaction ratings to the program, and had very few suggestions for improvement. The HEES survey – both on-line and mail, is perceived as user-friendly and accessible.

- **Investigate if the recommendations algorithm is appropriate**

The recommendations algorithm appears to be appropriate – even though many of the recommendations were reportedly already taken before participating (a finding that should be confirmed with future research), participants were satisfied with the recommendations they received and few offered ways to improve the program. Many participants were motivated to take follow-up action such as participating in PG&E rebate programs and buying energy efficiency equipment as a result of the program.

- **Determine the effectiveness of the survey for CSI customers**

The survey was equally as effective for CSI customers as non-CSI customers, even though they had already implemented a greater proportion of recommended measures prior to participating. With their higher income and greater disposition towards energy efficiency investments, they were more able and motivated to follow HEES recommendations.

- **Analyze the effectiveness of the primary marketing strategies**

The marketing strategies are effective in attracting two distinct populations – direct mailing of surveys to a broader segment of the population and on-line advertising to a more selective audience. The groups are not likely to be aware of the other options, suggesting that participants do not "select" a mode but instead respond to the one mode they are made aware of by program marketing.

- **Identify important respondent demographic differences across HEES modes and the HEES recommendations that they implement**

On-line survey participants are more pre-disposed to take energy efficiency actions prior to the survey, and to take subsequent action due to higher energy efficiency awareness, income and education levels. However, mail participants were just as likely to be influenced by HEES to implement energy efficiency measures, even though they had done less prior to their participation.

In general, the two groups undertake behavioral and investment type measures just as often, though there is some evidence at the measure category level to suggest that mail-in participants take behavioral measures more often (e.g., lighting).

Based on the results of the billing regressions, the percent change in electricty usage differed little for the on-line and mail-in participants: 2.34 percent reduction versus a 2.24 percent reduction, These two point estimates are not statistically significantly different. For natural gas, the estimated percent change in consumption for on-line participants is a 1.6 percent reduction, but is not statistically significant. For mail-in participants the percent reduction in natural gas consumption is 2.9 percent and is statistically significantly different from zero.

1.5 RECOMMENDATIONS

The attribution model was an innovative method employed to determine net savings attributable to the HEES program. Going forward we believe that further refinements may be made to the approach to narrow in on a net savings estimate.

- Expand the attribution survey question to more explicitly probe for partial attribution - the majority of respondents who followed a HEES recommendation said they had already done the measure before taking HEES, and we could probe them to see if they increased their actions after receiving the HEES recommendation or whether HEES spurred them to take action even though they had already been aware of the recommended measure prior to HEES.

- Incorporate non-participants into the billing analysis model, e.g., 2010 participants, to determine whether 2008 participants would have been likely to reduce their energy consumption regardless of their participation during 2008-2009.

- Conduct follow-up telephone surveys with participants closely following receipt of the HEES report to improve respondent recall of the timing of taking actions in their home.

We recommend continuing to offer both the mail and on-line survey modes, using both direct mail and on-line advertising. The mail-in survey attracts a broader audience that is less likely to have implemented energy efficiency measures. The on-line survey segment leads to more follow-up action, most likely because they are already pre-disposed to participating in programs, particularly via the PG&E website.

The CSI group, though more inclined to have already taken energy efficient measures prior to participating in HEES, get as much value out of the program as non-CSI customers as they attribute just as many recommendations that they followed to the HEES program. They also were more likely to take follow-up action. We recommend that CSI participants continue to participate in HEES.

2. INTRODUCTION

This report presents process evaluation results for the Pacific Gas and Electric 2006-08 Home Energy Efficiency Survey (HEES) Program, which is a program that conducts residential energy audits. The primary research activities were a participant phone survey launched in February 2009 and billing analyses conducted in late 2009.

The HEES program offers residential energy audits designed to increase residential customer awareness of their energy consumption, induce behavioral changes that can reduce energy use, and provide information about efficient equipment options (including available rebates). The program delivers its energy audits via a mail-in form, an on-line portal, and over the phone.

The key objectives of this evaluation were to measure how well the HEES program is resulting in customer conservation actions, to identify drivers of customer satisfaction, and to collect suggestions for making the surveys more user-friendly. In addition, a billing regression model estimated the program's energy saving impacts. Other research goals are described subsequently in this report. To address these issues, the following major evaluation tasks were completed:

- *Kick-off Meeting.* The kickoff meeting for the HEES program took place in July 2008. ECONorthwest met with program staff members to present the design of this evaluation and to solicit ideas for research topics to be addressed by this analysis. The group decided that the scope of this project would exclude participants who conducted the HEES survey by phone.

- *Logic model and program theory.* A logic model and program theory was developed based on review of program materials and interviews with program staff, providing a starting point for all evaluation activities. The structure of the logic model, which links program activities and expected outcomes, is a useful instrument for identifying specific program assumptions that can be tested using a survey or other primary data collection activities.

- *Participant survey.* The primary data collection instrument was a participant survey, fielded over the phone. The survey explored the participant experience with program services and addressed the research issues identified by the logic model and kickoff meeting discussion. When appropriate, results were also examined by survey mode (mail-in and on-line) to investigate how participants in the various modes compare with regard to the most effective marketing strategies, recommendation implementation rates, and measures of satisfaction.

- *Billing analysis.* The development of estimates of energy savings required a two-stage analysis that combined billing regression analysis with a statistical regression model to estimate the portion of energy savings attributable to the HEES program.

The remainder of this report includes an overview of the program, a description of the research methods, results from the participant survey and the billing analyses, study findings, conclusions and recommendations. The participant telephone survey instrument is included as an appendix.

3. PROGRAM BACKGROUND

The 2006-2008 Home Energy Efficiency Survey (HEES) program, branded as the SmartEnergy Analyzer, is a non-resource acquisition program that provides residential customers with a mail-in, on-line, or telephone energy audit of their homes. The 2006-2008 program is within the umbrella of PG&E's Education and Training initiatives, but will become its own resource acquisition program with energy saving goals in the 2009-2011 program cycle.

The audit tool uses a series of questions combined with actual or estimated participant billing data to determine energy efficiency opportunities within the participant's home, and offers behavioral tips and appliance upgrade recommendations and the associated energy bill savings. The audit results pair recommendations with phone numbers to call and websites to visit to access appropriate appliance rebate programs and other energy efficiency programs. Overall, the HEES program aims to increase customer awareness of energy efficiency measures, induce customer energy efficiency behavioral changes related and prompt participation in other energy efficiency programs.

In addition to energy efficiency recommendations, the tool presents an analysis of the customer's annual energy use attributed to each of their major appliances, as well as a graphical comparison of their household energy consumption in comparison with other similar households. The tool creates these estimates using one year of energy usage data. An additional feature for on-line users is an interactive graphic that represents the customer's home, with depictions of the various appliances in the home. The participant can hold their mouse over each appliance to reveal how much energy that appliance uses each year.

Depending on how the participant accesses the SmartEnergy Analyzer tool, PG&E either accesses the customer's actual billing history or uses customized default usage values to integrate energy usage into the tool's calculations. On-line participants who have established an on-line PG&E user account (Customer Service Online) can first log into their accounts and then use the Analyzer, which links to their actual billing histories.[1] Alternatively, customers without an on-line user account may rely on the tool's default values or manually enter in their usage data. Moreover, for customers who receive the mail-in survey through targeted mailings, the program manager has access to their billing histories and makes that information available to process the requested reports. Other mail-in HEES marketing approaches rely on the program's default energy usage values for the energy calculations.[2]

Primary program marketing strategies included advertising at community events, e-mail blasts, mailing the surveys to targeted customer homes, advertisements on the PG&E website, and cross-marketing through other PG&E programs. A new marketing partnership in the 2006-2008 program cycle is with the California Solar Initiative program. Customers of the California Solar Initiative must complete a HEES survey in order to obtain their solar incentive.

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[1] Where eight months of usage is available, a calculated projection of annual usage is made and where less than eight months usage is available, default values are used.
[2] Both the mail-in and on-line energy audit tools have default values for customers generated from a proprietary modeling program.

3.1 HEES PROGRAM LOGIC MODEL AND PROGRAM THEORY

One of the first tasks for the evaluation was to develop a program logic model and document the program theory for the HEES program. The structure of the logic model that links activities and outcomes is a useful instrument for identifying specific program assumptions that can be tested using survey or other primary data collection activities. Crucial program evaluation issues often question whether program services are adequately designed and equipped to generate their desired outcomes.

Additionally, the construction of a program theory and logic model provides a common knowledge and language between program implementers, evaluators, and stakeholders. It allows for a more precise conversation about what is occurring within a program and why the program actions should produce the expected outcomes.

The following program theory for the HEES program builds on the program logic model and provides additional detail on program activities, outputs, and outcomes.

Activities

Coordination with other programs

An objective of the HEES program is to channel participants to other PG&E energy efficiency programs. The recommendations on the HEES report are coupled with the contact information and program offerings of appropriate energy efficiency programs. Therefore, HEES program staff members synchronize with other PG&E programs to direct survey design efforts.

Marketing and outreach

The on-line HEES is promoted through the PG&E website and through utility bill inserts. In addition, paper HEES surveys are mailed directly to customers in targeted zip codes, such as those located in higher climate zones and areas of higher energy usage.

HEES Survey

The PG&E HEES is provided in three different modes (mail-in, on-line, and phone) and in two languages for the on-line mode (English and Spanish) in order to appeal to a broader range of customers.

The program's survey instrument includes a series of questions about the participant's home and then offers a specific list of tips based on the responses. Recommendations include both changes in behavior and information on more energy efficient appliances. Tips are coupled with phone numbers and web links for other energy efficiency programs such as rebate programs that alleviate the cost of installing the recommended upgrades. The HEES program accesses the customer's billing information to produce a graphical analysis of each participant's annual trends in electric and gas and benchmarks each household with other similar households in the region.

Short Term Outcomes

Customers are aware of the HEES

The marketing collateral successfully reaches its target customer group. The content is convincing and clearly indicates how to access the HEES survey. As a result, customers become aware of the HEES survey opportunity and understand its potential benefits.

Customers complete the survey and become more aware of their energy use profile and savings opportunities

Customers that take the on-line version or conduct an over-the-phone session receive instantaneous results. Customers that fill out the mail-in version obtain the survey results by mail within two weeks.

After reading their HEES results, participants understand which of their appliances uses the most energy and how their household energy consumption compares with other similar households. Through the energy saving tips section, participants gain new knowledge about daily behaviors and equipment that can reduce their energy consumption. The participants also become aware of PG&E rebate and other programs that can assist them in implementing the saving measures.

Mid Term Outcomes

Customers implement low-cost energy saving recommendations and inquire about energy efficiency programs identified in the survey

After receiving survey results, participants adopt some or all of the recommended energy-saving behaviors and purchase low-cost equipment upgrades. The participants contact some of the other PG&E programs identified in the survey to access equipment rebates and to learn about further savings opportunities.

kWh, kW, and therm savings and utility bill reductions

After implementing some of the HEES recommendations, participants achieve energy savings, which translate into reduced energy bills.

Long Term Outcomes

Customers participate in other PG&E energy efficiency programs and purchase energy efficiency equipment

Customers recognize the savings benefits of implementing the low-cost energy efficiency measures and begin to incorporate energy efficiency into their standard purchasing decisions. Customers utilize PG&E programs to implement the major equipment upgrades recommended by the HEES results and participate in demand response programs.

Sustained kWh, kW, and therm savings

There is a higher level of energy-efficient equipment installed in California homes and customers adopt energy-saving behaviors as standard practice. Thus, customers are more energy efficient and there are peak demand reductions.

Figure 1: HEES Program Logic Model
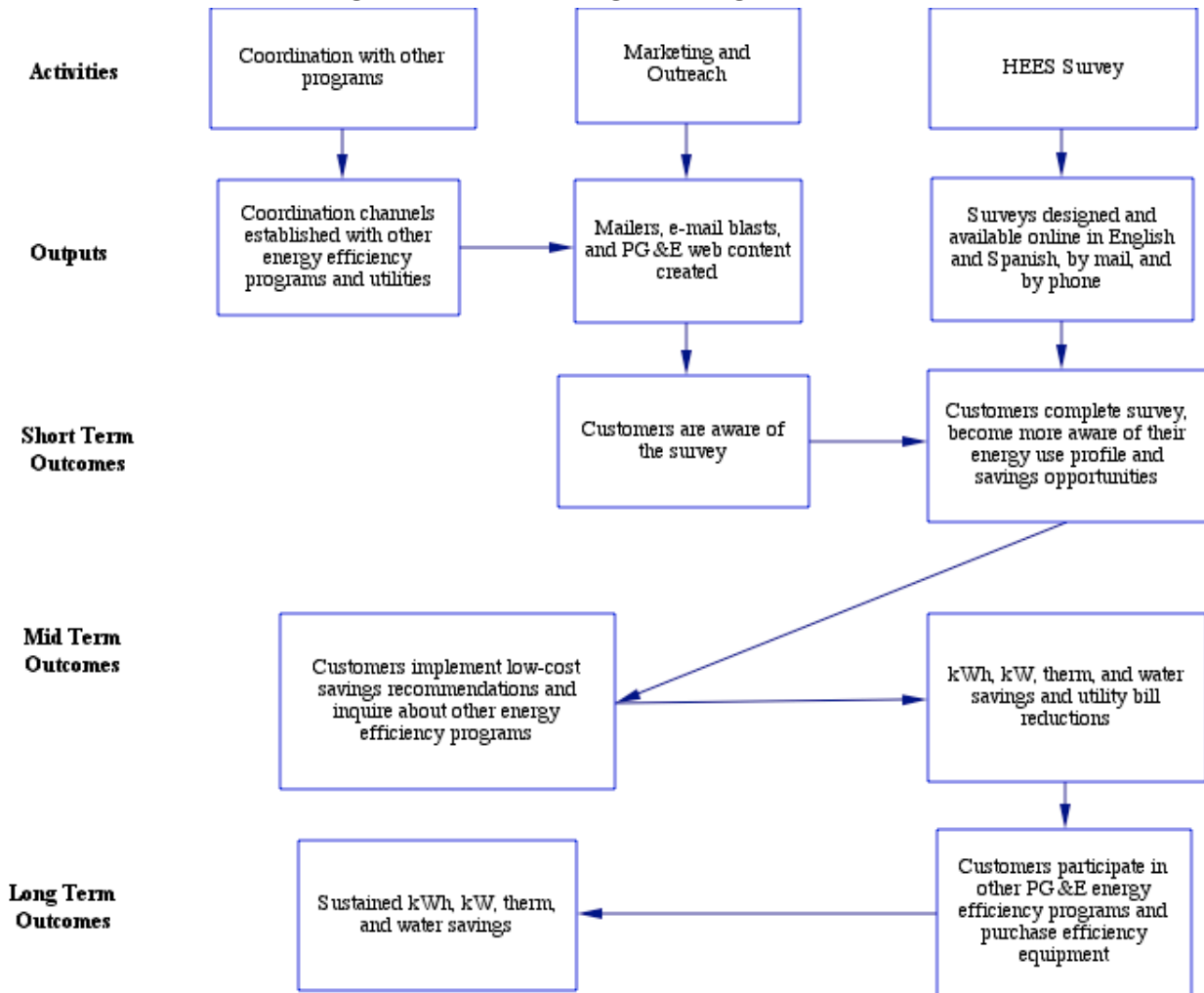
4. RESEARCH METHODS

This section describes the research issues explored by this study and the methods used to investigate them.

4.1 KEY RESEARCH ISSUES

Based on the program theory, a review of program documents *(e.g.*, quarterly reports, PIP), and through the kickoff meeting discussion, the research issues below were identified. These research issues helped to direct the focus of all data collection tasks. The fundamental research question is whether the HEES program is effectively designed to increase the residential adoption of energy conservation practices. An additional primary goal of this evaluation is to estimate energy savings impacts. To that end, there are several researchable issues:

- **Estimate the expected savings for this program**

While during the 2006-2008 program cycle, HEES was a non-resource program, with no explicit energy savings goals. Going forward, the program will claim energy savings for the 2010-2012 cycle. A goal of this evaluation was to estimate the savings values that PG&E expects for the subsequent cycle.

- **Examine the user-friendliness and accessibility of HEES**

PG&E is currently developing a Universal Energy Audit for residential and non-residential programs and lessons learned from this evaluation can be applied to this new audit. It is important to know if the design of the HEES report is successfully imparting useful knowledge, referring participants to helpful resources, and if this coordination effort is motivating participants to adopt more energy efficient behaviors. Are recommendations clearly explained and are the appropriate resources easy to access? What was most useful information provided by HEES? What else should be provided? What is the overall satisfaction with HEES and what are the key drivers of satisfaction (and dissatisfaction)?

- **Investigate if the recommendations algorithm is appropriate**

The HEES report provides a list of energy saving recommendations, which are triggered by responses to survey questions about customer equipment holdings and household behaviors. Customers sometimes receive recommendations in the HEES report that they have already implemented in the past (such as installing CFLs). Does this jeopardize the credibility of the other recommendations or does this motivate customers to implement the remaining measures? Is there a certain threshold of repetition that is good? Furthermore, should there be more advanced energy efficiency tips for sophisticated customers who already do most of the energy efficiency behaviors, and if so, what types?

- **Determine the effectiveness of the survey for CSI customers**

In the 2006-2008 program cycle, the California Solar Initiative offered solar rebates contingent upon customers completing a HEES audit. In some cases, the solar vendor/installer simply fills out the HEES for the customer, which significantly decreases the value of the program. What is

the best manner to deliver the HEES to solar rebate customers to encourage further action (to help inform California Solar Initiative requirements for 2009)? Are solar customers more or less likely to do HEES measures than other participants? Is the HEES serving the needs of solar customers, or have these more advanced customers already completed all of the survey recommendations?

- **Analyze the effectiveness of the primary marketing strategies**

The process evaluation can assess the efficacy of the HEES marketing program, investigating what specific elements of the marketing campaign most effectively stimulate participation. Related areas of research include why customers select a particular HEES mode and if they are aware of the other survey modes (on-line, mail-in, and phone).

- **Identify important respondent demographic differences across HEES modes and the HEES recommendations that they implement**

Also, what are the average energy bills for various demographic groups (zip code, age, type of home, square footage, etc.) who take the HEES?

4.2 PARTICIPANT PHONE SURVEY METHODS

To address these research issues, ECONorthwest fielded a participant phone survey through Freeman Sullivan in February 2009. The usable participant sample with phone numbers and billing information was 3,761 data points, from which we were able to achieve 601 completes (out of our goal of 800). Survey completes were collected in two sample batches, which contained program participants that had completed a survey between March 2007 and December 2008. The survey took between 15 and 20 minutes to complete.

Table 2 shows how many respondents were surveyed from each HEES mode. Notably, once we began fielding the survey, several respondents asserted that they received an on-site energy audit. ECONorthwest alerted the program manager, who explained that a program staffer from the Local Government Partnerships in Monterey and Bakersfield conducted several hundred on-site energy audits using the HEES mail-in form. Out of the 601 completes, 231 were on-line, 301 were mail-in, and 69 were in-home. The 69 in-home audits are incorporated in the mail-in category for this report.

Table 2: Respondents from Each Sample Batch

Survey Mode	Survey Completes	Total Sample
Mail-in	370	2,550
On-line	231	1,211
Total	601	3,761

4.3 BILLING ANALYSIS METHODS

Data

The primary tool of impact evaluation at both the household and commercial/industrial level is the billing regression model. The goal of nearly all energy efficiency programs is to reduce energy consumption for a given level ("baseline") of service to the household or business. This baseline level of service is most often represented by the monthly recorded usage of electricity or gas, though other periods-of-service (e.g., daily) may be recorded. Because energy consumption can vary greatly month-to-month, ideally one will have a full 12 months of baseline energy consumption for each household or business being analyzed.

Monthly electricity consumption data (billing data) for each household that participated in the HEES program were obtained from PG&E. Billing data for each participating household were pulled for all months from January 2006 through July 2009 (43 total months), although this full range of months of data was not available for all households. The billing data for each household was merged with local temperature data, obtained from the National Weather Service.[3] The weather data, available on a per-day basis, were aggregated into two monthly-level temperature variables:

- CDD, which is the monthly sum of cooling degree days based on an ambient temp of 65

- HDD, which is the monthly sum of heating degree days based on an ambient temp of 65

In the statistical models, these variables served as controls for month-to-month and year-over-year variations in temperatures. Thus, differences in monthly electricity use due to differences in local temperature are accounted for and are not confused with potential changes in electricity used due to participation in the HEES program.

Because households took the HEES at different times, the months that constituted the baseline differed across households. Nevertheless, the baseline period for each household consists of at least 12 consecutive months—i.e., at least one full calendar year. Each household examined in the billing analysis also had at least 12 months of billing data subsequent to taking the survey. Thus, for each household, we examined at least one calendar year of baseline and one year of post-survey electricity consumption data.

To evaluate change in energy consumption between the baseline and post-survey period for each HEES participant, we statistically examined energy consumption during the baseline year to energy consumption during the post-period, while accounting for differences in outside temperature as represented by the CDD and HDD variables.

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[3]Weather data was provided by PG&E for 33 weather stations in their service territory in terms of minimum and maximum daily temperatures and heating and cooling degree days. Data from these weather stations was merged onto participant data using the weather station ID and zip codes. The data were provided on a daily basis from January 1, 2006 through July 31, 2009

Analytical Methods

A two-stage modeling framework was developed to examine the estimated change in electricity and natural gas usage between the baseline and post-period and to estimate the proportion of any estimated energy savings attributable to the HEES program. The statistical models developed for this project are as follows:

3. **Billing Regressions** were estimated to estimate the change in household electricity and natural gas consumption from the baseline period to the post-survey period

4. An **Attribution Model** was estimated to statistically estimate the relationship of any change (reduction) in electricity and natural gas consumption to the HEES program.

Billing Regressions

Billing regressions are used to estimate the existence and magnitude of change in energy use due to the actions of energy efficiency program or measure. For this analysis, we develop a *fixed-effects panel data* model to estimate changes in household electricity usage and natural gas conssumption between the baseline and post-HEES periods. The billing regression model relates energy consumption to outside temperatures, month of year, and time for the HEES participants.[4] The model was estimated based on the logarithmic (natural log) transformation of the dependent variable (electricity usage in kWh and natural gas consumption in therms). In addition to often providing a better fit to the data than untransformed "levels" data, a convenient characteristic of logarithmic transformation is that the coefficient estimate of the indicator variable for the contest year is an elasticity.[5]

A standard specification for conducting billing analysis is to organize the data by time period (month in this case) for each participant. This commonly referred to as a panel data set or as cross-sectional, time-series data. For this analysis, each participant represents a cross-section of information and the monthly energy use representing the time-series of information. Several econometric programs, such as Limdep/Nlogit, which was used in this analysis, include models specifically designed for panel data. For this analysis, we specified the panel data model as a fixed-effects model, which simply means that we explicitly recognize within the model the unique (but unknown) characteristics of each household that participated in the HEES project. This is done by including an indicator variable for each household that equals one if the data record represents that household or zero if the record does not.[6]

Energy use is estimated as a function of control variables, including cooling degree days (kWh

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[4] In fact, only those households with a minimum of 12 months of baseline data and 12 months of post-survey data were included in the models.

[5] An elasticity is a mathematical measure of the percent change in one variable due to a change (either percent, unit, or binary) in another variable.

[6] The standard method for Limdep/Nlogit is to drop the constant term from the model and to include an indicator variable for each household. Please see an introductory econometrics text for more information on the relationship between indicator variables and the constant term.

model), heating degree days (therm model), indicators for month, a variable representing time, an indicator variable representing the post-survey period, and individual indicator variables for each household. The control variables are critical to the model because their individual and collective influence must be accounted for in order to isolate the effect that the HEES program had on household energy consumption—the variables representing the post-survey period.

Statistically significant coefficient estimates for the variables representing the post-survey period are assumed to represent actual change in electricity use between the baseline and post-survey period. This is a logical assumption given the inclusion of the control variables that account for household-specific characteristics, any differences in temperature between the baseline and post-survey period, seasonal effects, and any systematic trends in electricity usage. Statistically significant coefficient estimates for variables representing the post-survey period do not, however, indicate the reason for the change in electricity use. That is, the model results can tell us if electricity use went up or down between the baseline and post-survey period, but the results cannot attribute the change to the HEES program or other factors. This will be learned through the attribution model.

The fixed-effects, panel data models are specified as follows:
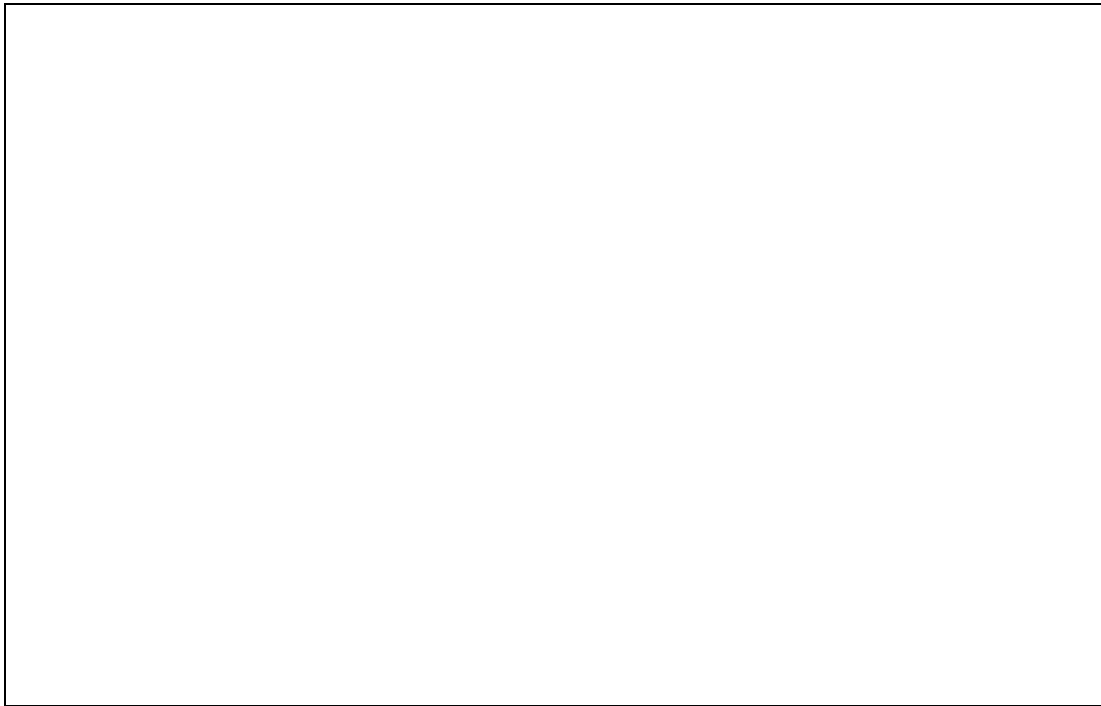
Attribution Model

Without additional information, a billing regression can only provide estimates of changes in energy consumption, it cannot attribute changes in energy consumption to a particular measure, program, or behavior. Variables or sets of variables are included in billing regression as a means to measure change in energy consumption over time and/or for a particular cross-section of a population. To the extent that the estimated coefficients on these variables are statistically

significant and of the expected sign (generally negative), this is frequently offered as evidence that the measure, program, or behavior under study resulted in the desired change. The statistical results of billing regression are a measure of the correlation between the dependent and explanatory variables, but they are not proof that change in the explanatory variable caused changes in the dependent variable.[7] Thus, the results of most billing regression—including the one estimated in this analysis—do not indicate causation; rather they indicate correlation.

For the HEES program, a subset of participant households was surveyed to gather additional demographic and behavioral information. Included in the survey were questions asking if the recommended measures were installed and, if they were, was the action taken in response to the recommendations from HEES program. It is this direct questioning of the participant households that allowed us to develop a simple model for decomposing any energy savings into that attributable to the HEES program and that which would have occurred regardless of the program.

There were approximately 560 households that took the HEES survey. Of these, there were 270 households that installed measures or took actions that were recommended in feedback by the HEES program. It is important to note that we are not stating that these 270 households installed measures or took actions because of the HEES program, rather that the measures they installed and/or the actions they took were ones also recommended through the HEES program.

As part of the HEES survey, respondents were asked if they installed the measure or took the action because of the HEES recommendation. A "yes" response to this question is the basis for attribution. Thus, attribution was determined by a household both installing a measure (or taking an action) recommended by the HEES program *and* by stating in the follow-up survey that they did so because of the recommendation from the HEES program (33% of households that said they installed a measure said they did so because of HEES). Only those survey respondents that experienced a savings in kWh usage were included in the attribution model.[8]

The electricity and natural gas attribution models were estimated using weighted regression, with average monthly energy use (either electricity or therms) during the baseline period as the weighting variable. The attribution models are specified as follows:

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[7] Most billing regressions measure the linear relationship between the explanatory and dependent variables, however, non-linear regression models could be specified and estimated to estimate more complex relationships.

[8] Attribution at the program level is calculated for net kWh savings (i.e., kWh savings – kWh increases). For the purposes of estimating the attribution model, we are only interested in those households that actually experienced savings.
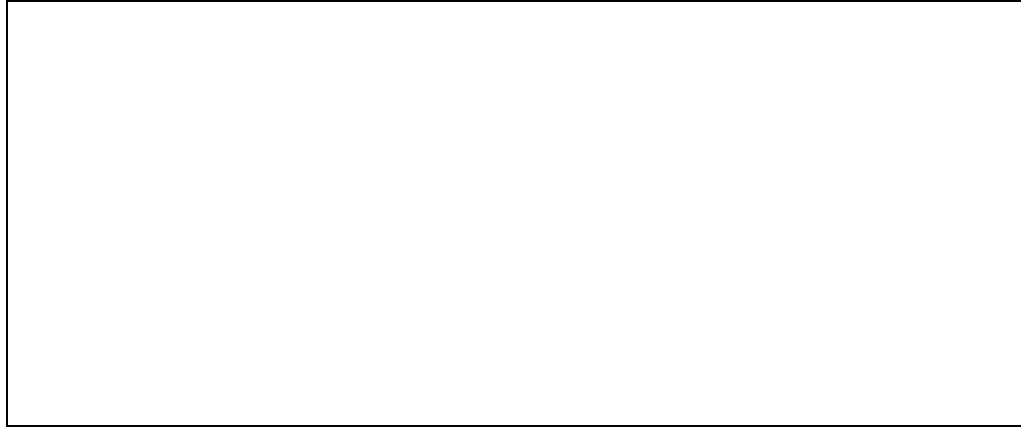
Note that the attribution model does not include a constant term. This is because the purpose of the model is only to estimate the proportion of savings attributable to the HEES program and not to estimate the marginal effect on energy savings associated with a HEES recommendation.

Coincident factors were developed for the HEES program based on the distribution of measures acted upon by the participants. The gross distribution of tips was based on all tips that respondents said they acted on after participating in the program, while the net distribution of tips was based only on tips that participants acted on and attributed to the program. The sources of information used to develp the coincident factors include 2006-2008 PG&E work papers for their residential programs, the 2005 LIEE Impact Evaluation[9], and the 2004-2005 California IOU Single-Family Rebate program evaluation[10]. The weighted coincident factors by measure category and aggregated for the HEES program are shown in Table 3.

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[9] West Hill Energy, August 2008.

[10] Itron, Inc. and KEMA, Inc. October 2007.

Table 3: Weighted Coincident Factors by End-Use and Aggregate

End-use	Tip Distribution		Coincident Factor	Weighted Coincident Factor	
	Gross	Net		Gross	Net
Lighting	7%	9%	0.01%	0.001%	0.001%
Refrigerator & Freezer	13%	20%	0.02%	0.002%	0.003%
Space Heating	14%	16%	0.00%	0.000%	0.000%
Washing & Drying Clothes	19%	13%	0.04%	0.008%	0.005%
Weatherization	14%	16%	0.11%	0.015%	0.017%
Pool & Spa	1%	1%	0.02%	0.000%	0.000%
Water Heating & Water Usage	14%	17%	0.02%	0.003%	0.004%
Space Cooling	6%	4%	0.16%	0.010%	0.005%
Dishwasher	11%	5%	0.03%	0.003%	0.002%
Aggregate Weighted Coincident Factors				**0.043%**	**0.038%**

Source: ECONorthwest analysis based on data from PG&E and other sources.

5. PARTICIPANT PHONE SURVEY RESULTS

This section presents the results of the participant phone survey.

5.1 CSI INCENTIVE PROGRAM PARTICIPATION

The California Solar Incentive (CSI) program offers financial incentives for residential solar equipment contingent on the completion of an energy survey through the HEES program. Respondents who used the SmartEnergy Analyzer as a part of their CSI application are highlighted in this report in order to examine any key differences in this special population. Table 4 shows that 16 percent of respondents (97 respondents) said that they completed a survey in order to be eligible for the CSI incentive: 49 filled out a mail-in form and 48 accessed the on-line portal. Only 34 percent of this group had applied for the CSI financial incentive at the time that their interviews were conducted.

Table 4: California Solar Incentive Applicants (CSI)

Response	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)
Yes	13%	21%	16%
No	82%	76%	80%
Don't know	5%	4%	4%

Applied for a solar incentive?			
Response	Mail-in Percent (N=49)	On-line Percent (N=48)	Total Percent (N=97)
Yes	18%	50%	34%
No	78%	50%	64%
Don't know	4%	0%	2%

5.2 DEMOGRAPHICS

The following six tables provide basic demographic information about the 601 program participants who were surveyed for this evaluation. As shown in Table 5, most respondents live in single-family detached homes (92 percent). Furthermore, Table 6 shows that most respondents own their homes: 92 percent of respondents own their homes, while only eight percent rent their homes.

Table 5: Type of Home

Housing Type	Mail-in Percent (N=366)	On-line Percent (N=230)	Total Percent (N=596)	CSI Customers Percent (N=96)
Single-Family Detached Home	93%	90%	92%	92%
Condo	3%	3%	3%	0%
Townhouse	1%	3%	2%	0%
Mobile Home / Manufactured Home	1%	2%	1%	2%
Duplex	2%	1%	2%	3%
Apartment	1%	1%	1%	2%
Other	0%	1%	<1%	1%

Table 6: Own or Rent

Housing Type	Mail-in Percent (N=366)	On-line Percent (N=230)	Total Percent (N=596)	CSI Customers Percent (N=96)
Own	91%	93%	92%	90%
Rent	9%	7%	8%	10%

Table 7 shows that the mail-in mode is most popular among customers who are 65 years or older. On-line users are mostly between 35 and 55 years. Only eight percent of all respondents are under the age of 35.

Table 7: Age

Age Range	Mail-in Percent (N=350)	On-line Percent (N=230)	Total Percent (N=580)	CSI Customers Percent (N=94)
Under 25 Years	1%	1%	1%	2%
25 To 34 Years	7%	7%	7%	10%
35 To 44 Years	11%	27%	17%	17%
45 To 54 Years	25%	30%	27%	26%
55 To 59 Years	14%	13%	13%	18%
60 To 64 Years	11%	11%	11%	13%
65 Years or Older	30%	10%	22%	15%

Table 8 shows that the highest level of education reached by the respondents is widely distributed and differs significantly between survey modes. In general, on-line participants achieved higher levels of education than the mail-in respondents. Overall, 50 percent of respondents (broken down to 64 percent of on-line respondents and 44 percent of mail-in respondents) had obtained at minimum a Bachelor's degree. Twenty-eight percent of respondents who used the mail-in form had achieved a high school diploma or less, compared to eight percent of on-line respondents.

Table 8: Highest Level of Education

Highest Level of Education	Mail-in Percent (N=353)	On-line Percent (N=226)	Total Percent (N=579)	CSI Customers Percent (N=94)
High school diploma or less	28%	8%	20%	20%
Some college	22%	23%	22%	18%
Associates degree	7%	8%	7%	9%
Bachelors degree	24%	31%	26%	22%
Graduate or professional	20%	32%	24%	31%

As shown in Table 9, about 55 percent of respondents have annual household income greater than $60,000 (72 percent of on-line respondents compared to 44 percent of respondents who used the mail-in form).

Table 9: Annual Household Income

Income Range	Mail-in Percent (N=297)	On-line Percent (N=193)	Total Percent (N=490)	CSI Customers Percent (N=79)
Less than $20,000	12%	5%	9%	11%
$20,000 to less than $40,000	25%	8%	18%	18%
$40,000 to less than $60,000	16%	14%	15%	10%
$60,000 to less than $80,000	15%	11%	13%	13%
$80,000 to less than $100,000	12%	15%	13%	9%
$100,000 to less than $150,000	10%	27%	17%	19%
More than $150,000	6%	20%	11%	16%
Don't know	3%	1%	2%	4%

5.3 MARKETING

Table 10 lists the ways respondents first heard about the SmartEnergy Analyzer. Mail-in survey participants learned of the program through a variety of channels, but the most common was a bill insert (21 percent) and friends or family (13 percent). The bill insert may also refer to the marketing strategy that mails the survey form to targeted households. The majority (59 percent) of on-line participants initially discovered the program through the PG&E website. CSI customers learned of the SmartEnergy Analyzer largely through the CSI program (21 percent) and the PG&E website (18 percent).

Table 10: First Information Source

Source	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
PG&E website	4%	59%	25%	18%
Bill insert	21%	11%	17%	8%
Friend/family	13%	2%	9%	12%
Utility representative	9%	1%	6%	5%
Community event	7%	0%	4%	4%
Contractor	5%	3%	4%	9%
California Solar Incentive Program	1%	7%	3%	21%
Newspaper ad	5%	0%	3%	1%
Flyer or brochure	4%	1%	3%	1%
Letter from utility	4%	1%	3%	3%
E-mail	0%	3%	1%	1%
Workshop/Conference	2%	0%	1%	0%
Other	5%	2%	4%	1%
Don't know	19%	9%	15%	15%

Table 11 shows factors that respondents felt were very important in their decision to take the survey. Eighty-five percent of respondents used the SmartEnergy Analyzer to identify ways to lower their energy bills. Sixty-one percent said that the environment was a very important factor, and about half said that finding information about other energy efficiency programs was a key factor. CSI customers tended to place a greater weight on the environment and finding information about energy efficiency programs than the broader set of respondents.

Table 11: Percentage of Participants Considering Factors "Very Important"

Decision Factor	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
To reduce the cost of my energy bill	87%	84%	85%	86%
Concern about environment	65%	53%	61%	67%
Desire to find information on energy efficiency programs	48%	49%	49%	54%

5.4 SURVEY COMPLETION TIME AND LENGTH

Table 12 shows that the length of time to take the survey varies greatly across respondents, but does not vary by survey mode. CSI customers were much more capable of recalling the time it took to complete the survey; just 11 percent responded "Don't know" compared to 27 percent for respondents overall. Twenty-one percent of respondents required more than 15 minutes to finish the SmartEnergy Analyzer.

Table 12: SmartEnergy Analyzer Length

Time to complete survey	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Less than 5 Minutes	6%	7%	7%	10%
5 to 10 Minutes	26%	26%	26%	24%
10 to 15 Minutes	17%	26%	20%	30%
More than 15 Minutes	25%	14%	21%	25%
Don't know	26%	28%	27%	11%

Table 13 shows that before they participated in the HEES program, 37 percent of respondents felt that they were "very knowledgeable" about opportunities for improving the energy efficiency of their homes. As expected, this was higher for CSI customers (54 percent).

Table 13: Self-Reported Base Level of Knowledge About Energy Efficiency

Knowledge Level	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Very knowledgeable	34%	42%	37%	54%
Somewhat knowledgeable	49%	47%	48%	34%
Not very knowledgeable	13%	8%	11%	11%
Not at all knowledgeable	3%	2%	3%	1%
Don't know	1%	<1%	1%	0%

The majority (69 percent) of respondents who completed the SmartEnergy Analyzer on-line had signed-up for the PG&E on-line "My Account" service (see Table 14). Of this group (160 respondents), 72 percent did log into their accounts before taking the survey, allowing their billing history to be integrated into survey results.

For the respondents who did not sync their billing histories with the tool (either had not signed up for "My Account" at the time or they had signed up but not used their accounts before taking the survey), only 26 percent manually typed in their energy usage (kW or therms) for the last year when prompted to so during the survey (see Table 15). More than one quarter of this group did not recall even seeing that option.

Table 14: Had Signed Up For the PG&E On-line "My Account" Service

Response	On-line Percent (N=231)	CSI Customers Percent (N=48)
Yes	69%	56%
No	20%	25%
Don't know	11%	19%

Took the SmartEnergy Analyzer after logging-in?

Response	On-line Percent (N=160)	CSI Customers Percent (N=27)
Yes	72%	74%
No	5%	4%
Don't know	23%	22%

Table 15: Manually Entered In Electric Bill History

Response	On-line Percent (N=116)	CSI Customers Percent (N=28)
Yes	26%	43%
No	16%	7%
Don't recall the screen	26%	21%
Don't know	32%	29%

5.5 AWARENESS OF OTHER HEES MODES

Table 16 shows that most respondents (72 percent) were not aware of other survey modes. The majority of respondents (83 percent) who were aware of another mode chose their particular mode because it was perceived to be the easiest, the most convenient, or the fastest (see Table 17). All the on-line participants mentioned this as their reason.

Table 16: Awareness of Other HEES Modes

Aware?	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Yes	20%	23%	21%	27%
No	72%	71%	72%	66%
Don't know	8%	7%	8%	7%

Table 17: Reason for Selecting HEES Mode

Reason	Mail-in Percent (N=72)	On-line Percent (N=52)	Total Percent (N=124)	CSI Customers Percent (N=26)
Was the most convenient/easiest/fastest	71%	100%	83%	85%
Did not have internet access	10%	NA	6%	4%
Was the only mode that was offered to me	7%	0%	4%	0%
Not comfortable with computers/internet	6%	NA	3%	4%
Would provide the most helpful/accurate information	1%	0%	1%	0%
Other	4%	0%	2%	4%
Don't know	7%	0%	4%	4%

Multiple responses accepted

5.6 HEES RECOMMENDATIONS AND BEHAVIORAL IMPACTS

A key feature of the HEES program is the recommendations that advise participants on ways to increase the energy efficiency of their homes. This section of the report analyzes the behavioral impacts of the HEES program on purchasing energy efficient equipment and adopting efficient energy consumption behaviors.

ECONorthwest delivered a sample frame to the survey house (Freeman-Sullivan) that contained a total of 3,761 HEES participants, including the 116,746 recommendations they were given when they took the SmartEnergy Analyzer survey. There were 84 unique recommendations or tips included in the sample frame. To prepare the sample frame, ECONorthwest re-phrased tips in order to fit appropriately into the evaluation survey questions, and these re-writes are presented in the tables in this section.

The evaluation team grouped these recommended tips into nine measure categories for this report. Figure 2 shows the distribution of all 116,746 tips in the sample frame. The largest share of measures includes water heating/water usage tips (21 percent), while there is a fairly even distribution of weatherization, space heating, refrigerator/freezer measures, and washing/drying clothes measures in the sample. Dishwasher, space cooling, lighting, and pool/spa measures are less frequent.

Figure 2: HEES Tips in Sample Frame by Measure Category
(N = 116,746 Tips)
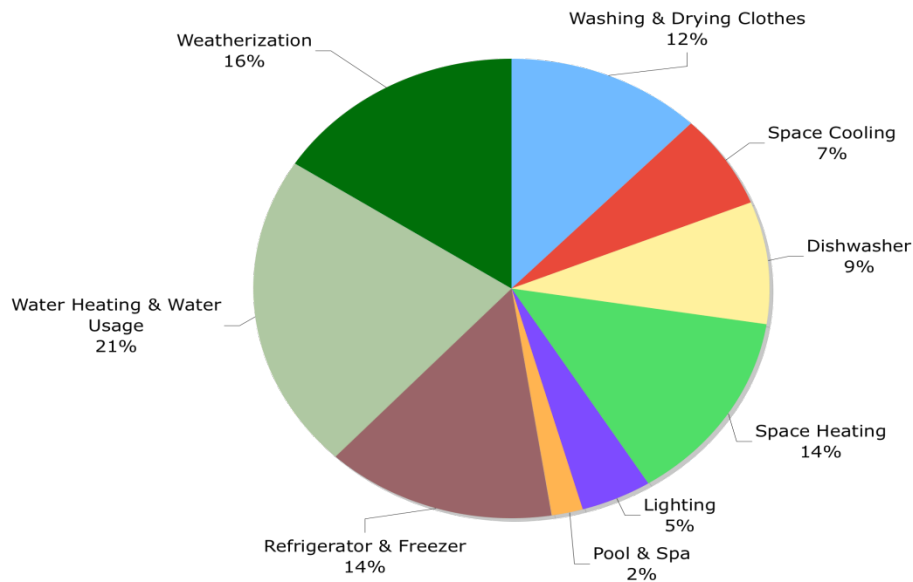
On average, survey respondents received 30 tips in their HEES reports (very close to the 31 tip average for the sample frame). During the participant survey, respondents were asked about a random sample of 3 tips they received, a process that yielded a sample of 68 unique tips (of 84 in the sample frame) and 1,778 tips received by survey respondents (of 116,746 in the sample frame) in the final sample database.

The number of respondents and tips inquired about in each of the nine measure categories are listed in Table 18. The distribution of selected tips received by respondents in the sample is very consistent with the distribution of tips in the sample frame (shown in the pie chart above). For the subsequent tables in this section, the sample size N refers to the number of tips asked about during the participant survey (1,778), rather than the number of respondents.[11] While each respondent may receive each tip only once, respondents may have received more than one of the tips within each category.

Table 18: HEES Tips in Sample by Measure Category

Measure Category	Respondents Per Category (N=601)	Tips Asked Per Category (Total = 1,778)	Tips Asked, Percent of Total
Water Heating & Water Usage	238	415	23%
Weatherization	209	299	17%
Space Heating	200	257	14%
Washing & Drying Clothes	189	237	13%
Refrigerator & Freezer	184	234	13%
Dishwasher	129	139	8%
Space Cooling	100	108	6%
Lighting	50	50	3%
Pool & Spa	30	39	2%

Table 19 below presents the distribution of the random sample of tips received by participant telephone respondents by behavioral versus equipment purchases. Across all tips in the sample, 44 percent are behavioral and 56 percent are equipment purchase. Within each measure category, the distribution varies greatly – with almost all water heating tips given to participants relating to equipment purchases, and almost all lighting tips recommending behavioral changes.

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[11] 1,801 (not 1,803) tips were asked of respondents: one of the 601 respondents supposedly only received one recommendation from the SmartEnergy Analyzer.

Table 19: HEES Tips in Sample by Behavioral vs. Equipment

Measure Category	Behavioral Tips	Equipment tips
Water Heating & Water Usage	7%	93%
Weatherization	20%	80%
Space Heating	47%	53%
Washing & Drying Clothes	60%	40%
Refrigerator & Freezer	86%	14%
Dishwasher	80%	20%
Space Cooling	48%	52%
Lighting	96%	4%
Pool & Spa	56%	44%
Total	44%	56%
N (tips received by sample)	790	1,011

As shown in Table 20, participant survey respondents reportedly implemented half of the 1,778 tips they were asked about; 43 percent were not implemented and respondents said they did not recall receiving 6 percent of tips. On-line and CSI respondents were more likely to implement tips than mail-in respondents.

Table 20: Implementation of Tips by Survey Mode and CSI

Whether Tip was Implemented	Mail-in	On-line	CSI	Total
Yes	46%	54%	53%	49%
No	44%	42%	42%	43%
Do not recall receiving recommendation	8%	3%	5%	6%
Don't know	1%	1%	1%	1%
Total	100%	100%	100%	100%
N tips	1,110	691	287	1,801

Table 21 shows the proportion of tips that were reportedly implemented by participants by behavioral and equipment purchase type. Overall, an even number of behavioral and equipment tips were implemented. For lighting measures, the vast majority of tips that were implemented were behavioral.

Table 21: Implementation of Tips by Behavioral vs. Equipment

Measure Category	Behavioral tips	Equipment tips	Total
Lighting (N=50)	85%	3%	88%
Refrigerator & Freezer (N=234)	43%	5%	48%
Space Heating (N=257)	28%	18%	46%
Washing & Drying Clothes (N=237)	43%	25%	68%
Weatherization (N=299)	9%	34%	43%
Pool & Spa (N=39)	20%	11%	31%
Water Heating & Water Usage (N=415)	5%	36%	40%
Space Cooling (N=108)	20%	22%	43%
Dishwasher (N=139)	50%	6%	56%
Total (N=1,778)	25%	24%	49%

Attribution

Respondents were asked, for tips that they said they implemented, whether they were already doing the action <u>before</u> or <u>as a result</u> of using the HEES Smart Energy Analyzer. Table 22 presents these results by measure category. (The table sums to 50%, representing the tips that were implemented. Table 30 addresses reasons for not implementing tips.)[12]

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[12] For all subsequent analyses, we exclude the "don't know" responses shown above in Table 20 (n=23 tips).

- *No attribution*: 35 percent of all tips (or 70% of tips that were reportedly implemented) were implemented <u>prior</u> to respondent use of the Smart Energy Analyzer.

- *Full attribution*: 11 percent of all tips (or 22% of tips that were reportedly implemented) were implemented <u>as a result</u> of HEES.

- *Partial attribution*: A small fraction of tips (4% overall, or 8% of implemented tips) are partially attributable to HEES, with respondents saying equally as often that they took the action as a result of the survey but thought about doing it before HEES, or they were already doing it but did more as a result of HEES. Note that respondents were not prompted with partial attribution categories – they were prompted only with no or full attribution. However, surveyors captured partial attribution categories if provided by respondents.[13]

As shown below, the highest share of tips implemented prior to the HEES survey was in the washing and drying clothes category (54 percent of all recommended clothes washing and drying tips), followed by the dishwasher (47 percent) and lighting (46 percent) categories. The largest proportion of tips that were completed by respondents as a result of taking the HEES survey included lighting (38 percent of all recommended tips in the category) and refrigerator and freezer tips (20 percent). Both of these categories included primarily low-cost or easy-to-implement behavioral tips, such as turning off lights when leaving a room, installing CFLs, turning up the temperature setting on refrigerators and freezers, and cleaning freezer coils twice a year.

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[13] See question R3 in the survey instrument (Appendix A). The partial attribution categories were marked "DO NOT READ" in the CATI software.

Table 22: Attribution by Measure Category

Respondent level of attribution to HEES Survey for Tip Implementation	No attribution	Full Attribution	Partial Attribution	
			When Tip was implemented relative to HEES completion	
Measure Category	**Prior to HEES survey**	**Post-HEES Survey**	**Done as a result of survey, but thought of doing before HEES**	**Already doing it, but doing it more because of HEES**
Lighting (N=50)	46%	38%	2%	2%
Refrigerator & Freezer (N=234)	26%	20%	1%	<1%
Space Heating (N=257)	31%	11%	1%	3%
Washing & Drying Clothes (N=237)	54%	9%	3%	2%
Weatherization (N=299)	31%	8%	3%	2%
Pool & Spa (N=39)	23%	8%	0%	0%
Water Heating & Water Usage (N=415)	30%	8%	1%	1%
Space Cooling (N=108)	35%	7%	1%	0%
Dishwasher (N=139)	47%	6%	0%	3%
Total (N=1,778)	35%	11%	2%	2%

Table 23 and Table 24 present the information shown above in Table 22 by survey mode. Participants who took the HEES on-line had a higher rate (40 percent) of previously implemented measures compared to those who did the mail-in version (32 percent of recommended tips). The largest discrepancy between the survey modes for baseline installations was in the dishwasher category: on-line respondents had been doing 67 percent of the dishwashing tips they received before they took the survey, while mail-in respondents were doing 37 percent. The post-survey measure completes were 11 percent of all recommended tips for both survey modes. However, there was a lot of difference between the modes for lighting tips: on-line respondents implemented 19 percent of their lighting tips as a direct result of the HEEs survey, while mail-in respondents completed 61 percent of all the surveyed lighting recommendations as a result of the HEES.

Table 23: Attribution by Measure Category - Mail-in Respondents

Respondent level of attribution to HEES Survey for Tip Implementation	No attribution	Full Attribution	Partial Attribution	
			When Tip was taken relative to HEES completion	
Measure Category	Prior to HEES survey	Post-HEES Survey	Done as a result of survey, but thought of doing before HEES	Already doing it, but doing it more because of HEES
Lighting (N=23)	35%	61%	4%	0%
Refrigerator & Freezer (N=140)	25%	16%	2%	0%
Space Heating (N=160)	31%	12%	1%	3%
Washing & Drying Clothes (N=144)	50%	9%	3%	1%
Weatherization (N=192)	29%	8%	3%	3%
Pool & Spa (N=18)	6%	11%	0%	0%
Water Heating & Water Usage (N=245)	26%	9%	2%	1%
Space Cooling (N=81)	35%	9%	1%	0%
Dishwasher (N=91)	37%	8%	0%	1%
Total (N=1,094)	32%	11%	2%	1%

Table 24: Attribution by Measure Category - On-line Respondents

Respondent level of attribution to HEES Survey for Tip Implementation	No attribution	Full Attribution	Partial Attribution	
			When Tip was taken relative to HEES completion	
Measure Category	Prior to HEES survey	Post-HEES Survey	Done as a result of survey, but thought of doing before HEES	Already doing it, but doing it more because of HEES
Lighting (N=27)	56%	19%	0%	4%
Refrigerator & Freezer (N=94)	28%	24%	0%	1%
Space Heating (N=97)	31%	10%	0%	4%
Washing & Drying Clothes (N=93)	61%	10%	1%	3%
Weatherization (N=107)	36%	9%	2%	0%
Pool & Spa (N=21)	38%	5%	0%	0%
Water Heating & Water Usage (N=170)	36%	7%	1%	1%
Space Cooling (N=27)	37%	4%	0%	0%
Dishwasher (N=48)	67%	4%	0%	6%
Total (N=684)	40%	11%	1%	2%

Table 25 displays the attribution of tips for the CSI subgroup. Overall, CSI respondents had implemented 11 percent of the tips received as a result of their experience with the HEES program, the same as the broader set of respondents. The CSI subgroup had implemented 40 percent of the recommendations they received before they took the HEES survey, which is a larger proportion than the overall population (35 percent). CSI respondents also had a much higher proportion of pre-HEES measure installations for the space cooling and space heating tips, and a lower proportion for refrigeration and freezer tips.

Table 25: Attribution by Measure Category - CSI Respondents

Respondent level of attribution to HEES Survey for Tip Implementation	No attribution	Full Attribution	Partial Attribution	
			When Tip was taken relative to HEES completion	
Measure Category	Prior to HEES survey	Post-HEES Survey	Done as a result of survey, but thought of doing before HEES	Already doing it, but doing it more because of HEES
Lighting (N=7)	43%	14%	0%	0%
Refrigerator & Freezer (N=42)	12%	24%	0%	0%
Space Heating (N=42)	55%	5%	0%	0%
Washing & Drying Clothes (N=32)	56%	9%	0%	0%
Weatherization (N=51)	41%	16%	2%	2%
Pool & Spa (N=8)	25%	25%	0%	0%
Water Heating & Water Usage	32%	3%	0%	0%
Space Cooling (N=15)	60%	13%	7%	0%
Dishwasher (N=24)	54%	8%	0%	0%
Total (N=287)	40%	11%	1%	<1%

Table 26 shows attribution of tips by measure category, with tips broken out by behavioral vs. equipment purchase, for tips that were fully or not at all attributable to HEES. (Tips that were not implemented or where respondents could not recall – 50% of tips – and tips that were partially attributable to HEES – 4% of tips – were excluded.)

Participants gave full or no attribution just as often concerning behavioral and equipment tips. Within measure categories, however, there were some differences in attribution of behavioral versus equipment tips. Respondents were more likely to have purchased energy efficient lighting, pool & spa and water heating measures that were recommended in their HEES reports prior to participation. They were more likely to have already done the recommended behavioral measures related to clothes washing and drying, space cooling and dishwashing prior to participating.

Table 26: Attribution by Behavioral vs. Equipment Tips
(Of Implemented Tips, Excluding Partial Attribution)

| Type of Tip | Behavioral | | Equipment | |
Respondent level of attribution to HEES Survey for Measure Completion Measure Category	No attribution-Prior to HEES Survey	Full Attribution-Post-HEES Survey	No attribution-Prior to HEES Survey	Full Attribution-Post-HEES Survey
Lighting (N=50)	53%	47%	100%	0%
Refrigerator & Freezer (N=234)	56%	44%	60%	40%
Space Heating (N=257)	76%	24%	71%	29%
Washing & Drying Clothes (N=237)	88%	12%	81%	19%
Weatherization (N=299)	75%	25%	81%	19%
Pool & Spa (N=39)	60%	40%	100%	0%
Water Heating & Water Usage (N=415)	60%	40%	82%	18%
Space Cooling (N=108)	85%	15%	82%	18%
Dishwasher (N=139)	89%	11%	83%	17%
Total (N=1,778)	75%	25%	77%	23%

Table 27 shows the same information in the previous table but for mail-in respondents only, who were also equally likely to attribute behavioral and equipment measures to HEES. However, mail-in respondents were much more likely to attribute the lighting behavioral measures they took to the HEES report than on-line respondents. Likewise, they were twice as likely to attribute the pool & spa equipment measures they installed to HEES. They gave no credit to HEES for the behavioral water heating measure they took.

Table 27: Attribution by Behavioral vs. Equipment Tips - Mail-in Respondents (Of Implemented Tips, Excluding Partial Attribution)

Type of Tip	Behavioral		Equipment	
Respondent level of attribution to HEES Survey for Measure Completion **Measure Category**	**No attribution-Prior to HEES Survey**	**Full Attribution-Post-HEES Survey**	**No attribution-Prior to HEES Survey**	**Full Attribution-Post-HEES Survey**
Lighting (N=23)	36%	64%	NA	NA
Refrigerator & Freezer (N=140)	61%	39%	60%	40%
Space Heating (N=160)	76%	24%	67%	33%
Washing & Drying Clothes (N=144)	91%	9%	76%	24%
Weatherization (N=192)	63%	38%	80%	20%
Pool & Spa (N=18)	15%	85%	100%	0%
Water Heating & Water Usage (N=245)	100%	0%	74%	26%
Space Cooling (N=81)	74%	26%	86%	14%
Dishwasher (N=91)	82%	18%	86%	14%
Total (N=1,094)	75%	25%	74%	26%

Table 28 shows attribution by behavioral versus equipment tips for the on-line respondents. In general, on-line respondents were less likely to attribute their actions to HEES, reporting that for nearly 80 percent of the tips that they took, they had already implemented them before the HEES survey. They were much less likely to attribute lighting behavioral measures to HEES than mail-in respondents, and less likely to attribute space cooling and dishwasher behavioral measures.

**Table 28: Attribution by Behavioral vs. Equipment Tips - On-line Respondents
(Of Implemented Tips, Excluding Partial Attribution)**

Type of Tip	Behavioral		Equipment	
Respondent level of attribution to HEES Survey for Measure Completion **Measure Category**	**No attribution-Prior to HEES Survey**	**Full Attribution-Post-HEES Survey**	**No attribution-Prior to HEES Survey**	**Full Attribution-Post-HEES Survey**
Lighting (N=27)	72%	28%	100%	0%
Refrigerator & Freezer (N=94)	54%	46%	50%	50%
Space Heating (N=97)	80%	20%	69%	31%
Washing & Drying Clothes (N=93)	87%	13%	83%	17%
Weatherization (N=107)	88%	13%	78%	22%
Pool & Spa (N=21)	83%	17%	100%	0%
Water Heating & Water Usage (N=170)	67%	33%	88%	12%
Space Cooling (N=27)	95%	5%	86%	14%
Dishwasher (N=48)	96%	4%	75%	25%
Total (N=684)	79%	21%	78%	22%

Table 29 shows attribution by behavioral versus equipment tips for CSI respondents. Similar to the on-line respondents, the CSI group was more likely to give themselves credit for the HEES measures that they had implemented, across both behavioral and equipment purchase measures. They were less likely to attribute lighting and space heating behavioral measures to HEES than the rest of respondents. They were more likely to attribute refrigerator and freezer and weatherization behavioral measures to HEES. They were more likely to have already implemented refrigerator and freezer, space heating, water heating and space cooling equipment measures that were recommended by HEES.

Table 29: Attribution by Behavioral vs. Equipment Tips - CSI Respondents
(Of Implemented Tips, Excluding Partial Attribution)

Type of Tip	Behavioral		Equipment	
Respondent level of attribution to HEES Survey for Measure Completion	No attribution-Prior to HEES Survey	Full Attribution-Post-HEES Survey	No attribution-Prior to HEES Survey	Full Attribution-Post-HEES Survey
Lighting (N=7)	67%	33%	100%	0%
Refrigerator & Freezer (N=42)	25%	75%	100%	0%
Space Heating (N=42)	95%	5%	83%	17%
Washing & Drying Clothes (N=32)	87%	13%	84%	16%
Weatherization (N=51)	33%	67%	79%	21%
Pool & Spa (N=8)	50%	50%	NA	NA
Water Heating & Water Usage (N=66)	80%	20%	93%	7%
Space Cooling (N=15)	78%	22%	100%	0%
Dishwasher (N=24)	89%	11%	75%	25%
Total (N=287)	78%	22%	79%	21%

Reasons for Not Implementing Recommendations

Table 30 summarizes the reasons respondents did not implement the recommendations they received. As stated above, respondents did not implement 44 percent of all 1,778 tips addressed by the participant survey. The most common reason for not implementing tips was that respondents said the tip was not applicable to them (28 percent of disregarded tips, or 12 percent of all tips received), though for three measure categories the tip was not applicable to the respondent 40 percent of the time. The second most frequent response given for not implementing measures was that they were too expensive (23 percent of disregarded tips, or 10 percent of all tips received). More detail regarding the "other" responses as well as analysis at the individual tip level is provided in the "Results by Recommendation Measure Category" section later in this report.

Table 30: Reasons for Not Implementing Tip by All Survey Respondents

Measure Category / Response	Lighting (N=5)	Refrigerator & Freezer (N=98)	Space Heating (N=112)	Washing & Drying Clothes (N=66)	Weatherization (N=145)	Pool & Spa (N=25)	Water Heating & Water Usage (N=204)	Space Cooling (N=50)	Dishwasher (N=53)	Total (N=758)
Does not apply to me	40%	28%	30%	27%	27%	40%	17%	40%	47%	**28%**
Forgot about it	20%	4%	1%	0%	1%	4%	2%	0%	4%	**2%**
Too expensive	20%	16%	21%	44%	27%	16%	20%	28%	9%	**23%**
Not enough savings	0%	3%	3%	5%	5%	0%	4%	2%	0%	**3%**
Too much effort	0%	14%	5%	8%	8%	4%	10%	4%	4%	**8%**
Did not understand how	0%	9%	10%	2%	6%	0%	10%	0%	2%	**7%**
Did not have time	0%	5%	4%	0%	5%	4%	3%	0%	4%	**4%**
Lifestyle	0%	6%	4%	5%	3%	8%	5%	8%	13%	**6%**
Landlord	0%	0%	4%	0%	4%	0%	3%	2%	0%	**2%**
Will do in future	0%	4%	6%	14%	8%	4%	8%	6%	2%	**7%**
Refused	0%	0%	0%	0%	0%	0%	<1%	0%	0%	**<1%**
Don't know	0%	4%	7%	0%	4%	0%	4%	2%	0%	**4%**
Other	20%	9%	13%	8%	8%	20%	18%	18%	23%	**14%**

Multiple responses accepted

We also examined reasons given by respondents for not implementing measures by survey mode and for CSI respondents. Overall, results are very similar between modes and for CSI respondents. The exception was that just 15 percent of CSI responses were that the recommended measures were too expensive (compared to 23 percent for the entire survey population).

Timing of Implementation

Table 31 shows that of the tips implemented due to the HEES program, almost 40 percent were executed immediately after the respondents read their HEES reports, an additional 27 percent were done within a month, and another 16 percent were implemented within three months. Fourteen percent of respondents implemented their recommendations later than three months

from the dates they received their reports and four percent said they did not know when they implemented them.

Table 31: Time of Implementation

Measure	Immediately	Within 1 Month	Within 3 Months	Within 6 Months	Within the 1st Year	More than 1 Year	Don't Know
Water Heating & Water Usage (N=39)	28%	39%	15%	10%	3%	3%	3%
Weatherization (N=33)	15%	30%	27%	12%	9%	6%	0%
Space Heating (N=31)	52%	26%	13%	7%	0%	0%	3%
Washing & Drying Clothes (N=29)	28%	10%	31%	17%	7%	0%	7%
Refrigerator & Freezer (N=49)	53%	31%	6%	0%	0%	4%	6%
Dishwasher (N=9)	44%	22%	11%	0%	11%	0%	11%
Space Cooling (N=9)	44%	11%	22%	0%	11%	0%	11%
Pool & Spa (N=3)	33%	33%	0%	33%	0%	0%	0%
Lighting (N=20)	60%	25%	10%	5%	0%	0%	0%
Total (N=222)	39%	27%	16%	8%	4%	2%	4%

Satisfaction with Measures Implemented

As shown in Table 32, nearly all respondents were satisfied with the measures they implemented as a result of the HEES program. For 55 percent of the tips they received, respondents were "very satisfied"; for only three percent of recommendations were respondents actually dissatisfied. All respondents who said they were less than "moderately satisfied" were asked to explain why. Reasons for dissatisfaction[14] are presented in the following section that provides in-depth results for each recommendation category. Notably, there are very small sample sizes for some of these measures.

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[14] Dissatisfaction is defined to include slightly satisfied, neutral, and any of the three varying dissatisfied responses.

Table 32: Satisfaction with New Measures

Measure	Very Satisfied	Moderately Satisfied	Slightly Satisfied	Neutral	Slightly Dissatisfied	Moderately Dissatisfied	Very Dissatisfied	Don't know
Water Heating & Water Usage (N=39)	51%	33%	3%	5%	3%	3%	3%	0%
Weatherization (N=33)	64%	21%	9%	6%	0%	0%	0%	0%
Space Heating (N=30)	47%	37%	7%	3%	0%	0%	0%	7%
Washing & Drying Clothes (N=28)	82%	4%	4%	0%	4%	0%	4%	4%
Refrigerator & Freezer (N=49)	39%	27%	12%	8%	0%	0%	0%	14%
Dishwasher (N=9)	56%	33%	0%	0%	0%	0%	11%	0%
Space Cooling (N=9)	56%	22%	11%	0%	0%	0%	0%	11%
Pool & Spa (N=3)	67%	33%	0%	0%	0%	0%	0%	0%
Lighting (N=20)	55%	35%	0%	5%	0%	5%	0%	0%
Total (N=220)	55%	26%	6%	5%	1%	1%	1%	5%

For the 14 percent of new measures respondents were dissatisfied with, Table 33 shows the reasons for dissatisfaction. The primary reason was that respondents did not feel they were getting enough energy savings (42 percent of tips). For another 25 percent of these tips, respondents said they were dissatisfied because they have not seen *any* energy savings. Nineteen percent of respondents cited some other reason for their dissatisfaction, including:

- Refrigeration recommendations:

  o It was a new house so I didn't notice results

  o It's hard to say if that specific thing changed anything

  o It made a difference in how the food kept

- Weatherization recommendations:

  o Caulking didn't need to be improved

- Water Heating/Water Usage recommendations:

  o Water was not warm enough to shower

Table 33: Reasons for Dissatisfaction with New Measures

Measure	Not getting ENOUGH energy savings	Not getting ANY energy savings	Hard to remember to keep doing it	Equipment was not worth the money	Is a hassle	Other	Don't know
Water Heating & Water Usage (N=6)	33%	33%	0%	0%	0%	33%	17%
Weatherization (N=5)	60%	20%	0%	0%	0%	20%	0%
Space Heating (N=3)	67%	0%	0%	33%	0%	0%	0%
Washing & Drying Clothes (N=3)	33%	33%	0%	0%	0%	33%	0%
Refrigerator & Freezer (N=10)	50%	50%	0%	0%	10%	30%	0%
Dishwasher (N=1)	100%	0%	0%	0%	0%	0%	0%
Space Cooling (N=1)	0%	0%	100%	0%	0%	0%	0%
Lighting (N=2)	50%	0%	0%	0%	0%	0%	50%
Total (N=31)	48%	29%	3%	3%	3%	23%	7%

Multiple responses accepted

We provide greater detail on the impacts of the HEES report at the individual recommendation level in Appendix B, "Results by Recommendation Measure Category".

Further Action

Table 34 details further actions taken by the respondents after receiving their SmartEnergy Analyzer reports, broken out by survey mode. Nearly 40 percent of respondents said they visited a utility website to get additional information on energy efficiency programs, and as expected, this was most common for the on-line survey mode (58 percent of on-line users). Moreover, 14 percent called the utility for additional information and 21 percent of all respondents called a contractor to learn more about installing energy efficient equipment. The on-line survey mode had the highest rates of participation in other energy efficiency programs and purchases of energy efficiency equipment. CSI customers had the same or slightly higher participation levels when compared to the entire respondent population, except for calling a contractor (38 percent participation compared to just 21 percent for all respondents).

Overall, 22 percent of respondents participated in another program as result of their HEES reports. As shown in Table 35, the most popular set of programs to participate in were PG&E rebate programs (37 percent). Twenty-eight percent of respondents said that they participated in a non-rebate program, and the most frequent other responses included:

- CFL program (x6)
- Attic insulation (x3)
- CARE (x3)
- Smart meter (x2)

Table 34: Action Taken As A Result of HEES

Action Taken	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Visit a utility website to get additional info on energy efficiency programs	26%	58%	38%	38%
Call the utility to get additional info on energy efficiency programs	17%	10%	14%	16%
Call a contractor to find more about installing energy efficient equipment	15%	31%	21%	38%
Participate in any other rebate or energy efficiency programs	18%	28%	22%	26%

Table 35: Programs Participated In

Program	Mail-in Percent (N=66)	On-line Percent (N=64)	Total Percent (N=130)	CSI Customers Percent (N=25)
PG&E Rebate Program	33%	41%	37%	28%
PG&E Smart AC Program (AC Cycling)	14%	13%	13%	8%
Solar System Rebate (California Solar Initiative)	3%	16%	9%	28%
I don't remember the program name	20%	14%	17%	16%
Other	30%	25%	28%	24%
Don't know	3%	0%	2%	0%

Multiple responses accepted

For the 22 percent of survey respondents that said they had participated in other PG&E programs as a result of the HEES report, they were also asked if they had purchased any energy efficient equipment. Of this subset of respondents, 59 percent did indeed purchase equipment (see Table 36).

Table 37 shows that of the equipment purchased as a result of the HEES program, the most common choices are clothes washers (30 percent), refrigerators/freezers (21 percent), dishwashers (18 percent), and air conditioners (12 percent). Of the 12 other responses given, the most frequent equipment purchases were clothes dryers (x5) and CFLs (x2). On the whole, 64 percent of respondents in this group said they received a PG&E rebate for their purchases, 33 percent did not, and four percent did not know (see Table 38). On-line users accessed rebates at higher rates than respondents who mailed in their survey forms.

Table 36: Purchase Energy Efficient Equipment?

Response	Mail-in Percent (N=66)	On-line Percent (N=64)	Total Percent (N=130)	CSI Customers Percent (N=25)
Yes	49%	70%	59%	56%
No	51%	30%	40%	44%

Table 37: Equipment Purchased

Equipment Type	Mail-in Percent (N=32)	On-line Percent (N=45)	Total Percent (N=77)	CSI Customers Percent (N=14)
Clothes washer	28%	31%	30%	29%
Refrigerator/Freezer	16%	24%	21%	7%
Dishwasher	16%	20%	18%	14%
Air conditioner	9%	13%	12%	7%
Water heater	6%	13%	10%	7%
Lighting	16%	4%	9%	7%
Furnace	3%	11%	8%	7%
Windows	9%	4%	6%	0%
Pool equipment	3%	7%	5%	7%
Whole house fan	3%	4%	4%	0%
Solar system	0%	7%	4%	21%
Insulation	6%	0%	3%	0%
HVAC system	0%	4%	3%	7%
Other	19%	13%	16%	7%

Table 38: Received Utility Rebate

Response	Mail-in Percent (N=32)	On-line Percent (N=45)	Total Percent (N=77)	CSI Customers Percent (N=14)
Yes	50%	73%	64%	57%
No	44%	24%	33%	43%
Don't know	6%	2%	4%	0%

5.7 PARTICIPANT SATISFACTION

This section of the report examines the clarity and usefulness of SmartEnergy Analyzer report.

Ease of Completing the HEES Survey

As shown in Table 39, 93 percent of respondents found it "somewhat easy" or "very easy" to complete the survey. Those who said the survey was anything but "very easy" (28% of respondents) were asked how the survey could be improved, and Table 40 displays these results. Of this group, twelve percent suggested to make the survey less technical six percent suggested to make it briefer. Many of the relevant responses from the "other" category are listed below.

- Follow up sooner (x3)
- More customized to individual house (x3)
- Send someone out to home (x2)
- Too simplistic (x2)
- Increase availability/awareness of on-line survey version (x2)
- None/the survey is good (x2)
- A follow up note in case it was lost
- Talk more about on-demand water heaters
- Do it on-line
- Had to inquire to find answers to questions
- It was too difficult to enter all the data
- It was a little complicated. Too long.
- Leave more options for the answers
- Make it more user-friendly
- More directly tie my results to my energy use
- More options for ways to save money
- Take into account smaller homes with fewer people
- The logging in was difficult and also printing with account number
- Talk more about on-demand water heaters

Table 39: Ease of Filling Out Survey

Level of Ease	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Very easy	69%	77%	72%	66%
Somewhat easy	22%	18%	21%	27%
Somewhat difficult	4%	2%	3%	3%
Very difficult	1%	<1%	1%	2%
Don't know	5%	2%	4%	2%

Table 40: What Would Make it Easier?

Recommendation	Mail-in Percent (N=108)	On-line Percent (N=49)	Total Percent (N=157)	CSI Customers Percent (N=33)
Make it less technical	12%	12%	12%	21%
Make is shorter/more concise	6%	6%	6%	3%
Make it available in more languages	3%	0%	2%	6%
Make the web portal move faster from page to page	0%	2%	1%	3%
Leave more room on the lines to write-in answers	1%	0%	1%	0%
Don't know	63%	45%	57%	42%
Other	18%	35%	23%	27%

Multiple Responses Accepted

The SmartEnergy Analyzer report shows an estimate of the annual energy cost of the customer's major appliances. According to Table 41, 33 percent of respondents found the appliance cost estimates to be "very useful" and at least 73 percent rated the charts as "somewhat useful."

Table 41: Usefulness of Energy Costs by Appliance Chart

Usefulness	Mail-in Percent (N=370)	On-line Percent (N=231)	Total Percent (N=601)	CSI Customers Percent (N=97)
Very useful	32%	35%	33%	39%
Somewhat useful	41%	39%	40%	34%
Not very useful	10%	15%	12%	13%
Not at all useful	5%	5%	5%	5%
Don't know	13%	6%	10%	8%

Satisfaction Ratings

Respondents were also asked to indicate their satisfaction levels with various aspects of the HEES program. Table 42 through Table 44 display the satisfaction ratings with the program by survey mode (mail-in versus on-line) and also among the subgroup of CSI customers. The majority of respondents across both survey modes were very satisfied with the amount of time it took to complete the survey and the clarity of the recommendations provided. About half (51 percent) of respondents were "very satisfied" with the SmartEnergy Analyzer tool overall.

The satisfaction ratings submitted by CSI respondents regarding the usefulness of the recommendations and the information provided on other energy efficiency programs were higher than the total participant ratings. In addition, 55 percent of CSI customers were "very satisfied" with the Home Energy Analyzer Survey.

Table 42: Satisfaction with the SmartEnergy Analyzer Tool – Mail-In Participants

	Very Satisfied	Moderately Satisfied	Slightly Satisfied	Neutral	Slightly Dissatisfied	Moderately or Very Dissatisfied	Don't Know
Program Feature				**Percent**			
Amount of time it took to complete the survey **(N=369)**	62%	24%	1%	5%	1%	1%	7%
Clarity of the recommendations provided by the survey **(N=370)**	57%	26%	4%	4%	1%	2%	7%
Usefulness of the recommendations provided **(N=370)**	45%	33%	5%	6%	3%	4%	4%
Information provided on other energy efficiency programs **(N=369)**	34%	31%	7%	5%	2%	2%	19%
Overall satisfaction with the Home Energy Analyzer Survey **(N=368)**	51%	34%	5%	5%	1%	3%	2%

Table 43: Satisfaction with the SmartEnergy Analyzer Tool – On-line Participants

	Very Satisfied	Moderately Satisfied	Slightly Satisfied	Neutral	Slightly Dissatisfied	Moderately or Very Dissatisfied	Don't Know
Program Feature				**Percent**			
Amount of time it took to complete the survey **(N=231)**	66%	22%	1%	4%	1%	1%	5%
Clarity of the recommendations provided by the survey **(N=231)**	61%	25%	3%	4%	<1%	2%	6%
Usefulness of the recommendations provided **(N=231)**	43%	31%	6%	7%	3%	6%	5%
Information provided on other energy efficiency programs **(N=230)**	34%	27%	7%	10%	2%	4%	17%
Overall satisfaction with the Home Energy Analyzer Survey **(N=231)**	51%	33%	6%	3%	1%	2%	4%

Table 44: Satisfaction with the SmartEnergy Analyzer Tool – CSI Customers

	Very Satisfied	Moderately Satisfied	Slightly Satisfied	Neutral	Slightly Dissatisfied	Moderately or Very Dissatisfied	Don't Know
Program Feature				**Percent**			
Amount of time it took to complete the survey **(N=97)**	59%	25%	2%	7%	3%	2%	2%
Clarity of the recommendations provided by the survey **(N=97)**	61%	26%	3%	5%	0%	1%	4%
Usefulness of the recommendations provided **(N=97)**	54%	28%	4%	7%	1%	5%	1%
Information provided on other energy efficiency programs **(N=96)**	42%	24%	5%	8%	4%	1%	16%
Overall satisfaction with the Home Energy Analyzer Survey **(N=97)**	55%	34%	3%	4%	1%	2%	1%

Reasons for Dissatisfaction

Respondents who said they were slightly, moderately, or very dissatisfied with one or more aspects of the program (Table 42 and Table 43) were asked to explain why they were not satisfied. Table 45 lists the reasons respondents were dissatisfied with the time required to complete the survey (one percent of total respondents). Of those respondents, eight of eleven said that the survey took too long.

Table 45: Time to Take Survey – Why Dissatisfied

Reason	Mail-in Percent (N=7)	On-line Percent (N=4)	Total Percent (N=11)	CSI Customers Percent (N=5)
Took too long	57%	100%	73%	100%
Was too short, not detailed enough	14%	25%	18%	
Other	57%	0%	36%	20%

Multiple Responses Accepted

Table 46 details reasons why 16 respondents (two percent of total respondents) were dissatisfied with the clarity of the SmartEnergy Analyzer recommendations they received. The most common answer was that the tips could be more specific (12 respondents).

Table 46: Clarity of Recommendations – Why Dissatisfied

Reason	Mail-in Percent (N=11)	On-line Percent (N=5)	Total Percent (N=16)	CSI Customers Percent (N=1)
Recommendations were too vague/wanted more specific info	82%	60%	75%	0%
Was not sure how to join energy efficiency programs mentioned	9%	0%	6%	0%
Did not understand some of the recommendations	18%	0%	13%	0%
Other	18%	40%	25%	100%
Don't Know	9%	0%	6%	0%

Multiple Responses Accepted

Five percent of all survey respondents were dissatisfied with the usefulness of their SmartEnergy Analyzer recommendations. As shown in Table 47, the top reason these respondents were dissatisfied was that the recommendations did not seem customized for their households (44 percent). Many respondents also explained that the information provided was too basic (35 percent) or that they had already implemented most of the measures prior to program participation (27 percent). Thirty-eight percent of respondents gave some other answer about why they were dissatisfied with the usefulness of the recommendations. These included:

- Recommendations too expensive (x4)
- Wanted an in-home review (x2)
- They were worthless/useless (x2)
- A smart meter was installed and my bills are higher
- Did not apply to me
- Didn't answer questions why our bills were so high
- Didn't think that would cut my cost significantly
- Inaccurate about insulation
- Suggested replacing freezers when it was brand new
- Wanted more specific information

Table 47: Usefulness of Recommendations – Why Dissatisfied

Reason	Mail-in Percent (N=28)	On-line Percent (N=20)	Total Percent (N=48)	CSI Customers Percent (N=6)
Did not seem customized for my household	36%	55%	44%	67%
Too basic – already knew about these things	29%	45%	35%	33%
Already did most of them	25%	30%	27%	17%
They were too much of a hassle	18%	10%	15%	17%
Wanted information on solar energy	4%	5%	4%	33%
Other	36%	40%	38%	17%

Multiple Responses Accepted

Many SmartEnergy Analyzer recommendations are paired with information about rebates and other energy efficiency programs. Twenty-six respondents (three percent of total respondents) were dissatisfied with the information provided in their reports and Table 48 lists the reasons why. Thirty-eight percent of respondents said that they did not receive any information or detailed enough information about other energy efficiency programs. Over 40 percent of respondents provided some "other" response, including:

- Recommendations too expensive (x2)
- Programs were not applicable (x2)
- I had to go to other part of website
- No specific info on PG&E programs
- Recommended rebates for me that I didn't qualify for
- Wanted more information on the rebates

Table 48: Information Provided on Other Programs – Why Dissatisfied

Reason	Mail-in Percent (N=13)	On-line Percent (N=13)	Total Percent (N=26)	CSI Customers Percent (N=5)
Did not receive info about other energy efficiency programs	31%	15%	23%	20%
Did not receive detailed enough info	23%	8%	15%	20%
Already have done all these programs	8%	8%	8%	0%
Already knew about all these programs	15%	8%	12%	0%
Wanted info on renewable energies programs (sun, wind, etc)	0%	8%	4%	0%
Wanted info on demand response programs for my home	0%	8%	4%	0%
Other	23%	62%	42%	60%
Don't know	8%	8%	8%	0%

Multiple Responses Accepted

Furthermore, 23 respondents (three percent of total participants) were dissatisfied with their overall experience in the HEES program. When these respondents were asked to explain their discontent, 35 percent said the survey was not customized enough to their households (see Table 49). About one-fourth of respondents said that the recommendations were too basic, the recommendations did not apply, and that they had already done most or all of the recommendations.

Table 49: Overall Satisfaction – Why Dissatisfied

Reason	Mail-in Percent (N=16)	On-line Percent (N=7)	Total Percent (N=23)	CSI Customers Percent (N=3)
Recommendations were not customized to my household	25%	57%	35%	33%
Recommendations were too basic/just seemed like common sense	25%	29%	26%	0%
Recommendations did not apply to my household	31%	14%	26%	33%
Already did most/all of the recommendations	25%	29%	26%	0%
Charts were not helpful	13%	29%	17%	0%
Recommendations were too vague	19%	14%	17%	0%
The recommendations were too expensive to implement	13%	14%	13%	0%
Did the recommendations but not seeing desired energy savings	0%	43%	13%	0%
Survey instrument was too short/not detailed enough	19%	0%	13%	0%
The recommendations were too much of a hassle to implement	6%	0%	4%	0%
Wanted a more direct link to energy efficiency and other rebate programs from the Survey Report	0%	14%	4%	0%
Wanted information on renewable power options	0%	14%	4%	0%
Survey took too long	0%	14%	4%	0%
Did not know how to answer some of the survey questions/too technical	6%	0%	4%	33%
Other	25%	14%	22%	0%
Don't know	6%	0%	4%	0%

Multiple Responses Accepted

5.8 OVERALL SUGGESTIONS

All respondents were asked what one thing they would change about the SmartEnergy Analyzer program, and the relevant responses are summarized in Table 50. More then half (55 percent) did not know, but when breaking down the 45 percent of respondents who offered a suggestion, the most common responses were: that the survey was great or nothing needed to be changed (five percent), to make the recommendations more customized (four percent), and to shorten the survey (four percent). Some of the most relevant responses in the "other" category included:

- Advertise it better so more people know about it
- Ask questions about previous years to compare savings
- Change the wording. Make it easier to read
- Follow up reminders on the information
- Had to put in too much info
- Have a live person to talk to about the survey (x2)
- Have an option to ask questions
- Have information on how changes make a difference
- I wish I had known that it was available on-line
- I would like PG&E people to be a little more personable
- Include more recommendations (x2)
- Incorporate more green friendly suggestions
- Link it to contractors in my area (x2)
- More available information about rebates and contractors
- More information on newer technology
- Offer more free CFL light bulbs/ more free items that save energy (2)
- Provide a way to see changes in the bill
- Restructure survey to eliminate items already addressed
- Some questions were redundant
- We had trouble with some of the CFLs given

Table 50: One Thing You Would Change About the Program

Response	Mail-in Percent (N=357)	On-line Percent (N=227)	Total Percent (N=584)	CSI Customers Percent (N=95)
It was great/Nothing	4%	6%	5%	3%
More customized recommendations	4%	6%	4%	3%
Shorter survey	5%	2%	4%	6%
More detailed/specific recommendations	2%	3%	2%	5%
Include free/cheap recommendations	1%	3%	2%	1%
Follow up sooner	1%	2%	2%	1%
More detailed/in-depth survey	1%	1%	1%	3%
Provide more advanced recommendations	1%	1%	1%	1%
More measures that produce noticeable energy savings	1%	1%	1%	3%
Have information on solar equipment/rebates	1%	1%	1%	1%
In-house visit and assistance	1%	1%	1%	0%
Make survey questions less technical	1%	1%	1%	1%
Include easy recommendations	1%	<1%	1%	0%
More information about rebates	1%	<1%	1%	1%
Make energy use charts more accurate	<1%	1%	1%	0%
Make on-line survey more efficient/fix technical problems with website	<1%	1%	1%	1%
Offer it in more languages	1%	0%	<1%	1%
Make survey more applicable for multifamily residences	0%	1%	<1%	0%
Have information on demand response programs	0%	<1%	<1%	1%
Have a more direct weblink to energy efficiency and other rebate programs from the Survey report	<1%	<1%	<1%	0%
Have information on renewable power options	<1%	<1%	<1%	1%
Integrate water usage	0%	<1%	<1%	0%
Auto-fill my electric and gas bill history	0%	1%	<1%	1%
Other	13%	16%	14%	11%
Don't know	59%	49%	55%	54%

An additional overarching question was "What was the most difficult thing about completing the Home Energy and Water Efficiency Survey?" Fifty-one percent of respondents did not know, with an additional thirty percent of respondents saying that nothing was too difficult. Of the remaining 19 percent, most commonly respondents said that the most difficult part was allocating time to finish the whole survey, knowing the technical names for household

equipment, and filling in the account information. Relevant answers from the "other" category include:

- Calculating rebates
- Difficult to come up with anything that made sense, it was all numbers
- Having the detailed information to enter
- Printing and logging in and having your account tied in with it. All those things were hard to do.
- Programmed poorly—didn't follow logically
- The CFLs that were recommended didn't fit into the sockets
- Locating the model year of my appliances
- That I can't really do anything to save money

Table 51: Most Difficult Thing About Completing the Survey

Response	Mail-in Percent (N=336)	On-line Percent (N=218)	Total Percent (N=554)	CSI Customers Percent (N=87)
Nothing/It was not difficult	33%	26%	30%	36%
Finishing the whole thing/Finding the time to do it	5%	5%	5%	6%
Filling in gas and electric bill histories	1%	4%	2%	2%
Knowing technical names for household equipment	3%	4%	3%	5%
Tool wasn't very customized to my home/survey answer choices did not apply	1%	1%	1%	1%
How to answer the questions as a renter	1%	0%	1%	2%
Finding the Survey Report on-line after starting to answer questions	<1%	<1%	<1%	0%
Clicking through all the pages of questions before the Survey Report	0%	1%	1%	1%
Other	5%	8%	6%	7%
Don't know	51%	50%	51%	40%

6. BILLING ANALYSIS RESULTS

This section describes the results of analysis conducted by ECONorthwest to estimate energy savings associated with the HEES program. The development of estimates of electricity and natural gas savings required a two-stage modeling approach that combined standard billing regression analysis with a statistical regression model to estimate the portion of energy savings attributable to the HEES program.

6.1 BILLING REGRESSION

In this section, we present a summary of the results of the billing regression models. Detailed results of the statistical models are provided at the end of the section. Table 52shows the estimated percent change (elasticity) in electricity use calculated based on the results of the fixed-effects regression model. The elasticity estimates were calculated as a subsequent step to the estimation of the billing regressions using the delta method.[15] Although it is a relatively straightforward matter to calculate point estimates of elasticities, the delta method allows one to calculate the standard error associated with each elasticity estimate based on the variance-covariance matrix estimated in the billing regression. The standard error is used to construct confidence intervals in which the "true" elasticities reside, as well as to perform hypothesis tests.

The percent change in electricity usage was estimated for the entire HEES program, as well as separately for those customers that participated through the on-line survey and those that participated through a mail-in survey. For the entire program, we estimated that participating households experienced a nearly 2.3 percent reduction in annual kWh use between the baseline and post-periods. The lower and upper 95 percent conficence interval for savings are are -0.9 percent and -3.7 percent respectively.

Table 52: Percent Change in Electricity Usage Between Baseline and Post-HEES Program Period

Billing Regression Model	Percent Change	Standard Error	Lower Bound (95% CI)	Upper Bound (95% CI)
All Participants	-2.28%	0.007*	-0.89%	-3.68%
On-Line Participants Only	-2.34%	0.007*	-0.95%	-3.72%
Mail-in Participants Only	-2.24%	0.007*	-0.83%	-3.64%

Source: ECONorthwest Analysis of data from PG&E and the HEES program
*Statistically significant at the 95 percent confidence level

For customers that participated through the on-line survey, the estimate percent change in electricity usage was -2.3 percent. The 95 percent confidence interval for the actual savings ranged from -0.95 percent up to -3.7 percent. For those that participated through the mail-in survey, the elasticity of electricity use was -2.2 percent. The 95 percent confidence interval for the actual savings ranged from -0.8 percent up to -3.6 percent.

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[15] The delta method is used to derive an approximate probability distribution for a function of an asymptotically normal statistical estimator based on knowledge of the variance-covariance of the underlying estimator.

As we discussed above, we do not claim that the estimated percent change in electricity usage is due to the HEES program per se. Rather, after accounting for household characteristics, month-to-month differences in temperatures, seasonal effects, and any underlying trend in energy consumption, we find statistically signrficant evidence that electricity usage decreased between the baseline and post-survey period by about 2.3 percent for the entire program.

Table 53 shows the estimated elasticities for natural gas consumption between the baseline and post-HEES program period. For all participants, we estimate that participating households experienced a 2.2 percent reduction in annual therm use between the baseline and post-periods. The magnitude of gas savings is only slightly less than was estimated for electricity for all participants. However, unlike the elasticity for electricity, the elasticity for natural gas is not statistically significantly different from zero (i.e., the 95 percent confidence interval include the value zero). Thus, for all participants, we cannot, at the 95 percent level of confidence, conclude that gas savings occurred between the baseline and post-period.

For those who participated through the on-line survey, the estimated elasticity is -1.6 percent, but is not statistically significant at the 95 percent level of confidence. For mail-participants, however, the estimated elasticity is much greater (-2.9 percent) and is statistically significant, ranging between about -0.1 percent to -5.8 percent.

Table 53: Percent Change in Natural Gas Consumption Between Baseline and Post-HEES Program Period

Billing Regression Model	Percent Change	Standard Error	Lower Bound (95% CI)	Upper Bound (95% CI)
All Participants	-2.24%	0.0143	*0.56%*	-5.04%
On-Line Participants Only	-1.58%	0.0141	*1.18%*	-4.34%
Mail-in Participants Only	-2.94%	0.0146	-0.09%	-5.80%

Source: ECONorthwest Analysis of data from PG&E and the HEES program
*Statistically significant at the 95 percent confidence level

6.2 ATTRIBUTION MODEL

As discussed in Section 2.3, the results of the billing regressions provide estimates of the change in energy use between the baseline and post-periods. The elasticities calculated from these statistical models provide estimates of the change in energy use between the baseline and post-periods. They do not, however, demonstrate a causal relationship between the HEES program and any estimated savings in energy consumption. Rather, they provide a measure of statistical correlation that may suggest a relationship. To derive estimates of energy savings attributable to the HEES program we develop and estimate second stage models that directly estimate the proportion of energy savings that HEES participants attribute to actions they took based on recommendations received through participation in the HEES program. The so-called "attribution" model is based on responses from a telephone survey of a representative sample of HEES participants.

Table 54 shows the estimated proportion of electricity savings estimated to be attributable to the HEES program—about 20 percent. The lower and upper 95 percent confidence bounds on the true proportion are 13.4 percent and 26.2 percent, respectively. Thus, we estimate that between one-eight and one-quarter of all savings experienced by the HEES program participants is attributable to recommendations made through the program.

Table 54: Attribution of Electricity Savings to the HEES Program

Billing Regression Model	Elasticity	Standard Error	Lower Bound (95% CI)	Upper Bound (95% CI)
Percent of Savings Attributed to HEES	0.198	0.032	0.134	0.262

Source: ECONorthwest Analysis of data from PG&E and the HEES program

Table 55 shows the same information for natural gas. Based on responses of HEES participants interviews conducted in the telephone survey, we estimate that about 31 percent of observed natural gas savings between the baseline and post-periods is attributable to recommendations made through the HEES program. The 95 percent confidence interval for the actual level of attribution ranges from 22 percent up to 40 percent.[16]

Table 55: Attribution of Natural Gas Savings to the HEES Program

Billing Regression Model	Elasticity	Standard Error	Lower Bound (95% CI)	Upper Bound (95% CI)
Percent of Savings Attributed to HEES	0.312	0.046	0.220	0.404

Source: ECONorthwest Analysis of data from PG&E and the HEES program

For those households that acted upon the HEES recommendations, the typical annual savings attributable to the HEES program is 407 kWh and 46 therms.

6.3 ATTRIBUTION OF ELECTRICITY AND NATURAL GAS SAVINGS

To calculate the expected attribution to the HEES program we multiply the estimated percent savings (2.28 percent for electricity) by the attribution-of-savings estimate (19.8 percent). The product, (0.0228 * 0.198 = 0.0049 = 0.45 percent) is our estimate of the lower bound percent change in electricity usage between the baseline and post-period that is directly attributable to the HEES program. Multiplying this by the total annual baseline electricity usage for all participants (4.03 million kWh), we estimate that the HEES program led to a savings of at least 218,489 kWh among households in our sample. The upper bound savings is 1,103,480, which is based on attributing to the HEES program the entire elasticity of 2.3 percent, estimated from the billing regression for electricity.

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[16] It is important to note that while the elasticity of natural gas consumption estimated through the billing regression is not statistically significant (i.e., 95 percent confidence interval includes zero), the estimated reduction in natural gas consumption attributable to the HEES program is highly statistically significant.

For natural gas, the expected attribution to the HEES program would be the estimated percent savings for gas (2.24 percent) multiplied by the attribution-of-savings estimate for gas (31.2 percent). The product, (0.0224 * 0.312 = 0.007 = 0.7 percent) is our estimate of the lower bound percent change in natural gas consumption between the baseline and post-period that is directly attributable to the HEES program.[17] Multiplying this by the total annual baseline natural gas usage for all participants (27,357 therms), we estimate that the HEES program led to a savings of at least 2,297 therms among households in our sample. The upper bounds savings is 7,7363 therms, is based on attributing to the HEES program the entire elasticity of 2.2 percent, estimated from the billing regression for natural gas.[18]

6.4 DETAILED MODEL RESULTS

The detailed model results are shown below.

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[17] As presented and discussed in Section 6.1, the estimated elasticity of natural gas consumption was not statistically significant. However, as discussed in Section 6.2, the estimated attribution rate for the HEES program was highly statistically significant. The product of these two random variables is also a random variable with a joint probability distribution, the variance of which is calculated using the formula shown below. The standard error of the joint probability distribution for natural gas is 0.0011. Thus, the 95 percent confidene interval for the attribution proportion is: $0.70 \pm 0.001096*1.96 = -0.48$ (lower bound) and -0.91 (upper bound).

Equation for Calculating the Joint Variacne of Two Independent Random Variables

[18] As we discuss in the Section 6.2, the elasticity of natural gas consumption between the baseline and post period is not statistically significant. However, given that the product of this elasticity and the estimated attribution rate is statistically significant, we believe it is reasonable to assert that the estimated elasticity from the billing regression (2.3 percent) represents an upper bound on the natural gas saving attributable to the HEES program.

Table 56: Regression Results for Fixed Effects Billing Regression—kWh

Building	Coefficient	Std. Error	T-Stat	P-value	Mean Value
Ln(CDD)	0.039	0.001	32.547	0.000	1.841
Post-Survey Period	-0.115	0.017	-6.639	0.000	0.482
Trend	-0.005	0.000	-12.215	0.000	22.011
Post-Survey*Trend	0.003	0.000	7.643	0.000	14.447
January	0.031	0.011	2.816	0.005	0.096
February	-0.088	0.011	-7.963	0.000	0.091
March	-0.208	0.011	-18.532	0.000	0.096
April	-0.396	0.012	-31.730	0.000	0.094
May	-0.362	0.014	-26.443	0.000	0.096
June	-0.240	0.015	-16.525	0.000	0.096
July	-0.050	0.015	-3.247	0.001	0.094
August	-0.040	0.015	-2.625	0.009	0.080
September	-0.076	0.015	-5.130	0.000	0.063
October	-0.299	0.014	-21.617	0.000	0.065
November	-0.227	0.013	-17.919	0.000	0.063
Post-Survey*January	0.058	0.017	3.473	0.001	0.032
Post-Survey*February	0.011	0.017	0.657	0.511	0.031
Post-Survey*March	-0.010	0.017	-0.578	0.563	0.035
Post-Survey*April	-0.044	0.016	-2.648	0.008	0.042
Post-Survey*May	-0.040	0.016	-2.465	0.014	0.049
Post-Survey*June	-0.027	0.016	-1.613	0.107	0.058
Post-Survey*July	0.025	0.017	1.479	0.139	0.061
Post-Survey*August	-0.063	0.017	-3.662	0.000	0.048
Post-Survey*September	0.052	0.018	2.934	0.003	0.032
Post-Survey*October	-0.009	0.018	-0.526	0.599	0.032
Post-Survey*November	-0.052	0.018	-2.900	0.004	0.031
				R^2	0.725
				F-Stat	76.8
				Observations	52.01
Weighted Average Post-Survey Change in Monthly Electricity Usage*					**-2.3%**

Source: ECONorthwest Analysis of data from PG&E and the HEES Program

Note 1: Model estimated as a fixed-effects panel data model in Limpdep, Nlogit 4.1

Note 2: White's heteroskedastic corrected covariance matrix used, variances assumed equal within groups and over time

* Statistically significant at the 0.05 level

Table 57: Regression Results for Fixed Effects Billing Regression—Therms

Building	Coefficient	Std. Error	T-Stat	P-value	Mean Value
Ln(HDD)	0.045	0.002	20.770	0.000	3.883
Post-Survey Period	0.170	0.047	3.592	0.000	0.480
Trend	0.003	0.001	3.406	0.001	27.986
Post-Survey*Trend	-0.007	0.001	-5.127	0.000	17.220
January	0.370	0.020	18.568	0.000	0.097
February	0.252	0.020	12.636	0.000	0.093
March	-0.101	0.020	-5.047	0.000	0.098
April	-0.495	0.020	-24.542	0.000	0.097
May	-0.611	0.021	-28.869	0.000	0.098
June	-0.782	0.024	-33.105	0.000	0.098
July	-0.873	0.026	-33.242	0.000	0.096
August	-0.990	0.026	-37.514	0.000	0.066
September	-1.031	0.024	-43.109	0.000	0.065
October	-0.869	0.023	-38.343	0.000	0.066
November	-0.640	0.022	-28.480	0.000	0.062
Post-Survey*January	0.028	0.030	0.946	0.344	0.034
Post-Survey*February	-0.011	0.030	-0.377	0.707	0.036
Post-Survey*March	0.131	0.029	4.458	0.000	0.040
Post-Survey*April	0.202	0.029	6.912	0.000	0.045
Post-Survey*May	0.086	0.029	2.936	0.003	0.050
Post-Survey*June	0.036	0.029	1.244	0.213	0.056
Post-Survey*July	0.003	0.029	0.093	0.926	0.059
Post-Survey*August	0.033	0.032	1.013	0.311	0.033
Post-Survey*September	0.104	0.032	3.206	0.001	0.033
Post-Survey*October	-0.079	0.032	-2.494	0.013	0.033
Post-Survey*November	-0.061	0.032	-1.910	0.056	0.030
				R^2	0.71
				F-Stat	69.1
				Observations	34,190
Weighted Average Post-Survey Change in Monthly Gas Usage*					-2.2%

Source: ECONorthwest Analysis of data from PG&E and the HEES Program

Note 1: Model estimated as a fixed-effects panel data model in Limpdep, Nlogit 4.1

Note 2: White's heteroskedastic corrected covariance matrix used, variances assumed equal within groups and over time

* Statistically significant at the 0.05 level

Table 58: Regression Results for kWh Attribution Model*

Building	Coefficient	Std. Error	T-Stat	P-value	Mean Value
HEES Recommend Followed	-0.198	0.032	-6. 276	0.000	NA
				R^2	0.13
				F-Stat	39.4
				Observations	270

Source: ECONorthwest Analysis of data from PG&E and the HEES Program

* Estimated using weighted least squares; baseline kWh usage is the weighting variable

Table 59: Regression Results for Natural Gas Attribution Model

Building	Coefficient	Std. Error	T-Stat	P-value	Mean Value
HEES Recommend Followed	-0.312	0.046	-6. 776	0.000	NA
				R^2	0.21
				F-Stat	45.9
				Observations	171

Source: ECONorthwest Analysis of data from PG&E and the HEES Program

* Estimated using weighted least squares; baseline therm usage is the weighting variable

7. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This section presents a summary of the research findings, conclusions and recommendations.

7.1 PARTICIPANT SURVEY FINDINGS

The key findings from the participant survey are presented below.

Participant Characteristics and Motivations

Due to a combination of target marketing and self-selection, HEES participants are overwhelmingly single-family detached homeowners. Mail-in participants are much older, less educated, and have lower households income than on-line participants and CSI customers. Over half of participants rate themselves as "very knowledgeable" about energy efficiency. CSI customers rate themselves highest in terms of energy efficiency knowledge, followed by on-line and then mail-in participants.

Participants are most often motivated to take the survey in order to save money on their energy bill, followed by concern about the environment and lastly a desire to learn about energy efficiency programs. Mail-in and CSI customers are more likely to be motivated by their concern for the environment than on-line participants.

Program Marketing and Survey Modes

Customers who participate in the mail-in survey learn about the program through billing inserts (or presumably direct mail of the survey), friends/family and utility representatives (e.g., by calling with a high-bill complaint). Customers who participate in the on-line survey learn about the program most often directly from the PG&E website. Most participants were not aware of the other modes available, suggesting that on-line and mail surveys are targeting distinct customer groups.

HEES Recommendations

Each HEES participant receives a customized report that provides a breakdown of home energy use by measure category, and a series of recommendations or tips (an average of 30 per report) to save energy through both behavioral changes (e.g., turn off lights) and measure installations, with about an even split between the two. More than half of all tips relate to water heating, weatherization, space heating and clothes washing and drying.

Attribution

HEES participants said they implemented half of the tips they received in their report – but most of these measures (70%) were reportedly already taken *before* HEES participation. Respondents gave full credit to HEES for 22 percent of tips that they implemented, and partial credit for the remaining 8 percent. On-line and CSI participants were more likely than mail-in respondents to implement tips they received in their HEES reports, but that is because those groups were more likely to say they had already implemented measures prior to HEES. The rate at which tips were followed and attributed to the HEES report did not differ by survey mode and for the CSI group.

By Measure Category

The impact of the HEES program was greatest with respec to lighting measures – with 38 percent of all lighting tips being implemented as a direct result of HEES recommendations – all behavioral lighting measures. Refrigerator and freezer measures were taken as a result of HEES 20 percent of the time. These two categories were among the measure categories that were composed of more behavioral than equipment purchase tips. Tips within the remaining measure categories were taken as a result of HEES between 5 and 10 percent of the time.

In general, participants were equally as likely to attribute recommended behavioral changes and equipment purchases that they made to HEES, though there were some differences between behavioral and equipment attribution by measure category.

Mail-in participants said they implemented all the lighting recommendations that they received in their HEES report (all behavioral) – mostly as a result of HEES. On-line participants implemented 79 percent of lighting tips, mostly prior to HEES.

On-line participants were much more likely to implement refrigerator and freezer measures, and were more likely to attribute those actions to HEES. CSI customers were much more likely to implement pool and spa tips, and were more likely to attribute those actions to HEES.

Reasons for Not Implementing Recommendations

Participants did not implement recommended measures from their HEES reports because the tips were not applicable or were too expensive. There were few differences in these reasons by survey mode or for the CSI group, except CSI customers were less likely to cite that the recommendation was too expensive than non-CSI customers.

Timing of Implementation

Participants typically implemented measures within 1 month of reading their HEES survey reports, and almost all measures implemented within 3 months.

Satisfaction with Measures Implemented

Satisfaction with new measures was fairly high, with the majority saying they were very satisfied and another quarter moderately satisfied. Satisfaction was highest with washing and drying recommendations.

Further Action

More than half of on-line (and one-quarter of mail) participants obtained more information about energy efficiency programs from PG&E's website as a result of participating in HEES. A substantial proportion of participants called PG&E or a contractor to obtain more information on energy efficiency programs, and participated in other programs. About half of those that participated in additional PG&E programs said they purchased energy efficiency equipment. On-line and CSI participants were much more likely than mail-in participants to take further action as a result of HEES.

Participant Satisfaction

All but a small minority of participants found the survey easy to fill out, with a higher percentage of on-line participants finding it very easy to fill out. Most participants found the energy cost breakdown by appliance to be somewhat or very useful. Satisfaction with the energy analysis tool was fairly high, with most participants very or moderately satisfied with its features. Participants could not come up with much to improve the program, with 60 percent saying they were not sure, it was great or nothing.

7.2 BILLING ANALYSIS FINDINGS

After controlling for temperature and other confounding factors, we estimate that the typical household that participated in the HEES program reduced their annual *electricity* consumption by 241 kWh in the year following taking the HEES survey—a 2.3 percent reduction from baseline levels. This estimate is the gross savings estimate. With respect to kW, the typical household that participated in the HEES program achieved gross savings of 0.10 kW.

For natural gas, we find that the typical household that participated in the HEES program achieved gross natural gas savings of 15.2 therms—a 2.2 percent reduction from baseline levels. This estimated elasticity is not statistically significant.

Energy savings estimates were not statistically significantly different between on-line and mail survey participants.

Based on analysis of households that took part in the HEES program and participated in the survey, we estimate net household electricity savings of 20 percent and 31 percent for natural gas. The per-household, per-year electricity and natural gas savings directly attributable to the HEES program (i.e., net savings) are 48 kWh, 0.02 kW, and 4.7 therms, respectively. These average savings values includes all households that took part in the HEES program, including those that did not act on any of the HEES recommendations.

For those households that acted upon the HEES recommendations, the net annual savings attributable to the HEES program is 407 kWh and 0.17 kW of electricity and 46 therms of natural gas.

Aggregating across the approximately 4,500 participating households in our sample, we estimate gross and net savings of 218,489 and 1.1 million kWh of electricity, 93 and 470 kW, and 2,297 and 7,363 therm of natural gas, respectively.

7.3 CONCLUSIONS

The study conclusions are organized around the original research questions identified at the start of the study.

- **Estimate the expected savings for this program**

We estimate that the program achieved net and gross savings of 0.45 and 2.3 percent of the average participant's electricity bill and 0.7 percent and 2.2 percent of the average participant's

natural gas bill in the year following their participation, respectively. The net savings estimates reflect the minimum energy savings that participants directly attributed to HEES. However, the billing analysis results showed gross savings 5 times that for gas and 3 times that for natural gas. This result is consistent with the participant survey self-report findings, on which the attribution model was based. In that survey, participants said they followed half of all recommendations received on their HEES report, but they only attributed 22 percent of those actions to HEES, claiming they had already implemented 70 percent.

The survey results indicate that the HEES program leads to a substantial amount of follow-up action, including participation in other PG&E programs and energy equipment measure installation, particularly among on-line survey participants.

- **Examine the user-friendliness and accessibility of HEES**

HEES participants gave high satisfaction ratings to the program, and had very few suggestions for improvement. The HEES survey – both on-line and mail, is perceived as user-friendly and accessible.

- **Investigate if the recommendations algorithm is appropriate**

Participants receive 30 tips on average in their report. On average they say they already implemented 11, implemented 4 as a result of HEES, and did not follow the remaining 15 (4 because of inapplicability, 3 because it is too costly.) We recommend conducting follow-up research to increase confidence around the large proportion of tips that were reportedly already implemented prior to HEES, since the billing analysis found much higher savings than what was directly attributed to HEES.

HEES participants were satisfied with their experience and many took follow-up action as a result of their participation. Satisfaction with the recommendations was also high – with more than three-quarters very or moderately satisfied with the clarity and usefulness of recommendations provided. When asked how the program could be improved, the vast majority of participants could not think of anything to improve.

The recommendations algorithm appears to be appropriate – even though many of the recommendations were reportedly already taken before participating (a finding that should be confirmed with future research), participants were satisfied with the recommendations they received and few offered ways to improve the program. Many participants were motivated to take follow-up action such as participating in PG&E rebate programs and buying energy efficiency equipment as a result of the program.

- **Determine the effectiveness of the survey for CSI customers**

CSI customers were slightly younger and more educated than non-CSI, slightly more likely to be concerned about the environment, and rated themselves higher in terms of energy efficiency knowledge. These findings are not surprising given the self-selection bias inherent in a solar program.

CSI customers were more likely to have already implemented recommended measures prior to participating, but they were just as likely as non-CSI participants to implement additional recommended measures as a result of participating in HEES. Even though they may already done more prior to participating in HEES, the audit report was just as valuable to them in terms of suggesting additional ways to save energy in the home.

CSI customers were less likely than non-CSI customers to say that measures were too expensive as a reason for not implementing HEES recommendations, perhaps explaining how this group achieved just as many program-related impacts as non-CSI customers, even though they had already implemented more measures prior to participating.

CSI customers were more likely than non-CSI customers to take follow-up action as a result of HEES, including visiting the PG&E website to learn about energy efficiency programs, call a contractor about installing energy efficiency equipment, and participate in energy efficiency programs. These results may reflect their participation in the CSI program and their work with a contractor to install a solar system.

The survey was equally as effective for CSI customers as non-CSI customers, even though they had already implemented a greater proportion of recommended measures prior to participating. With their higher income and greater disposition towards energy efficiency investments, they were more able and motivated to follow HEES recommendations.

- **Analyze the effectiveness of the primary marketing strategies**

The marketing strategies are effective in attracting two distinct populations – direct mailing of surveys to a broader segment of the population and on-line advertising to a more selective audience. The groups are not likely to be aware of the other options, suggesting that participants do not "select" a mode but instead respond to the one mode they are made aware of by program marketing.

- **Identify important respondent demographic differences across HEES modes and the HEES recommendations that they implement**

On-line survey participants are more pre-disposed to take energy efficiency actions prior to the survey, and to take subsequent action due to higher energy efficiency awareness, income and education levels. However, mail participants were just as likely to be influenced by HEES to implement energy efficiency measures, even though they had done less prior to their participation.

In general, the two groups undertake behavioral and investment type measures just as often, though there is some evidence at the measure category level to suggest that mail-in participants take behavioral measures more often (e.g., lighting).

7.4 RECOMMENDATIONS

The attribution model was an innovative method employed to determine net savings attributable to the HEES program. Going forward we believe that further refinements may be made to the approach to narrow in on a net savings estimate:

- Expand the attribution survey question to more explicitly probe for partial attribution - the majority of respondents who followed a HEES recommendation said they had already done the measure before taking HEES, and we could probe them to see if they increased their actions after receiving the HEES recommendation or whether HEES spurred them to take action even though they had already been aware of the recommended measure prior to HEES

- Incorporate non-participants into the billing analysis model, e.g., 2010 participants, to determine whether 2008 participants would have been likely to reduce their energy consumption regardless of their participation during 2008-2009

- Conduct follow-up telephone surveys with participants closely following receipt of the HEES report to improve respondent recall of the timing of taking actions in their home

We recommend continuing to offer both the mail and on-line survey modes, using both direct mail and on-line advertising. The mail-in survey attracts a broader audience that is less likely to have implemented energy efficiency measures. The on-line survey segment leads to more follow-up action, most likely because they are already pre-disposed to participating in programs, particularly via the PG&E website.

The CSI group, though more inclined to have already taken energy efficient measures prior to participating in HEES, get as much value out of the program as non-CSI customers as they attribute just as many recommendations that they followed to the HEES program. They also were more likely to take follow-up action. We recommend that CSI participants continue to participate in HEES.

APPENDIX A: RESULTS BY RECOMMENDATION MEASURE CATEGORY

This section presents detail at the tip level by measure category for tips that HEES participants took as a result of participating in the program.

WATER HEATING & WATER USAGE

Table 60 details the behavior of respondents for water heating/water usage recommendations they received in their HEES reports. Overall, eight percent of the measures were done as a result of the program, and this is particularly high for the tips to lower the hot water temperature and to install low-flow showerheads. Moreover, 30 percent of the water heating/water usage tips had already been implemented prior to program participation. Also of note is that 51 percent of respondents have not implemented the recommended measures. The sample size for each individual measure varies from 1 to 87 respondents, and therefore the precision of these estimates is relatively low. This note on sample sizes is applicable to all the measure categories.[19]

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[19] Due to the complex and elaborate programming in this section of the survey, there were some errors made (respondents were skipped out of questions they should have been asked). Respondents were dropped from the analysis where applicable. This issue overall is small in magnitude (happened to less than one percent of respondents) and only affects a small handful of questions.

Table 60: Water Heating & Water Usage - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other[20]	Don't Know	Do Not Recall Tip
Have your water heater inspected by a pro every 2 yrs (N=87)	34%	8%	51%	0%	1%	6%
Install heat traps on your water heater (N=64)	16%	3%	66%	0%	0%	16%
Install efficient aerators on your sinks (N=66)	44%	3%	36%	5%	0%	12%
Insulate hot water pipes (N=60)	30%	10%	45%	0%	2%	13%
Replace your water heater with an energy efficient model (N=40)	15%	3%	78%	3%	0%	3%
Install low-flow showerheads (N=31)	45%	26%	23%	3%	0%	3%
Wrap your water heater with an insulating blanket (N=17)	6%	6%	71%	12%	0%	6%
Take shorter showers, reduce to 7 min or less (N=15)	40%	13%	40%	7%	0%	0%
Lower the temp of your water heater (120 and 130˚) (N=13)	46%	23%	23%	8%	0%	0%
Control your water heater with an automatic timer (N=6)	17%	17%	67%	0%	0%	0%
Repair your leaking toilets (N=4)	75%	0%	25%	0%	0%	0%
Install a heat recovery water heating system (N=2)	0%	0%	100%	0%	0%	0%
Make your waterbed every day with a thick cover (N=1)	0%	0%	100%	0%	0%	0%
Repair your leaking shower heads (N=1)	0%	100%	0%	0%	0%	0%
Total (N=407)	**30%**	**8%**	**50%**	**2%**	**<1%**	**8%**

Of the 50 percent of water heating and water usage tips that respondents did not implement, the most common reasons given for not following through include: the measure was too expensive (20 percent of tips disregarded), it did not apply to them (17 percent of tips disregarded), it took too much effort/is a hassle (10 percent of tips disregarded), and they did not understand how to do it (10 percent of tips disregarded).

Table 61 also shows that respondents gave other responses for 18 percent of recommendations as well. Seven of the nine respondents in the "other" category for the water heater inspection measure said they didn't have their water heater inspected because the unit was newer. Of the nine respondents who offered some other reason for not installing a heat recovery water system, four had already bought/were planning on buying a new water heater and three didn't know what a heat trap was. The two other reasons respondents did not insulate hot water pipes included "I am going to replace water heater" and "I need to have been here 5 years for them to install (it for) free". Of the seven respondents in the "other" category for replacing the hot water heater with a more energy efficient model, one said the old equipment still works and three other respondents said they wouldn't replace it until they have to (i.e., it breaks).

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[20] The "other" category includes respondents who were already considering the measure before they took the survey and respondents who were already implementing the measure before they took the survey, but are now doing so more frequently as a result of the survey.

Table 61: Water Heating & Water Usage – Why Didn't You Do The Measure?

Reason / Measure	Does not apply to me	Lifestyle	Did not understand how	Too expensive	Too much effort	Will do in future	Not enough savings	Did not have time	Landlord	Refused	Forgot about it	Other	Don't know
Have your water heater inspected by a pro every 2 years (N=44)	25%	7%	2%	25%	2%	5%	5%	0%	5%	2%	2%	20%	2%
Install heat traps on your water heater (N=42)	14%	0%	26%	10%	10%	10%	2%	5%	0%	0%	0%	21%	7%
Install efficient aerators on your sinks (N=24)	8%	8%	21%	17%	8%	0%	0%	4%	4%	0%	8%	13%	8%
Insulate hot water pipes (N=27)	11%	0%	11%	15%	37%	7%	0%	4%	0%	0%	0%	11%	4%
Replace your water heater with an energy efficient model (N=31)	16%	0%	0%	42%	6%	10%	13%	0%	6%	0%	0%	23%	3%
Install low-flow showerheads (N=7)	0%	14%	0%	0%	14%	14%	14%	14%	0%	0%	14%	14%	0%
Wrap your water heater with an insulating blanket (N=12)	17%	0%	0%	17%	8%	33%	0%	8%	8%	0%	0%	17%	0%
Take shorter showers, reduce to 7 min or less (N=6)	0%	83%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%
Lower the temp of your water heater to between 120° and 130° (N=3)	0%	0%	0%	0%	0%	0%	0%	33%	0%	0%	0%	67%	0%
Control your water heater with an automatic timer (N=4)	75%	0%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Repair your leaking toilets (N=1)	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Install a heat recovery water heating system (N=2)	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total (N=204)	**17%**	**5%**	**10%**	**20%**	**10%**	**8%**	**4%**	**3%**	**3%**	**<1%**	**2%**	**18%**	**4%**

Multiple responses accepted

SPACE COOLING

Table 62 shows that on average, 36 percent of the space cooling recommendations had been executed prior to program participation, eight percent were carried out as a result of the HEES, and 48 percent were disregarded. The program had a very low impact on the equipment upgrades such as central and room air conditioners.

Table 62: Space Cooling - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Replace your room AC with a new energy efficient model (N=37)	27%	3%	57%	3%	0%	11%
Cool your house with your whole house fan before you turn on your AC (N=26)	50%	15%	23%	0%	0%	12%
Replace your central AC with an energy efficiency model (high SEER and EER) (N=19)	5%	5%	90%	0%	0%	0%
Raise your cooling thermostat setting a few degrees higher (N=17)	59%	12%	29%	0%	0%	0%
Regularly maintain your AC by replacing the filter and straightening the cooling fins (N=4)	75%	0%	0%	0%	0%	25%
Have your central AC tuned-up, inspected, and cleaned by a professional every other season (N=2)	50%	0%	50%	0%	0%	0%
Total (N=105)	**36%**	**8%**	**48%**	**1%**	**0%**	**8%**

Table 63 shows reasons why respondents failed to implement 48 percent of the space cooling measures suggested in their HEES reports. For 40 percent of the space cooling measures disregarded, respondents said the measure did not apply to their households and for 28 percent of the ignored tips, respondents said they were too expensive.

Other explanations represented 18 percent of the answers. For replacing a room air conditioner, responses included there was no other AC to cool that room, the AC is not broke, and that they didn't feel like a replacement was needed. With regard to installing a whole house fan, the respondent who did not install it said they don't use air conditioning. The other reasons for not raising the air conditioning thermostat setting included "added an air/heat pump" and "It's already on 80." The reason given for not replacing a central AC system was that the equipment was new.

Table 63: Space Cooling – Why Didn't You Do The Measure?

Reason	Replace your room AC (N=21)	Cool your house with your whole house fan before you turn on your AC (N=6)	Replace your central AC (N=17)	Raise your cooling thermostat setting a few degrees higher (N=5)	Have your central AC tuned-up by a professional (N=1)	Total (N=50)
Does not apply to me	57%	50%	18%	40%	0%	40%
Lifestyle	5%	17%	6%	20%	0%	8%
Too expensive	14%	0%	65%	0%	0%	28%
Too much effort	0%	17%	0%	20%	0%	4%
Will do in future	0%	0%	12%	0%	100%	6%
Not enough savings	0%	0%	6%	0%	0%	2%
Landlord	0%	0%	6%	0%	0%	2%
Don't know	0%	17%	0%	0%	0%	2%
Other	24%	17%	6%	40%	0%	18%

Multiple responses accepted

LIGHTING

As shown in Table 64, all respondents who received the suggestion about turning off lights when not in use had already done so prior to taking the survey. More then half of respondents who received a tip about using CFLs claim to have done so as a result of the HEES. Some respondents said they simply had not done one of the following two recommendations: replacing halogen torchieres with ENERGY STAR-compliant fluorescent torchieres and turning off their computer overnight. Overall, 46 percent of the lighting tips had already been implemented before program participation, and 38 percent were executed as a result of the survey.

Table 64: Lighting - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Use CFLs in high-use lamps (N=27)	41%	52%	0%	4%	0%	4%
Turn off your computers overnight (N=7)	29%	14%	57%	0%	0%	0%
Turn lights off when not using them (N=7)	100%	0%	0%	0%	0%	0%
Use CFLs in recessed fixtures (N=7)	29%	57%	0%	14%	0%	0%
Replace your Halogen Torchieres with ENERGY STAR-compliant fluorescent torchieres (N=2)	50%	0%	50%	0%	0%	0%
Total (N=50)	**46%**	**38%**	**10%**	**4%**	**0%**	**2%**

Just 10 percent of lighting measures suggested in HEES reports were not implemented by survey respondents. Table 65 shows the varied handful of responses cited; respondents did report that two of the five measures didn't even apply to them.

Table 65: Lighting – Why Didn't You Do The Measure?

Reason	Turn off your computers overnight (N=4)	Replace your Halogen Torchieres (N=1)	Total (N=5)
Does not apply to me	25%	100%	40%
Too expensive	25%	0%	20%
Forgot about it	25%	0%	20%
Other	25%	0%	20%

Multiple responses accepted

WASHING & DRYING CLOTHES

Table 66 shows that many of the behavioral washing and drying clothes tips received had already been implemented prior to program participation. For the following three recommendations, a large share of participants had already done them prior to taking the HEES: match clothes washer load setting to load size (96 percent), wash full loads of clothes (88 percent), and dry full loads of clothes (81 percent). Overall, 55 percent of the tips were already implemented.

The HEES survey had the strongest impact on the following measures: wash clothes in cold water (implemented by three respondents), replace clothes washer with an h-axis (implemented by seven respondents), replace the dryer with a more energy efficient model (implemented by three respondents), and dry full loads of clothes (implemented by six respondents). Overall, only nine percent of tips were implemented due to the program and 28 percent of tips were disregarded.

Table 66: Washing and Drying Clothes - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Dry full loads of clothes when possible (N=77)	81%	8%	8%	4%	0%	0%
Replace your dryer with a more efficient model (N=50)	24%	6%	54%	8%	0%	8%
Replace your clothes washer with an energy efficient horizontal-axis (h-axis) model (N=45)	20%	16%	56%	7%	2%	0%
Avoid over drying clothes by removing clothes from the clothes as soon as they are dry (N=24)	63%	4%	21%	4%	0%	8%
Match clothes washer load setting to load size (N=23)	96%	4%	0%	0%	0%	0%
Wash full loads of clothes when possible (N=8)	88%	13%	0%	0%	0%	0%
Use cooler water for washing clothes (N=8)	25%	38%	38%	0%	0%	0%
Total (N=235)	**55%**	**9%**	**28%**	**5%**	**<1%**	**3%**

For the 28 percent of washing and drying recommendations that were not taken by respondents, Table 67 shows that the two most common reasons for avoiding the suggested measures were that they were too expensive (44 percent) or did not apply to the participant (27 percent). Eight percent described other reasons that they did not implement the recommendations. For drying full loads of clothes, one respondent gave the explanation that they did not have a clothes dryer. One respondent said they did not remove clothes from the dryer as soon as they were dry because they put most of the clothes on the clothesline anyways. Respondents said they did not replace their clothes washer because as a renter they do not pay the utilities or they had just purchased the washer at the time of the survey. Finally, the participant who did not replace their clothes dryer for other reasons stated it was because the two water heaters were not the biggest issue.

Table 67: Washing and Drying Clothes – Why Didn't You Do The Measure?

Reason	Dry full loads of clothes (N=6)	Replace your dryer with a more efficient model (N=27)	Replace your clothes washer with a h-axis model (N=25)	Avoid over drying clothes (N=5)	Use cooler water for washing clothes (N=3)	Total (N=66)
Does not apply to me	67%	22%	16%	60%	33%	27%
Lifestyle	17%	0%	0%	20%	33%	5%
Did not understand how	0%	0%	0%	20%	0%	2%
Too expensive	0%	44%	68%	0%	0%	44%
Too much effort	17%	15%	0%	0%	0%	8%
Will do in future	0%	22%	8%	0%	33%	14%
Not enough savings	0%	7%	4%	0%	0%	5%
Other	17%	4%	8%	20%	0%	8%

Multiple responses accepted

WEATHERIZATION

As shown in Table 68, different types of insulation measures make up the bulk of the weatherization category. The highest implementation rates in the weatherization category are for caulking and weather-stripping windows and doors, wrapping air ducts with insulation, and sealing leaks in air ducts. Thirteen percent of respondents who caulked and weather-stripped windows and doors did so as a result of taking the HEES. In total, 9 percent of the weatherization tips were implemented as a result of the program.

Table 68: Weatherization – Measure Implemented?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Caulk and weather-strip your windows and doors (N=70)	45%	13%	31%	7%	3%	1%
Seal leaks in air ducts (N=61)	30%	10%	51%	5%	0%	5%
Wrap your air ducts with insulation (N=59)	36%	10%	46%	3%	0%	5%
Improve the insulation in your home (N=53)	26%	8%	62%	2%	0%	2%
Install exterior solar screens on windows (N=41)	22%	0%	59%	2%	0%	17%
Replace your windows or install storm windows (N=10)	10%	0%	80%	10%	0%	0%
Total (N=294)	**32%**	**9%**	**49%**	**4%**	**1%**	**5%**

For the 49 percent of weatherization measures received and not implemented, respondents were asked what stopped them from taking action (see Table 69). For 27 percent of the disregarded weatherization tips, the recommendations did not apply to the household. For another 27 percent of these weatherization tips, respondents said the recommendations were too expensive, and this was particularly true for replacing windows, installing solar screens on windows, and improving the insulation of their home.

Respondents provided some other reason to explain why eight percent of weatherization tips were not implemented. The four other responses cited for not adding caulk to windows and doors included: simply not needing it, having new windows put in recently, it's already in good enough shape, and being a renter. The two reasons for not sealing leaks in air ducts were that the participant was doing a recommendation similar to it already and that the entire heating system needs to be replaced. Respondents said they had not installed exterior solar screens on windows because they had moved, they had already signed up for solar at the time of the survey, or they instead bought new windows which helped (reduce energy costs) a lot.

Table 69: Weatherization – Why Didn't You Do The Measure?

Reason	Caulk and weather-strip your windows and doors (N=22)	Seal leaks in air ducts (N=31)	Wrap your air ducts with insulation (N=27)	Improve the insulation in your home (N=33)	Install exterior solar screens on windows (N=24)	Replace your windows or install storm windows (N=8)	Total (N=145)
Does not apply to me	18%	48%	19%	24%	25%	13%	27%
Lifestyle	9%	0%	0%	3%	0%	13%	3%
Did not understand how	5%	6%	11%	3%	8%	0%	6%
Too expensive	23%	13%	19%	30%	42%	63%	27%
Too much effort	0%	16%	11%	9%	0%	0%	8%
Will do in future	14%	0%	7%	12%	8%	13%	8%
Not enough savings	14%	0%	4%	6%	4%	0%	5%
Did not have time	5%	3%	15%	3%	0%	0%	5%
Landlord	0%	6%	4%	3%	8%	0%	4%
Forgot about it	0%	0%	0%	3%	0%	0%	1%
Don't know	0%	3%	15%	3%	0%	0%	4%
Other	18%	6%	0%	6%	13%	13%	8%

Multiple responses accepted

SPACE HEATING

Table 70 shows that 31 percent of space heating measures received had already been implemented prior to program participation, and another 11 percent were carried out due to the HEES program. The primary measures completed before the HEES were: blocking off vents in unoccupied areas, lowering thermostat setting, installing a programmable thermostat, regularly maintaining gas furnace, and insulating heat system pipes.

Table 70: Space Heating - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Block off heat vents and close doors in unoccupied areas to reduce energy use (N=47)	57%	19%	19%	4%	0%	0%
Lower your heating thermostat setting (N=46)	52%	26%	11%	8%	0%	2%
Install add-on Heat Pump to your heating system (N=42)	0%	2%	79%	0%	0%	19%
Install a programmable thermostat (N=34)	44%	9%	35%	3%	3%	6%
Replace your heating system with a new energy efficient model (N=28)	4%	4%	86%	4%	0%	4%
Turn off the pilot light for your heating system during the summer (N=18)	33%	0%	56%	6%	0%	6%
Install an automatic flue damper for your heating system (N=17)	0%	12%	47%	0%	0%	41%
Install an electronic ignition for your thermostat (N=13)	15%	0%	69%	8%	8%	0%
Regularly maintain your gas furnace (N=7)	57%	14%	14%	0%	0%	14%
Install an outdoor reset control for your boiler (N=2)	0%	0%	50%	0%	0%	50%
Wrap your heating system pipes with insulation (N=1)	100%	0%	0%	0%	0%	0%
Total (N=255)	**31%**	**11%**	**44%**	**4%**	**1%**	**9%**

For the 44 percent of space heating tips that were not completed, respondents were asked for reasons they did not pursue the measures. As shown in Table 71, space-heating recommendations were most frequently ignored because they did not apply (30 percent of disregarded tips) or because they were too expensive (21 percent of the disregarded tips), which is especially the case for replacing the heating system with an energy efficient model. However, the samples are quite small for many of the recommendations and thus the results should be interpreted with caution.

Thirteen percent of these respondents cited another reason for not doing the measure. The reasons provided by respondents for not installing a programmable thermostat were that they were completely solar and produced enough of their own electricity, it didn't matter because they mostly use their fireplace, and they don't use heat or AC. For installing an add-on heat pump, other reasons given for not doing the tip included not knowing what it was, feeling like the add-

on was not necessary, and they had just replaced the heater. The two other reasons for not installing an electronic ignition for the thermostat were that there is no electricity near the (old) furnace and the pre-existing system would not allow it.

Table 71: Space Heating – Why Didn't You Do The Measure?

Reason	Install add-on Heat Pump (N=33)	Replace heating system with EE model (N=24)	Install an auto flue damper (N=8)	Install an electronic ignition for your thermostat (N=9)	Block off heat vents and close doors in unoccupied areas (N=9)	Install a prog thermostat (N=12)	Pilot light (N=10)	Install outdoor reset control for your boiler (N=1)	Regularly maintain gas furnace (N=1)	Lower your heating thermostat setting (N=5)	Total (N=112)
Does not apply to me	21%	33%	38%	22%	56%	33%	30%	100%	0%	20%	30%
Lifestyle	0%	4%	0%	0%	22%	0%	10%	0%	0%	20%	4%
Did not understand how	12%	0%	25%	11%	0%	0%	30%	0%	100%	0%	10%
Too expensive	21%	46%	38%	22%	0%	0%	0%	0%	0%	0%	21%
Too much effort	0%	0%	0%	11%	0%	17%	30%	0%	0%	0%	5%
Will do in future	3%	8%	0%	0%	0%	25%	0%	0%	0%	20%	6%
Not enough savings	6%	0%	0%	0%	11%	0%	0%	0%	0%	0%	3%
Did not have time	6%	0%	0%	11%	0%	8%	10%	0%	0%	0%	4%
Landlord	3%	8%	0%	0%	0%	0%	0%	0%	0%	20%	4%
Forgot about it	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	1%
Don't know	12%	4%	0%	33%	0%	0%	0%	0%	0%	0%	7%
Other	15%	4%	13%	22%	22%	25%	0%	0%	0%	20%	13%

Multiple Responses Accepted

REFRIGERATOR & FREEZER

As shown in Table 72, 27 percent of refrigerator and freezer measures were implemented prior to program participation and 43 percent of tips were ignored. Overall, 20 percent of recommended tips were completed as a result of the HEES. The three tips with the highest implementation rates were raising the temperature setting on the freezer (50 percent), turning off the moisture control

heater on the refrigerator (32 percent), and raising the temp setting of the refrigerator (27 percent).

Table 72: Refrigerator & Freezer - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Brush and vacuum the coils of your freezer at least 2x a yr (N=74)	32%	14%	47%	1%	0%	5%
Raise the temp setting of your refrigerator (38-40 degrees F for the fresh food compartment and 0-5 degrees F for the freezer) (N=59)	36%	27%	22%	3%	3%	8%
Turn off the moisture control heater on your refrigerator (N=37)	5%	32%	41%	0%	0%	22%
Replace your refrigerator with an ENERGY STAR model (N=19)	21%	11%	63%	5%	0%	0%
Replace your freezer with an ENERGY STAR model (N=15)	20%	7%	73%	0%	0%	0%
Raise the temperature setting of your freezer (N=10)	20%	50%	20%	0%	0%	10%
Manually defrost your freezer regularly (N=11)	45%	0%	55%	0%	0%	0%
Unplug your 2nd refrigerator (N=5)	0%	0%	80%	0%	0%	20%
Total (N=230)	**27%**	**20%**	**43%**	**2%**	**1%**	**8%**

For the 43 percent of refrigerator and freezer tips ignored by survey respondents, the top two reasons given for not implementing measures were that they did not apply to the participants' household (28 percent of disregarded tips) and that they were too expensive (16 percent of disregarded tips). Table 73 also shows that nine percent of respondents gave some other answer for why they did not implement the tips. The four (of nine total responses for the category) other responses for not brushing and vacuuming freezer coils were getting new equipment (x3) and not knowing where the coils are located. The reason for not replacing a refrigerator or freezer with a new ENERGY STAR model was that their existing equipment was too new (x2).

Table 73: Refrigerator & Freezer – Why Didn't You Do the Measure?

Reason	Brush and vacuum the coils of your freezer at least 2x a year (N=35)	Raise the temp setting of your refrigerator (N=13)	Turn off the moisture control heater on your refrigerator (N=15)	Replace your refrigerator (N=12)	Replace your freezer (N=11)	Raise the temperature setting of your freezer (N=2)	Manually defrost your freezer regularly (N=6)	Unplug your 2nd refrigerator (N=4)	Total (N=98)
Does not apply to me	34%	46%	40%	0%	18%	0%	17%	0%	28%
Lifestyle	0%	23%	0%	0%	0%	0%	0%	75%	6%
Did not understand	11%	0%	33%	0%	0%	0%	0%	0%	9%
Too expensive	0%	0%	0%	67%	64%	0%	17%	0%	16%
Too much effort	31%	8%	0%	0%	0%	0%	17%	25%	14%
Will do in future	3%	8%	0%	17%	0%	0%	0%	0%	4%
Not enough savings	0%	0%	7%	0%	9%	0%	17%	0%	3%
Did not have time	9%	0%	0%	8%	0%	0%	17%	0%	5%
Forgot about it	3%	8%	0%	0%	0%	0%	33%	0%	4%
Don't know	0%	8%	13%	8%	0%	0%	0%	0%	4%
Other	11%	0%	7%	8%	9%	100%	0%	0%	9%

Multiple Responses Accepted

DISHWASHER

As exhibited in Table 74, the vast majority of respondents who received a dishwasher tip either said that they were already doing it (48 percent of recommended tips) or weren't doing it (38 percent). The HEES appears to have had a very small impact for these measures, as just seven percent of recommended measures were done as a result of the respondent doing the survey.

Table 74: Dishwasher - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Wash full loads of dishes when possible (N=50)	70%	0%	20%	4%	2%	4%
Air dry dishes by turning off the drying heater on your dishwasher or stop the dishwasher after the rinse cycle (N=61)	43%	11%	43%	3%	0%	0%
Replace your dishwasher with a new energy efficient model (N=27)	19%	7%	63%	0%	0%	11%
Total (N=138)	**48%**	**7%**	**38%**	**3%**	**1%**	**4%**

For the 38 percent of dishwasher tips that were not done, respondents were asked to provide reasons for not acting on those recommendations. Table 75 shows the most frequent explanation was that the measure did not apply (47 percent of disregarded tips), while for 23 percent of tips, respondents gave some other reason for not implementing the measures. Other justification offered for not purchasing a new dishwasher included the dishwasher is not used (x3) and the present dishwasher is fairly new (x2). Of the four other responses given for why a participant did not air dry dishes, the most frequent answer was that they do not use the dishwasher very much (x3).

Table 75: Dishwasher – Why Didn't You Do The Measure?

Reason	Wash full loads of dishes (N=10)	Air dry dishes (N=26)	Replace your dishwasher with a new energy efficient model (N=17)	Total (N=53)
Does not apply to me	46%	46%	29%	47%
Lifestyle	23%	23%	0%	13%
Did not understand how	4%	4%	0%	2%
Too expensive	0%	0%	29%	9%
Too much effort	8%	8%	0%	4%
Will do in future	0%	0%	6%	2%
Did not have time	4%	4%	0%	4%
Forgot about it	8%	8%	0%	4%
Other	15%	15%	35%	23%

POOL & SPA

As shown in Table 76, relatively few respondents were asked about the pool and spa recommendations they received (because this population of customers is relatively small). Only three tips were executed specifically as a result of the HEES program– lowering the temperature of the hot tub, purchasing an insulating cover for the hot tub, and using pool cover regularly. Overall, eight percent of the tips were implemented due to the program and 24 percent had already been implemented prior to participation.

Table 76: Pool & Spa - Doing the Measure?

Measure	Already did before HEES	Result of HEES	No	Other	Don't Know	Do Not Recall Tip
Replace your pool pump with more energy efficient unit (N=11)	9%	0%	91%	0%	0%	0%
Lower the temp of your hot tub to 100˚ or lower (N=9)	56%	11%	33%	0%	0%	0%
Lower the temp of your pool to 76˚ or lower (N=5)	20%	0%	80%	0%	0%	0%
Use your pool cover regularly (N=5)	0%	20%	80%	0%	0%	0%
Run your pool pump less (N=4)	50%	0%	25%	0%	0%	25%
Purchase a rigid foam insulating cover for your hot tub and use regularly (N=2)	0%	50%	50%	0%	0%	0%
Purchase and use a pool cover (N=2)	0%	0%	100%	0%	0%	0%
Total (N=38)	**24%**	**8%**	**66%**	**0%**	**0%**	**3%**

About two thirds of all Pool & Spa recommendations were not completed by survey respondents. Table 77 shows that most frequently, the respondents who failed to act on the pool and spa recommendations explained that the measures did not apply (40 percent of disregarded tips). Sixteen percent said the measures were too expensive and another 20 percent cited other reasons for not doing them. The reason given for not replacing the pool pump was that it was new/not that old (x2) and the reason for not using a pool cover was that it is an oddly shaped pool and a cover is difficult to obtain.

Table 77: Pool & Spa – Why Didn't You Do The Measure?

Reason	Replace your pool pump with more energy efficient unit (N=10)	Lower the temp of your hot tub to 100˚ or lower (N=3)	Lower the temp of your pool to 76˚ or lower (N=4)	Use your pool cover regularly (N=4)	Run your pool pump less (N=1)	Purchase and use a pool cover (N=2)	Purchase and use rigid foam insulating cover for hot tub (N=1)	Total (N=25)
Does not apply to me	30%	33%	75%	75%	0%	0%	0%	40%
Lifestyle	0%	33%	0%	0%	100%	0%	0%	8%
Too expensive	30%	0%	0%	0%	0%	0%	100%	16%
Too much effort	10%	0%	0%	0%	0%	0%	0%	4%
Will do in future	10%	0%	0%	0%	0%	0%	0%	4%
Did not have time	0%	0%	0%	0%	0%	50%	0%	4%
Forgot about it	0%	0%	25%	0%	0%	0%	0%	4%
Other	20%	33%	0%	25%	0%	50%	0%	20%

Multiple responses accepted

In summary, respondents mostly frequently implement behavioral measures and these rates decrease markedly for recommendations to purchase new equipment (at least in the short run). However, across all measures implemented as a result of the HEES, the majority of respondents are very satisfied with their results and those who were dissatisfied cited insufficient energy savings. The most common reasons respondents disregarded recommendations were that the measures did not apply to them or were too expensive.

APPENDIX B: PARTICIPANT TELEPHONE SURVEY INSTRUMENT

PG&E HOME ENERGY EFFICIENCY SURVEY PROGRAM

Hello, my name is _____ and I'm calling from Freeman & Sullivan, an independent research firm. We are conducting research on behalf of Pacific Gas and Electric to improve the energy efficiency programs they offer to help customers save energy, money, and the environment.

IN <u>MONTH</u> of <u>YEAR</u> you used the Pacific Gas and Electric's Energy Analyzer Survey that asked you questions about your household appliances and energy use. Based on your responses, you received a personalized report showing what you can do to save energy in your home.

I would like to go through a brief survey to learn about your experience and it should only take about 15 minutes to complete.

[MODE] Create variable in sample data that shows HEES mode

1. SURVEY PROCESS

According to our records, you used the Energy Analyzer through [a paper Survey that you mailed in/an on-line Survey on the PG&E website]?

Is that correct?

Yes

No – Thank and term

Q1. How did you FIRST learn about the Smart Energy Analyzer Survey? [Do not read] *(Mark one)*

1. California Solar Initiative rebate program
2. Retail Store
3. E-mail
4. Bill insert
5. Flyer or brochure
6. Contractor
7. Community event
8. Workshop/conference
9. PG&E website
10. Utility representative
11. Newspaper ad
12. Letter from PG&E
13. Friend/family
14. Other (Q1oth:specify:_____)
88. Refused

99. Don't know

If MODE = Mail-in, say "on paper and mailed it in"

If MODE = On-line, say "on-line through the PG&E website"

Q2. You took the survey [MODE], did you know that you could also do the survey other ways, such as [Show if Mode = On-line:] through a paper survey that you mail in, [Show if Mode = Mail-in:] on-line through PG&E's website, or over the phone? *(Mark one)*

1. Yes **[Ask Q3]**
2. No **[Skip to Q4]**
88. Refused **[Skip to Q4]**

99. Don't know **[Skip to Q4]**

If MODE = Mail-in, say "on paper"

If MODE = On-line, say "on-line through the PG&E website"

Q3. Why did you decide to take the Smart Energy Analyzer Survey [MODE]? [Do not read]

1. Was the most convenient/easiest/fastest
2. Would provide the most helpful/accurate information
3. Needed survey in my language
4. Not comfortable with computers/internet
5. Did not have internet access
6. Was the only mode that was offered to me
7. Other (Q3oth: _____)
88. Refused

99. Don't know

Q4. Did you take the Smart Energy Analyzer Survey as part of the application process for a solar energy equipment incentive through the California Solar Initiative? *(Mark one)*

1. Yes
2. No **[Skip to Q6]**
88. Refused **[Skip to Q6]**

99. Don't know **[Skip to Q6]**

Q5. Have you applied for the solar financial incentive? *(Mark one)*

1. Yes
2. No
88. Refused

99. Don't know

Q6. Prior to taking the Smart Energy Analyzer Survey, how knowledgeable did you feel about OPPORTUNITIES FOR IMPROVING the energy efficiency of your home? *(Mark one)*

1. Very knowledgeable
2. Somewhat knowledgeable
3. Not very knowledgeable
4. Not at all knowledgeable

88. Refused

99. Don't know

I'll read a list of factors. For each, please tell me if the factor was a very important, somewhat important, not very important, or not at all important to your decision to take the Smart Energy Analyzer Survey.

Q7. Wanted to reduce the cost of my energy bill: *(Mark one)*

1. Very important
2. Somewhat important
3. Not very important
4. Not at all important
88. Refused

99. Don't know

Q8. Concern about the environment: *(Mark one)*

1. Very important
2. Somewhat important
3. Not very important
4. Not at all important
88. Refused

99. Don't know

Q9. Was looking for information on energy efficiency programs I could participate in: *(Mark one)*

1. Very important
2. Somewhat important
3. Not very important
4. Not at all important
88. Refused

99. Don't know

Q10. How long did it take you to complete the Smart Energy Analyzer Survey? *(Mark one)*

1. Less than 5 minutes
2. 5 to 10 minutes
3. 10 to 15 minutes
4. More than 15 minutes
88. Refused

99. Don't know

[Ask if Mode = Online, else skip to R1]

Q11. At the time that you took the Smart Energy Analyzer Survey, had you signed-up for the On-line PG&E "My Account" service? [If need further prompting, say: This is where you have a username and password on-line to pay your bills and access your billing history]

1. Yes **[Ask Q12]**
2. No **[Ask Q13]**

88. Refused **[Ask Q13]**

99. Don't know **[Ask Q13]**

Q12. Did you take the Smart Energy Analyzer Survey after logging-in to "My Account" so your bill history was automatically integrated into the Survey results?

1. Yes **[Skip to R1]**

2. No **[Ask Q13]**

88. Refused **[Ask Q13]**

99. Don't know **[Ask Q13]**

Q13. Did you manually enter your PG&E gas and electric use history when the Smart Energy Analyzer Survey asked for it?

1. Yes
2. No
3. Don't recall being asked/seeing that screen **[Do not read]**
88. Refused

99. Don't know

2. SURVEY RECOMMENDATIONS

Now, I will ask you about the energy efficiency measures that Smart Energy Analyzer Survey Report recommended for your home. We would like to know if you have implemented any of the recommendations. We are going to quickly go through no more than 3 of the recommendations that were given to you in the Survey Results.

[RANDOMLY SELECT 3 TIPS THAT CUSTOMER RECEIVED]

R1. Your Smart Energy Analyzer Survey Report recommended [Tip #1]. Are you doing/Have you done this?
(Mark one)

1. Yes **[SKIP TO R3]**
2. No **[ASK R2]**
3. Do not recall receiving recommendation **[SKIP TO NEXT TIP]**
88. Refused **[DO NOT READ] [SKIP TO NEXT TIP]**

99. Don't Know **[DO NOT READ] [SKIP TO NEXT TIP]**

R2. What stopped you? [DO NOT READ]

(Multiple responses accepted)

1. Does not apply to me
2. Read recommendation, but forgot to actually do it
3. Too expensive
4. Would not provide enough savings

5. Required too much effort/Hassle/Too difficult
6. Did not understand how to do it
7. Did not have the time
8. Did not match my lifestyle
9. Needed permission form my landlord
10. Am planning to do it in the future
11. Other (R2oth) _____
88. Refused
99. Don't Know

[If Answered R2, go to next tip]

R3. Were you already doing this before you used the Smart Energy Analyzer or are you doing it as a result of the Survey? *(Mark one)*

1. Already doing it **[SKIP TO NEXT TIP]**
2. Did as result of survey **[ASK R4]**
3. Did it as a result of the Survey, but was already thinking about doing it before I took the Survey **[DO NOT READ] [Ask R4]**
4. Was already doing it, but doing it more as a result of the survey **[DO NOT READ] [SKIP TO NEXT TIP]**
88. Refused **[SKIP TO NEXT TIP]**

99. Don't Know **[SKIP TO NEXT TIP]**

R4. How soon after the Smart Energy Analyzer did you do this? *(Mark one)*

1. Immediately
2. Within the first month
3. Within the first 3 months
4. Within the first 6 months
5. Within the first Year
6. More than a year after
88. Refused

99. Don't Know

R5. How satisfied are you with the results of the change you made due to the recommendation? *(Mark one)*

1. Very Satisfied
2. Moderately Satisfied
3. Slightly Satisfied
4. Neutral
5. Slightly Dissatisfied
6. Moderately Dissatisfied
7. Very Dissatisfied
88. Refused
99. Don't Know

[IF R5 IS NOT EQUAL TO "VERY SATISFIED" OR "MODERATELY SATISFIED," ASK:

R6. In what ways were you not completely satisfied? [DO NOT READ] *(Multiple responses accepted)*

1. Not getting ENOUGH energy savings
2. Not getting ANY energy savings
3. Is a hassle
4. Hard to remember to keep doing it
5. Equipment is ugly
6. Equipment is noisy
7. Equipment was not worth the money
8. Equipment already is broken
9. Other (R6oth please specify)_____
88. Refused
99. Don't know

3. FURTHER ACTION

Your Smart Energy Analyzer Survey report included a website link to PG&E energy efficiency and rebate programs and a phone number to call for more information about PG&E programs.

F1. AS A RESULT OF READING your Smart Energy Analyzer Survey Report, did you:

Visit the PG&E website to get additional information on rebates or other energy efficiency programs? *(Mark one)*

1. Yes
2. No
88. Refused

99. Don't know

F2. Call the utility to get additional info on rebates or other energy efficiency programs? *(Mark one)*

1. Yes
2. No
88. Refused

99. Don't know

F3. Call a contractor to find out more about installing energy efficiency equipment? *(Mark one)*

1. Yes
2. No
88. Refused

99. Don't know

F4. Participate in any PG&E rebate or other energy efficiency programs? Please do not include programs you joined before taking the Survey or that you joined primarily due to other influences. *(Mark one)*

1. Yes
2. No **[Skip to P1]**
88. Refused

99. Don't know

F5. What programs? *(Multiple responses accepted)*

1. PG&E Rebate program
2. PG&E Smart AC Program (air conditioning cycling)
3. PG&E Climate Smart Program (pay for your green house gas emissions)
4. Solar System Rebate Program (California Solar Initiative)
5. I don't remember the program name
6. Other (specify) F5oth _____
88. Refused

99. Don't know

F6. AS A RESULT OF READING your Smart Energy Analyzer Survey Report, did you purchase any energy efficient equipment? [IF F4=1, Say:] Please do include equipment you purchased through utility programs that you joined as a result of the Survey]

1. Yes
2. No
88. Refused

99. Don't know

F7. What equipment? *(Multiple responses accepted)*

1. Insulation
2. Duct sealing
3. Windows
4. Air conditioner (central)
5. Air conditioner (room)
6. Furnace
7. HVAC system
8. Whole house fan
9. Clothes washer
10. Refrigerator/freezer
11. Dishwasher
12. Water heater
13. Pool equipment
14. Lighting (has sticker with instant in-store rebate)
15. Solar system
16. Cool-roof
17. 80 plus energy efficient computer (has sticker with instant in-store rebate)
18. Other (specify: F7oth _____)
88. Refused

99. Don't know

F8. Did you receive a PG&E rebate to help offset the cost of your equipment purchase(s)?

(Note: Rebate may have been subtracted from your price at the time of purchase OR you may have received a rebate check in the mail.)

(Mark one)

1. Yes
2. No **[Skip to P1]**
88. Refused **[Skip to P1]**

99. Don't know **[Skip to P1]**

F9. Please tell me the equipment purchases where you received a rebate from PG&E. *(Multiple responses accepted)*

1. Insulation (attic or wall)
2. Duct sealing
3. Air conditioner (central)
4. Air conditioner (room)
5. Furnace (central natural gas)
6. HVAC system (variable speed motor air handler system)
7. Whole house fan
8. Clothes washer
9. Refrigerator/freezer
10. Dishwasher
11. Water heater
12. Pool multi-speed pump and motor
13. Lighting (has sticker with instant in-store rebate)
14. Solar system
15. Cool-roof
16. 80 plus energy efficient computer (has sticker with instant in-store rebate)
17. Other (specify: F9oth_____)
88. Refused

99. Don't know

4. ENERGY PROFILE

P1. The Smart Energy Analyzer Report provided a chart of the typical annual energy costs of appliances like yours in your area. How USEFUL was this information?

(Mark one)

1. Very useful
2. Somewhat useful
3. Not very useful
4. Not at all useful
88. Refused

99. Don't know

P2. The Smart Energy Analyzer Report also provided a chart that showed how energy costs vary on a monthly basis for homes similar to yours. How USEFUL was this information? *(Mark one)*

1. Very useful

2. Somewhat useful
3. Not very useful
4. Not at all useful
88. Refused

99. Don't know

5. SATISFACTION

This part of the survey asks about your satisfaction with the Smart Energy Analyzer.

S1. How easy was it to complete the Smart Energy Analyzer Survey? Was it:

(Mark one)

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
88. Refused

99. Don't know

[Ask if previous = not equal to 1 "very easy"]

S1A. What would you recommend for improvement?

1. Make it less technical
2. Make it shorter/more concise
3. Make it available in more languages (S1A_3: What language? _____)
4. Make the web portal move faster from page to page
5. Leave more room on the lines to write-in answers
6. Other (S1Aoth) _____
88. Refused

99. Don't know

S2. How satisfied were you with the AMOUNT OF TIME it took to complete the Survey?

(Mark one)

1. Very satisfied
2. Moderately satisfied
3. Slightly satisfied
4. Neutral
5. Slightly dissatisfied
6. Moderately dissatisfied
7. Very dissatisfied
88. Refused

99. Don't know

[Ask if previous = 5, 6, or 7]

S2A. In what ways were you not completely satisfied? [DO NOT READ]

    1. Took too long
    2. Was too short, not detailed enough
    3. Other (S4oth)_____
    88. Refused

    99. Don't know

S3. How satisfied were you with the CLARITY of the recommendations provided by the Survey Report?
(Mark one)

    1. Very satisfied
    2. Moderately satisfied
    3. Slightly satisfied
    4. Neutral
    5. Slightly dissatisfied
    6. Moderately dissatisfied
    7. Very dissatisfied
    88. Refused

    99. Don't know

[Ask if previous = 5, 6, or 7]

S3A. In what ways were you not satisfied? [DO NOT READ]

    1. Did not understand SOME of the recommendations
    2. Did not understand ANY of the recommendations
    3. Recommendations were too vague/Wanted more specific information
    4. Was not sure how to access rebates mentioned
    5. Could not find information about the rebates/programs on the websites listed
    6. Was not sure how to join energy efficiency programs mentioned
    7. Other (Please specify)
    88. Refused

    99. Don't know

S4. How satisfied were you with the USEFULNESS of the recommendations provided?

(Mark one)

    1. Very satisfied
    2. Moderately satisfied
    3. Slightly satisfied
    4. Neutral
    5. Slightly dissatisfied
    6. Moderately dissatisfied
    7. Very dissatisfied
    88. Refused

    99. Don't know

[Ask if previous = 5, 6, or 7]

S4A. In what ways were you not satisfied? [DO NOT READ]

1. Already did most of them
2. Too basic – already knew about these things
3. Did not seem customized for my household
4. They were too much of a hassle
5. Wanted information on solar energy
6. Other (Please specify)
88. Refused

99. Don't know

S5. How satisfied were you with the INFORMATION provided on other energy efficiency programs? *(Mark one)*

1. Very satisfied
2. Moderately satisfied
3. Slightly satisfied
4. Neutral
5. Slightly dissatisfied
6. Moderately dissatisfied
7. Very dissatisfied
88. Refused

99. Don't know

[Ask if previous = 5, 6, or 7]

S5A. In what ways were you not satisfied? [DO NOT READ]

1. Did not receive info about other energy efficiency programs
2. Information was not complete/specific enough
3. Already have done all these programs
4. Already knew about all these programs
5. Wanted info on renewable energies programs (sun, wind, etc)
6. Wanted info on solar energy equipment for my home
7. Wanted info on demand response programs for my home
8. Wanted info on other programs (Please specify)
9. Other (Please specify)
88. Refused

99. Don't know

S6. OVERALL, how satisfied were you with the Smart Energy Analyzer Survey? *(Mark one)*

1. Very satisfied
2. Moderately satisfied
3. Slightly satisfied
4. Neutral
5. Slightly dissatisfied
6. Moderately dissatisfied
7. Very dissatisfied
88. Refused

99. Don't know

[Ask if previous = 5, 6, or 7]

S6A. In what ways were you not satisfied? [DO NOT READ]

1. Survey took too long
2. Survey instrument was not in-depth enough/too short/not detailed enough
3. Did not know how to answer some of the survey questions/too technical
4. Survey was not appropriate for people who live in apartments/multifamily complexes (Follow-up: S6A_4: How so?)
5. Charts were not helpful
6. Recommendations were too basic/Just seemed like common sense
7. Already did most/all of the recommendations
8. Recommendations were too vague
9. Did not understand how to implement the recommendation(s)
10. Recommendations were not customized to my household/Felt like everyone got the same thing
11. The recommendations did not apply to my household
12. The recommendations were too much of a hassle to implement
13. The recommendations were too expensive to implement
14. Did the recommendations but not seeing desired energy savings
15. Wanted more detailed information on rebates (S6A_15 Follow-up: For what equipment?)
16. Wanted a more direct link to energy efficiency and other rebate programs from the Survey Report
17. Wanted more information about demand response programs
18. Wanted information on solar equipment/financial incentives for solar equipment
19. Wanted information on renewable power options (S6A_19 Follow-up: What type of renewable energy (wind, solar, wave, hydro, etc))
20. Did not like having to enter in my account numbers
21. Was not in my primary language (S6A_21 Follow-up: What is your primary language?)
22. The internet site was slow/had delays
23. Other (S6A_23Please specify) _____
88. Refused

99. Don't know

S7. If you could change one thing about the Smart Energy Analyzer, what would that be? [DO NOT READ]
(mark one)

1. Make the survey shorter
2. Make the survey more in-depth /longer/ask about more details
3. Make the survey questions less technical
4. Make survey more applicable for people who live in multifamily complexes (S7_4 Follow-up: How so?)
5. Make the appliance charts (of homes similar to mine) more accurate
6. Make the monthly energy use charts (of homes similar to mine) more accurate
7. Integrate my water usage
8. Have more advanced energy efficiency recommendations for well-informed customers
9. Make the recommendations more specific/Give more specific instructions on how to do them
10. Customize the recommendations to my household
11. Include recommendations that are easy/not a hassle to implement
12. Include recommendations that are free to implement
13. Include recommendations that are cheap to implement
14. Recommend measures that produce noticeable energy savings on my bill
15. Provide more information on available rebates (S7_15 Follow-up: For what equipment?)
16. Have a more direct weblink to energy efficiency and other rebate programs from the Survey Report
17. Have information about demand response programs
18. Have information on solar equipment/financial incentives for solar equipment
19. Have information on renewable power options (S7_19 Follow-up: What type of renewable energy (wind, solar, ocean wave, hydro, etc))

20. Provide clearer instructions for California Solar Initiative Customers on how to get their solar incentives after taking the survey
21. Auto-fill my electric and gas bill history
22. Offer it in more languages (S7_22 Follow-up: What language?)
23. Fix technical problems with the internet site/Make internet site faster
24. Make the on-line survey less disjointed/ Have the on-line survey flow more smoothly
25. Not to have to click through so many pages to complete the on-line survey
26. Other (S7_26 Please specify) _____
88. Refused

99. Don't know

S8. What was the most difficult thing about completing the Smart Energy Analyzer Survey? [DO NOT READ] *(mark one)*

1. Finishing the whole thing/the length
2. Filling in my gas and electric bill histories
3. Knowing the technical names for my household equipment
4. Knowing how to answer the questions as a renter
5. Finding the Survey Report On-line after I start answer answering the questions
6. Clicking through all the different pages of questions in order to get to the Survey Report
7. Other (S8oth please specify) _____
88. Refused

99. Don't know

6. APPLICANCE CHANGES

The next series of questions are designed to find out if there are changes to your household that may have affected energy use in the last couple years.

C1. Do you have an Air Conditioning system? *(mark one)*

1. Yes
2. No **[Skip to C7]**
88. Refused **[Skip to C7]**

99. Don't know **[Skip to C7]**

C2. Was it installed after Jan 2006? *(mark one)*

1. Yes
2. No **[Skip to C7]**
88. Refused **[Skip to C7]**

99. Don't know **[Skip to C7]**

C3. Approximately what month and year did you install the new AC system?

C3A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

C3B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

C4. What type? *(mark one)*

1. Central Air Conditioner
2. Room Air Conditioner
3. Heat Pump
4. Other (C4 oth please specify) _____
88. Refused

99. Don't know

C5. Was this new Air Conditioning system an addition or a replacement? *(mark one)*

1. Addition **[Skip to C7]**
2. Replacement **[Ask C6]**
88. Refused **[Skip to C7]**

99. Don't know **[Skip to C7]**

C6. What type of Air Conditioning system were you replacing? *(mark one)*

1. Central Air Conditioner
2. Room Air Conditioner
3. Heat Pump
4. Other (C6oth please specify) _____
88. Refused

99. Don't know

C7. What type of heating system do you have? *(mark one)*

1. Gas Furnace
2. Heat Pump
3. Electric Space Heat
4. Other (C7oth please specify) _____
88. Refused

99. Don't know

C8. Since Jan 2006, have you installed a new heating system? *(mark one)*

1. Yes
2. No **[Skip to C11]**
88. Refused **[Skip to C11]**

99. Don't know **[Skip to C11]**

C9. Approximately what month and year did you install the new heating system?

C9A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

C9B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

C10. What type of heating system were you replacing? *(mark one)*

1. Gas Furnace
2. Heat Pump
3. Electric Space Heat
4. Other (please specify)
88. Refused

99. Don't know

C11. What type of water heater do you have?

1. Gas
2. Electric
3. Other
88. Refused

99. Don't know

C12. Since Jan 2006, have you purchased a new water heater? *(mark one)*

1. Yes
2. No **[Skip to C14]**
88. Refused **[Skip to C14]**

99. Don't know **[Skip to C14]**

C13. Approximately what month and year did you install the new water heater? *(mark one)*

C13A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

C13B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

C14. Since Jan 2006, have you purchased a new clothes washer?

1. Yes
2. No **[Skip to C16]**
88. Refused **[Skip to C16]**

99. Don't know **[Skip to C16]**

C15. Approximately what month and year did you install the new clothes washer?

C15A. What month? *(mark one)*

    1.   January
    2.   February
    3.   March
    4.   April
    5.   May
    6.   June
    7.   July
    8.   August
    9.   September
    10. October
    11. November
    12. December
    88. Refused

    99. Don't know

C15B. What year? *(mark one)*

    1.   2006
    2.   2007
    3.   2008
    88. Refused

    99. Don't know

C16. Since Jan 2006, have you purchased a new clothes dryer? *(mark one)*

    1.   Yes
    2.   No **[Skip to C18]**
    88. Refused **[Skip to C18]**

    99. Don't know **[Skip to C18]**

C17. Approximately what month and year did you install the new clothes dryer?

C17A. What month? *(mark one)*

    1.   January
    2.   February
    3.   March
    4.   April
    5.   May
    6.   June
    7.   July
    8.   August
    9.   September
    10. October
    11. November
    12. December
    88. Refused

99. Don't know

C17B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

C18. Since Jan 2006, have you purchased new windows? *(mark one)*

1. Yes
2. No **[Skip to C20]**
88. Refused **[Skip to C20]**

99. Don't know **[Skip to C20]**

C19. Approximately what month and year did you install the new windows?

C19A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

C19B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

C20. Since Jan 2006, have you purchased new insulation? *(mark one)*

1. Yes
2. No **[Skip to C22]**
88. Refused **[Skip to C22]**

99. Don't know **[Skip to C22]**

C21. Approximately what month and year did you install the new insulation? *(mark one)*

C21A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

C21B. What year? *(mark one)*

4. 2006
5. 2007
6. 2008
88. Refused

99. Don't know

C22. Since Jan 2006, have you installed any CFLs? *(mark one)*

1. Yes
2. No **[Skip to H1]**
88. Refused **[Skip to H1]**

99. Don't know **[Skip to H1]**

C22. How many CFLs?

1. Record Response
88. Refused

99. Don't know

7. HOUSEHOLD CHANGES

H1. Since Jan 2006, have you done any remodeling or renovations? *(mark one)*

1. Yes

---

2. No **[Skip to H6]**
88. Refused **[Skip to H6]**

99. Don't know **[Skip to H6]**

H2. Approximately what month and year did you renovate your home? *(mark one)*

H2A. What month? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

H2B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

H3. Has the square footage of your house changed due to the renovation or remodel? *(mark one)*

1. Yes-it increased **[Ask H4]**
2. Yes-it decreased **[Ask H5]**
3. No **[Skip to H6]**
88. Refused **[Skip to H6]**

99. Don't know **[Skip to H6]**

H4. By how much did the square footage of your house increase as a result of the renovation? *(mark one)*

1. Enter Number
88. Refused

99. Don't know

H5. By how much did the square footage of your house decrease as a result of the renovation? *(mark one)*

    1. Enter Number
    88. Refused

    99. Don't know

H6. Including all adults AND children, how many people are in your household that live in your home year-round? *(mark one)*

    1. Enter Number
    88. Refused

    99. Don't know

H7. Since Jan 2006, did the number of people living in your home year-round change? *(mark one)*

    1. Yes, it increased **[Ask H7A]**
    2. Yes, it decreased **[Ask H7B]**
    3. No **[Skip to H9]**
    88. Refused **[Skip to H9]**

    99. Don't know **[Skip to H9]**

H8. How many did it increase by? *(mark one)*

    1. Enter Number
    88. Refused

    99. Don't know

H9. How many did it decrease by? *(mark one)*

    1. Enter Number
    88. Refused

    99. Don't know

H10. Approximately what month and year did the number of people in your house change?

H10A. What month? *(mark one)*

    1. January
    2. February
    3. March
    4. April
    5. May
    6. June
    7. July

8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

H10B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

H11. Have you had anything else done since Jan 2006 that might have affected energy use in your home? *(mark one)*

1. Yes
2. No **[Skip to G1]**
88. Refused **[Skip to G1]**

99. Don't know **[Skip to G1]**

H12. What? *(mark one)*

1. [OPEN-END]
88. Refused

99. Don't know

H12A. What month did that take place? *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

H12B. What year? *(mark one)*

1. 2006
2. 2007
3. 2008
88. Refused

99. Don't know

8. ENERGY USE FLUCTUATIONS

G1. To better understand customer energy usage, we are interested in determining the factors that lead to fluctuations in energy use. We have your monthly energy use data here from the last two years and would like to ask you a few questions for those months were there is a large change in consumption from the prior year.

[Have table that calculates change in each month. Ask about changes that are more than 10% for any month (up to 12 months).]

In [MONTH] of [2008/2007], your energy use was [X PERCENT] higher/lower than in [MONTH] of [2007/2006]. Other than the things we have already discussed, do you have any other information on why your energy use fluctuated so much in that particular month? **[probe for possible changes such as having more people in the house, remodels, kids home from school, etc.]**

Record for each month (repeat as needed).

G2. Interviewer note which month *(mark one)*

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
88. Refused

99. Don't know

G3. Interviewer note which year *(mark one)*

1. 2007
2. 2008
88. Refused

99. Don't know

G4. Interviewer select/add possible reasons.

1. College kids home from school
2. Extended visit of friend or extended family member (Specify how many)

3. House remodel
4. Prolonged illness in household
5. Working at home
6. Other (Please Specify)
88. Refused

99. Don't know

9. DEMOGRAPHIC QUESTIONS

This final part of the survey asks about general demographic information.

D1. Do you currently own or rent your home?

(Mark one)

1. Own
2. Rent
88. Refused

99. Don't know

D2. When was your home built? *(Mark one)*

1. 2000 or sooner
2. In the 1990's
3. In the 1980's
4. In the 1970's
5. In the 1960's
6. In the 1950's
7. In the 1940's
8. Before 1940
88. Refused

99. Don't know

D3. What type of home do you currently live in? *(Mark one)*

1. Single-family detached home
2. Condo
3. Townhouse
4. Mobile home / manufactured home
5. Duplex
6. Apartment
7. Other (specify)
88. Refused

99. Don't know

D4. How large is your home in square feet? *(Mark one)*

1. Less than 500 square feet
2. Between 500 and 1000 square feet
3. Between 1000 and 1500 square feet
4. Between 1500 and 2000 square feet
5. Between 2000 and 2500 square feet
6. Between 2500 and 3000 square feet
7. More than 3,000 square feet
88. Refused

99. Don't know

D5. Please indicate your age category: (*Mark one)*

1. Under 25 years
2. 25 to 34 years
3. 35 to 44 years
4. 45 to 54 years
5. 55 to 59 years
6. 60 to 64 years
7. 65 years or older
88. Refused

99. Don't know

D6. Please indicate the category that best describes your total annual household income: *(Mark one)*

1. Less than $20,000
2. $20,000 to $40,000
3. $40,001 to $60,000
4. $60,001 to $80,000
5. $80,001 to $100,000
6. $100,001 to $150,000
7. More than $150,000
88. Refused

99. Don't know

D7. What is the highest level of education you have completed? *(Mark one)*

27. High school diploma or less
28. Some college
29. Associates degree
30. Bachelors degree
31. Graduate or professional degree
88. Refused

99. Don't know

THAT'S IT – THANK YOU VERY MUCH FOR COMPLETING OUR SURVEY!