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Final Report

2011-2012 General Households Population Study in California

Study # SCE0321

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We would like to thank Pacific Gas & Electric and Southern California Edison staff for giving us the support needed to conduct this project. We also wish to acknowledge the many residents of California who agreed to participate in the survey and provided their responses to our questions; we appreciate their willingness to participate.

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EXECUTIVE SUMMARY

This document presents the results of the General Household Population Study (GPS) conducted in 2011-2012 for Pacific Gas & Electric (PG&E) and Southern California Edison (SCE). The GPS was designed to address four research goals in the residential sector:

- Validate the *awareness-knowledge-Attitudes-Behavior* (akAB) model of behavior change and use this model to measure *awareness/knowledge* of energy efficiency (**ak**), *concern* and *personal responsibility* attitudes (**A)** toward energy efficiency and energy use, and *intention* to adopt and *adoption* of an energy-efficient behavior (**B**);
- Segment residential customers and identify marketing and outreach opportunities for current and future PG&E and SCE energy efficiency programs and campaigns;
- Examine recent appliance and electronic product purchasing behavior to support Home Energy Efficiency Rebate (HEER) and Business and Consumer Electronics (BCE) program evaluations; and
- Assess appliance recycling and comprehensive house retrofit behaviors in the general California residential market.

The akAB model of behavior change describes stages that individuals or households go through before lasting behavioral change can occur (Randazzo & Peters, 2011).[1] This model holds that customers who are *aware* and *knowledgeable* (**ak**) about energy efficiency and energy consumption issues are more likely to develop *concerns* about or *personal responsibility attitudes* (**A**) toward reducing energy use. These **akA** perceptions and attitudes, if present, set the stage for *behavior intention* and *behavior change* to occur (**B**). The GPS is the first study empirically testing the validity of this model and measuring customers' actions relative to the akAB stages.

The GPS also is a market characterization study designed to identify marketing and outreach opportunities for various utility energy efficiency programs, including HEER and BCE. HEER is a statewide residential program that offers rebates to residents who purchase efficient home appliances. The BCE program seeks to increase the availability of energy-efficient TVs, desktop computers, and monitors by providing per-unit incentives to midstream actors (retailers and distributors).

[1] Randazzo, K.V. and J.S. Peters. 2011. *Reconsidering What We Measure: A White Paper.* Residential Decision-Making and Proposed Standard Questionnaire Items. Portland, Ore.: Research Into Action.

FINDINGS

akAB Results- Validation, Group Differences, and Program Performance Metrics

The GPS addressed three main research topics with respect to the akAB model: (1) whether the akAB model is valid; (2) whether akAB responses differ between relevant behavior-based groups; and (3) whether the akAB results could be used as residential program performance metrics (PPMs). The akAB analysis revealed the following:

- **The akAB model behaves as expected**. The results of the validity tests support the main points of the akAB model.
- **The HEER program is reaching customers who are similar to those customers who did NOT seek to buy an energy-efficient appliance.** Appliance purchasers who did not receive a utility rebate and said they were NOT planning to buy an ENERGY STAR® appliance had similar levels of *awareness/knowledge*, *concern*, and *responsibility* about the effects of their personal energy use on the environment as did HEER participants, but lower *intention* to act on the behavior than did the HEER participants. These results suggest that the HEER program reached customers who intended to buy an appliance, and likely would not have bought an energy-efficient appliance on their own.
- **Those who reported completing a comprehensive home energy upgrade and nonparticipants who sought ENERGY STAR products cared the most about the effects of their energy use on the environment.** The environmental akAB scores for those who had done a comprehensive home energy upgrade and those seeking ENERGY STAR products without a utility rebate were the highest across all GPS behavior-based groups.
- **Those who recently recycled a refrigerator or freezer and received a utility rebate for it (Appliance Recyclers) had greater concerns about the impacts of their personal energy use on their finances.** Appliance recyclers had lower incomes and they exhibited high *concern* about energy-use impacts on finances.

Residential Market Characterization -- Five Unique Market Segments

Segmentation analysis was the second research activity of the GPS. This analysis revealed five unique segments in the residential sector:

- ***Leading Achievers*** (27%) were highly educated and older homeowners with the highest incomes. They were more likely to install various low- to medium-cost energy efficiency measures or conduct a comprehensive home energy upgrade. They had high *awareness/ knowledge* of, *concern* about, and *responsibility* toward the effects of their energy use on the environment. However, only half of them were aware of HEER rebates and hardly any of them were aware of Energy Upgrade California and ENERGY STAR Most Efficient.

- ***Practical Spenders*** (22%) were similar to *Leading Achievers* in that they were older homeowners with high incomes who were more likely to install various low- to medium-cost energy efficiency measures or conduct a comprehensive home energy upgrade. They were distinguished from *Leading Achievers* by their moderate levels of education and relatively low levels of *awareness/knowledge* of and *concern* about the effects of their energy use on the environment. One-third of them were aware of HEER rebates, and hardly any of them were aware of Energy Upgrade California and ENERGY STAR Most Efficient.

- ***Striving Believers*** (22%) were relatively younger residents with moderate incomes and high education. Although they had high *awareness/knowledge* of, *concern* about, and *responsibility* toward the effects of their energy use on the environment, they were less likely to install low- to medium-cost energy efficiency measures in their homes, since slightly more than half of them were renters. They had low *awareness* of ENERGY STAR Most Efficient, HEER rebates, and Energy Upgrade California.

- ***Thrifty Conservers*** (11%) were less likely to install low- to medium-cost efficiency measures in their homes, since half of them were renters. These residents were older and their incomes were lower. They had low *awareness* of ENERGY STAR Most Efficient, HEER rebates, and Energy Upgrade California. Their *awareness/knowledge* of, *concern* about, and *responsibility* toward effects of their energy use on the environment were relatively low.

- ***Disconnected*** (19%) were relatively younger residents with the lowest incomes who were more likely to be renters and Hispanic. They had the lowest *awareness* of the ENERGY STAR logo, and they had never heard of the term "carbon footprint." However, they had high *awareness/knowledge* of, *concern* about, and *responsibility* toward the effects of their energy use on the environment. They also were highly *concerned* about and felt *responsible* for energy-use impacts on their finances. They were less likely to install low- to medium-cost energy efficiency measures in their homes, but one-third of them recently recycled an old refrigerator or a freezer and received a utility rebate for this action.

Appliance and Electronic Product Purchasing Behavior

Our study of the appliance and electronic products afforded us an opportunity to explore purchasing behavior relevant to the HEER and BCE programs. The following notable findings emerged:

- **California residents were buying many more electronic products than appliances.** Among the electronic products we inquired about in the GPS, TVs were bought the most frequently [mentioned by slightly more than one-third (39%) of respondents]. Among the

appliance products we inquired about, refrigerators were bought the most frequently [mentioned by one-fifth (21%) of respondents in SCE territory[2]].

➡ **Customers who bought a TV or desktop computer were less likely than those who bought an appliance to report intending to buy an energy-efficient version of these products.** At least two-thirds of those who bought a refrigerator, clothes washer, water heater, or room air-conditioner said they planned to buy an ENERGY STAR appliance. Half of those (50%) who bought a TV and less than one-third (29%) of those who bought a desktop computer intended to buy an ENERGY STAR model at the time they bought these electronic goods.

➡ **Knowledge of HEER rebates did not vary across nonparticipant groups.** Half of the nonparticipants who intended to buy an ENERGY STAR appliance knew about HEER rebates. Similarly, half of the nonparticipants who had not intended to buy an ENERGY STAR appliance knew about HEER rebates.

RECOMMENDATIONS

The GPS study resulted in six high-level recommendations based on all the research activities in this study. The high-level recommendations are to:

1. **Tailor financial and environmental messages to affect specific behaviors.** The akAB research shows that *awareness/knowledge* of energy efficiency, *concerns* about energy use, *personal responsibility attitudes* toward energy efficiency, and *intentions* to conserve energy at home vary across behavior-based market groups (i.e., appliance purchasers, appliance recyclers, and those who reported doing a comprehensive home upgrade). The research suggests the following messaging strategies:

   - Financially focused messages will resonate well with those who recycle old appliances, since they worry about the impacts of energy use on their finances.
   - HEER participants (appliance purchasers who received a utility rebate) have lower *concern* for the impacts of energy use on their finances and have relatively high incomes. Consequently, they may not respond well to financially focused messages.
   - Programs should continue to use environmental messaging since higher *awareness/knowledge* of, *concern* about, and *personal responsibility attitudes* toward the effects of energy use on the environment are key traits of those who have done comprehensive home upgrades and those who have bought ENERGY STAR appliances without a utility rebate. Pro-environmental messaging is likely important in influencing the attitudes of those who are less *aware* of, less *concerned* about, or feel less *responsible* for energy effects on the environment.

[2] Only SCE customers were asked about refrigerators.

2. **Target *Practical Spenders* with financially focused messages and target *Leading Achievers* with environmentally focused messages about energy efficiency. *Leading Achievers*** and ***Practical Spenders*** have the financial means to invest in more expensive energy efficiency upgrades; yet, ***Practical Spenders***, unlike ***Leading Achievers***, are less *aware* of and less *concerned* about energy-related effects on the environment. Consequently, ***Practical Spenders*** may not respond well to environmental messaging.

3. **Target middle-income households with lower-price-point appliances or products.** ***Striving Believers*** are middle-income customers who are responsive to environmentally focused messages because they are aware of, concerned about, and feel responsible for energy-related effects on the environment, yet they prefer the lower-price-point products.

4. **Messages should emphasize that there are energy-efficient options for electronic goods such as ENERGY STAR TVs or ENERGY STAR settings for computers.** While the majority of appliance purchasers said they intended to buy an ENERGY STAR appliance, only half of those who bought an ENERGY STAR TV and a minority of those who bought a desktop computer searched for an energy-efficient version of these products. This suggests that some customers may not be aware of energy efficiency options for electronic goods.

5. **Track participant and nonparticipant akA scores over time to develop program performance metrics (PPM).** The most useful approach for creating a residential PPM is to track akA among participants and nonparticipants across time, and to strive to connect any akA participant-related changes to other self-reported behaviors. For instance, indications of simultaneous increases in akA and possible spillover behavior might be identified.

6. **Conduct further research to determine whether the akAB model is effective with integrated Demand Side Management (DSM) programs (energy efficiency, smart connect, and demand response), including development of the program-specific akAB items for various plug-load-related programs to test the applicability of the akAB model for integrated DSM programs.**

1 INTRODUCTION

This report documents findings of the General Household Population Study conducted in 2011-2012 for Pacific Gas & Electric (PG&E) and Southern California Edison (SCE).

GENERAL HOUSEHOLD POPULATION STUDY

The General Household Population Study (GPS) sought to collect information on general awareness and knowledge of energy efficiency, general attitudes toward energy use, and the level of intention to and adoption of energy efficiency behaviors by homeowners and renters who reside in the PG&E and SCE service territories. Research Into Action, Inc., with the assistance of Opinion Dynamics Corporation (ODC), conducted this study to first assess customers' energy efficiency choices based on the *awareness-knowledge-Attitudes-Behavior* (akAB)[3] model of behavior change, and then, to identify marketing and outreach opportunities for current and future PG&E and SCE energy efficiency programs and campaigns.

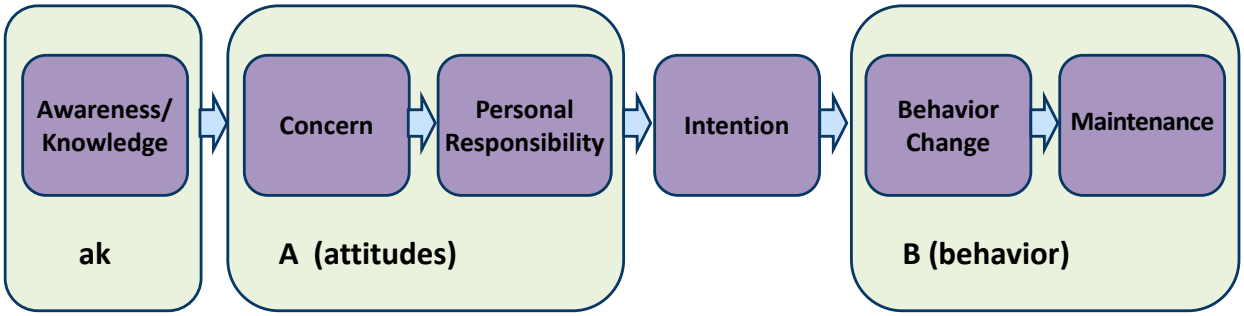
The akAB model of behavior change describes the stages individuals or households go through as they adopt an energy-efficient behavior that is intentional and durable (Figure 1). Specifically, this model includes five stages for energy-efficient behavior change:

- **Awareness/Knowledge:** People must be aware or know of the possibility of change and the benefits of change before they can deliberately change their behavior based on that knowledge. For example, for people to invest in a new efficient technology to help the environment or their own finances, they need to be aware of this technology and the environmental, financial, or other benefits associated with it.
- **Concern:** To change behavior deliberately, a person must exhibit a concern about a perceived problem that the behavior change would address. For example, concerns associated with energy use can be altruistic or environmental (such as being concerned about the impact of energy use on the environment), or financial (such as worrying about paying electricity bills).
- **Ascription of Responsibility to Self (Personal Responsibility):** A person also needs to recognize that they can make a change and realize that they are responsible to do so. They can feel personally responsible to change due to environmental or financial concerns.

[3] The akAB notation uses non-capitalized "ak" letters for "awareness" and "knowledge." This is intentional, since awareness and knowledge of energy efficiency already are well-established in the marketplace and the concepts are difficult to distinguish. Therefore, they are combined into one "ak" concept. Thus, the attitudinal ("A") and behavioral ("B") components of the akAB model now are the primary focus of efforts to understand energy-efficient behavior change.

- **Intention to Conserve:** Intention to change a behavior is the final step before a durable behavioral change is likely to occur.
- **Maintenance:** Maintenance occurs after an individual or household adopts a behavior. It is necessary to maintain an energy efficiency behavior if long-lasting energy efficiency behaviors are desired.

Figure 1: akAB Stage Model of Behavior Change (Randazzo & Peters 2011)



Work on this model began in 2008 with a review of relevant literature on how awareness of and attitudes toward energy efficiency relate to adoption of energy-efficient behaviors (Randazzo 2008).[4] Randazzo and Peters continued this effort, which resulted in the development of the akAB model in 2011.[5] The akAB model is grounded in decades of social science research about decision-making, and integrates prior empirical and theoretical research on how individuals make energy conservation and efficiency choices, as well as "green" choices more generally. Research Into Action and its subcontractors designed the GPS to validate the akAB model and to examine where California customers' are relative to the akAB stages.

The GPS also is designed to support the Home Energy Efficiency Rebate (HEER) and Business and Consumer Electronics (BCE) program evaluations. The HEER is a statewide residential program that offers rebates to residents who purchase efficient home appliances. The BCE program targets TVs, desktop computers, and monitors by providing per-unit incentives to midstream actors (retailers and distributors). Both PG&E and SCE implement these programs in their respective service territories.

The GPS survey included residents who recently bought an appliance or an electronic product; it was conducted in coordination with the 2011-2012 HEER process evaluation survey of 500 participants in PG&E and SCE service territories. This report includes selected results from the

[4] Randazzo, K.V. 2008. "A short, focused review of the literature on attitudes and behavior in efforts to promote energy-efficient behavior." In C.C. Chen, D. Laurel, J. Davenport, L. McLain and K.V. Randazzo, *2006-2008 Energy Centers (AgTAC, CTAC) Process Evaluation*. Rosemead, Calif.: Southern California Edison.

[5] Randazzo, K.V. and J.S. Peters. 2011. *Ibid.*

HEER and BCE study. The complete HEER findings are published as a separate report volume, HEER/BCE Study #SCE0306 (Peters, J.S. et all. 2012)[6].

ORGANIZATION OF THIS REPORT

This report has seven chapters. Chapter 1 introduces the GPS study and our report. Chapter 2 provides an overview of research objectives and methodology. In Chapters 3 through 5, we present akAB-, segmentation-, and product-specific findings. In Chapter 6, we discuss options for program performance metrics. We conclude with our recommendations for future akAB research in Chapter 7.

The appendices include a detailed sampling design, survey development and implementation method, post-stratification weighting procedure, and the final GPS survey questionnaire.

[6] Peters, J.S., M. Frank, A. Armstrong, R. Bordner, A.J. Howard, Z. Baron, and S. Parry. 2012. *Program & Technology Review of Two Residential Product Programs: Home Energy Efficiency Rebate (HEER)/Business & Consumer Electronics (BCE) Study #SCE0306 (Draft Final)*. Portland, Ore.: Research Into Action.

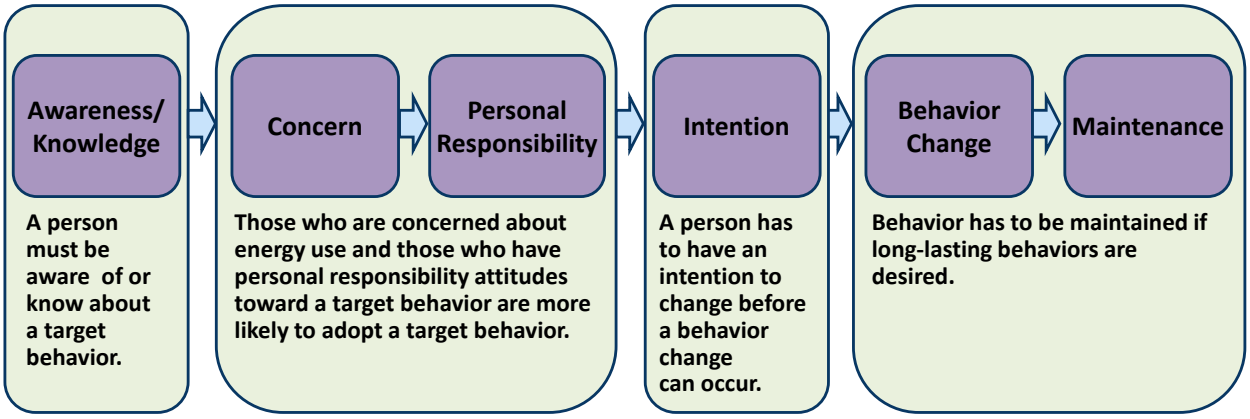
2 GPS OBJECTIVES & METHODS

OVERVIEW OF RESEARCH OBJECTIVES FOR GPS

akAB Background and The Problem

For many years, utilities had the notion that if energy efficiency programs can increase awareness (a) and knowledge (k) about energy efficiency, then they will change many attitudes (A) toward energy efficiency, and energy-efficient behaviors (B) will follow. This akAB framework often was included in program logic models and program theory diagrams. Given the importance of this framework, Randazzo and Peters (2011)[7] reviewed relevant decision-making literature in social psychology and related fields and numerous papers from the energy efficiency industry to determine whether this akAB framework of behavior change was appropriate. This work resulted in a development of the akAB model shown in Figure 2.

Figure 2: akAB Stage Model of Behavior Change



There is a lack of empirical evidence in support of the akAB model; thus, our understanding of whether this model is useful to utility program planners is incomplete. The GPS is the first study attempting to determine where customers are relative to the akAB stages. This study is intended to evaluate customers' akAB responses and to permit comparisons of such results across time and programs. These comparisons will allow us to track any akAB response differences between program participants, nonparticipants, or any other relevant groups.

[7] Randazzo, K.V. and J.S. Peters. 2011. *Ibid.*

GPS Research Design and Objectives

GPS afforded us a unique opportunity to study customers' energy efficiency choices based on the akAB model of behavior change and to take a comprehensive look at the residential market and current utility program activities working in this market. We designed the GPS to address several key research objectives:

- Validate the akAB model of behavior change;
- Measure levels of *awareness/knowledge* of energy efficiency (**ak**), levels of *concern* about energy use (**A)** and levels of *personal responsibility* attitudes toward energy efficiency (**A)** in the residential market;
- Determine if any **akA** measures could be used to construct residential program performance metrics (PPMs);
- Segment residential customers and assess akAB responses by segments to identify marketing and outreach opportunities for current and future PG&E and SCE energy efficiency programs or campaigns;
- Examine recent appliance and electronic product purchasing behavior to support HEER and BCE program evaluations; and
- Assess appliance recycling and comprehensive house retrofit behaviors in the California residential market.

To effectively address these research objectives, we refined and validated the measures for the akAB model, tested and validated the akAB model, and used an already developed segmentation algorithm to segment survey responses. In the following sections, we discuss our methods and findings.

METHODS

Survey Development

We conducted a telephone survey with California residents to collect the necessary information for this study. The initial draft of the survey instrument included a revised set of questions from the akAB White Paper[8] and several other key questions to assess appliance recycling, comprehensive house upgrades, and customers' recent purchases of appliances and electronic equipment. The survey instrument also contained segmentation and demographic questions.

Prior to the full-scale fielding of the GPS survey, we conducted two pre-tests to identify which survey items reliably measured the akAB constructs. The pre-tests also allowed us to identify

[8] Randazzo, K.V. and J.S. Peters. 2011. *Ibid*.

any problems with respondents' (and interviewers') understanding of questions or issues with the length of the survey. Each pre-test consisted of 200 completed surveys with a randomly selected sample of California residents. Based on the results from the pre-tests, we made major modifications to the akAB questions in the survey instrument. For a more in-depth description of the survey development method and for a final survey instrument, see Appendix A and Appendix C, respectively.

Sampling Design

The GPS sample had to closely represent the household population of California. It also needed to include participants and nonparticipants of utility programs who recently bought appliances and miscellaneous electronic equipment so we could learn about their purchase experience.

We stratified the GPS sample to ensure that it reflected key demographic proportions of the study population. The overall sample had to be representative of homeowners, renters, the age of the primary householder, and household population proportions in PG&E and SCE service territories. For a more extensive description of the sampling design, see Appendix A.

Sample Characteristics

Full-scale fielding of the GPS survey resulted in 928 surveys, which provides better than 5% precision at greater than 95% confidence level.

This sample of 928 slightly under-represented minorities, renters, younger respondents, and higher-income households. We corrected almost all of these deviations by calculating the weights based on age and applying them to the sample. For a more extensive description of the weighting procedure, see Appendix B.

In Table 1, we show the Census demographic profile for California and the demographic profile of the weighted GPS sample.

Table 1: Population and Weighted Sample Characteristics

Demographic Profile	CA Household Population (2010 ACS & Census)[1]	2012 GPS Sample Weighted
CA Household Population		(n =927)
In PG&E territory	63%	63%
In SCE territory	37%	37%
Homeownership		(n =927)
Owner	59%	60%
Renter	41%	40%
Age of Householder		(n=892)[2]
Under 55 years	61%	61%

DEMOGRAPHIC PROFILE	CA HOUSEHOLD POPULATION (2010 ACS & CENSUS)[1]	2012 GPS SAMPLE WEIGHTED
55 years or over	39%	39%
Race		(n=869)[2]
White	58%	58%
African American	6%	5%
Other	36%	36%
Household Income		(n=745)[2]
Less than $50,000	44%	53%
$50,000 to $100,000	30%	26%
More than $100,000	26%	21%

1 We obtained population percents from the 2010 Census and 2010 American Community Survey for CA.

2 Some respondents refused to provide their age, race, or income. We treated these responses as "missing."

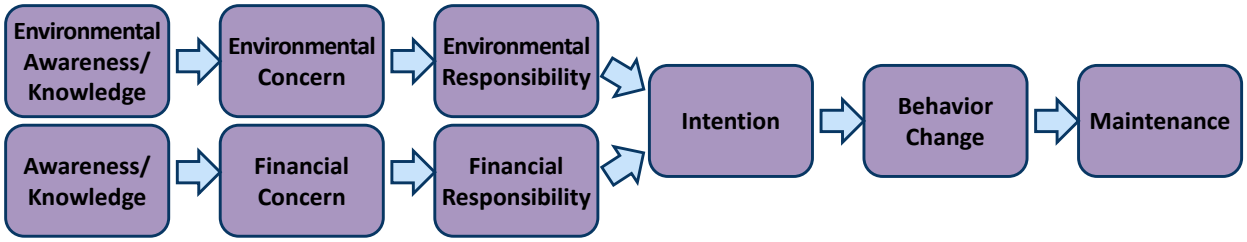
3 GPS AKAB RESULTS

In the next several sections, we discuss notable findings with respect to the akAB model. When possible, we compare the akAB findings from the GPS survey to the akAB results from the 2012 HEER evaluation. The GPS findings discussed in the subsequent sections include only the weighted estimates.

AKAB ITEM DEVELOPMENT AND VALIDATION

To study the akAB model of behavior change, we had to develop and validate measures for *awareness/knowledge*, *concern*, *personal responsibility*, and *intention* constructs of the akAB model. We focused specifically on environmental and financial motivations for change when developing measures for the akAB constructs (Figure 3).

Figure 3: Environmental & Financial akAB Constructs



First, we revised the proposed questionnaire from the akAB White Paper.[9] Then, we conducted two pre-tests of this survey questionnaire to identify which survey items reliably measure the akAB constructs depicted in Figure 3. Each pre-test consisted of 200 completed surveys with a randomly selected sample of California residents. California residents who agreed to take the pre-test survey rated how much they agreed with various statements using a scale from 0 to 10 where 0 meant "not at all agree" and 10 meant "completely agree." We linked these statements with the appropriate akAB constructs. For example, survey contacts had to tell us how much they agreed with "I sometimes worry whether there is enough money to pay my energy bill." This statement was associated with the *concern* for finances construct.

Overall, we collected ratings for 67 statements during the two pre-tests. Of the 67 items, we determined that only 11 were good measures of the akAB constructs (see Appendix A for in-depth methodology and pre-test results). We included these 11 items and selected behavioral, segmentation, and demographic items in the final GPS survey instrument. Then, we conducted

[9] Randazzo, V.K. and J.S. Peters. 2011. *Ibid*.

reliability[10] tests to determine whether the akAB items used in the GPS reliably measured the akAB constructs.

To test for internal consistency reliability, we used Cronbach's Alpha. Cronbach's Alpha reveals if items have internal consistency, that is, if they measure the same thing. The Cronbach's Alpha values range from 0 to 1 and are higher when the correlations between items increase. Generally, values of 0.7 to 0.9 are indicators of good reliability. We found that GPS responses to akAB items had acceptable Cronbach's Alpha values for almost all *awareness/knowledge*, *concern*, *personal responsibility*, and *intention* constructs related to financial and environmental motivations for change (Table 2).

We also found that we still lacked good measures for the financial *awareness/knowledge* and general *behavior maintenance* constructs (Table 2).

Table 2: Items That Reliably Measured the Hypothesized akAB Constructs

Contacts Rated The Following Statements On a Scale of 0-10, Where 0=Not at All Agree & 10=Completely Agree	Percent Of Contacts Giving High Ratings (9 or 10)	Cronbach's Alpha
Awareness/Knowledge of Energy Effects on the Environment		
1. Household electricity has an impact on the environment.	44%	0.80
2. Conserving electricity will help reduce global warming.	45%	
Awareness/Knowledge of Financial Benefits of Energy Savings		
Tested Many; None Identified	-	-
Concern for the Environment		
1. I am very concerned about how energy use affects the environment.	43%	0.70
2. How worried are you about global warming? [1=Not at all to 5=Extremely worried; we transformed this 1-5 scale to a 0-10 scale.]	18%	
Concern for Finances		
1. I sometimes worry whether there is enough money to pay my energy bill.	30%	0.66
2. I often worry that the cost of energy for my home will increase.	50%	
Personal Responsibility for the Environment		
1. It is my responsibility to use as little energy as possible to help the environment.	53%	0.74
2. I feel guilty if I use too much energy.	32%	

[10] Reliability statistics describe the extent to which a set of items measure the same construct or the extent to which a measuring procedure yields the same results on repeated trials.

Contacts Rated The Following Statements On a Scale of 0-10, Where 0=Not at All Agree & 10=Completely Agree	Percent Of Contacts Giving High Ratings (9 or 10)	Cronbach's Alpha
Personal Responsibility for Finances		
1. If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs.	39%	0.69
2. I have to take the lead in my household if we're going to keep our utility bills down.	58%	
3. If my utility bill goes up, I feel like I must do something to reduce it.	55%	
General Intention to Conserve Energy in the Home		
1. I intend to conserve on gas or electricity consumption in my home this winter.	56%	0.80
2. I intend to conserve on electricity consumption in my home this summer.	60%	
Behavior Maintenance		
Tested Many; None Identified	-	-

AKAB MODEL VALIDATION

To assess whether our data support the akAB model, we conducted construct validity[11] tests to assess whether observed relationships between akAB constructs and energy efficiency behaviors are consistent with the theoretical assertions of the akAB model. To do this, we first created measures of each akAB construct by averaging the component items to produce a construct score for each individual. This is appropriate, since component items of each akAB construct, displayed in Table 2, reliably measured that construct.

Then, we explored relationships between the akAB constructs and the behavior. The behavior variable was the sum of all energy efficiency or energy conservation actions that respondents reported doing.[12] We expected to observe the following:

1. Correlations between akAB constructs further away from the behavior are lower than correlations between akAB constructs closer to the behavior.
2. akAB constructs closest to each other are more correlated than akAB constructs farther away from each other.

[11] Construct validity is the extent to which empirical relationships between constructs and other measures are consistent with a priori hypotheses concerning the constructs that are being measured.

[12] Respondents reported whether they have done the following actions: (1) installed attic vent; (2) installed programmable thermostats; (3) installed ceiling fans; (4) installed motion detectors for lights; (5) bought ENERGY STAR electronics; (6) lowered water heater temperature; (7) enabled sleep features on their computers; (8) unplugged electronic equipment when not in use; (9) unplugged cell phone chargers when not in use; (10) washed laundry with cold water; and (11) dried clothes on line or drying rack.

We found that the results support our hypotheses, since the observed correlations are lower between constructs farther away from the behavior than constructs closer to the behavior (Figure 4 and Figure 5). Additionally, neighboring akAB constructs are more highly correlated than non-neighboring akAB constructs (Figure 4 and Figure 5). For example, the correlation between *concern* and *responsibility* is stronger than the correlation between *concern* and *intention* in the akAB environmental model. Similarly, this pattern holds true for the akAB financial model.

Figure 4: akAB Environmental Model Correlations for GPS Respondents

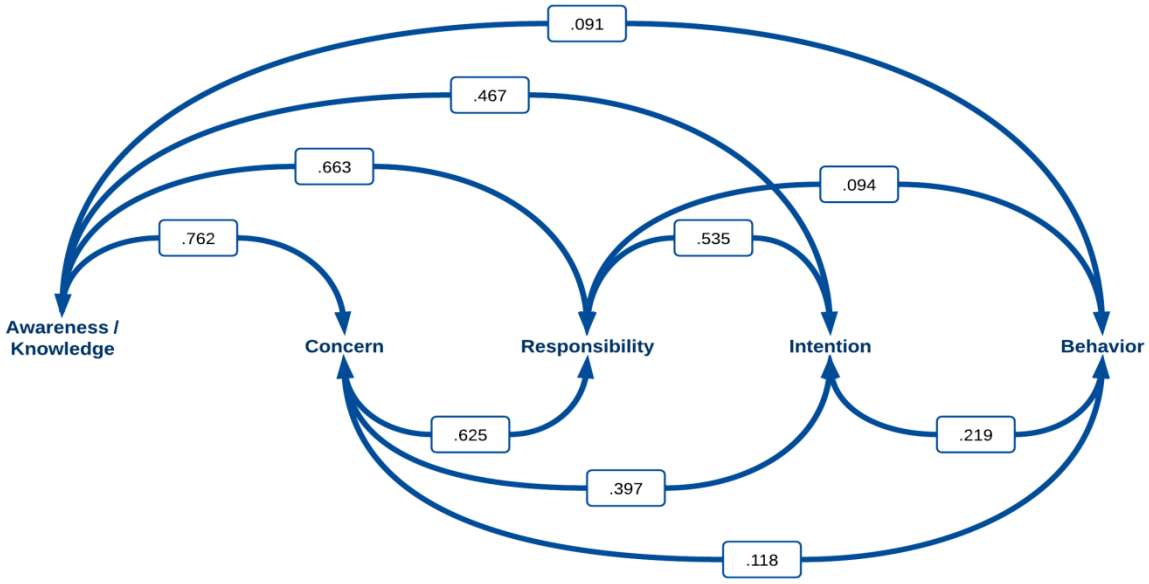
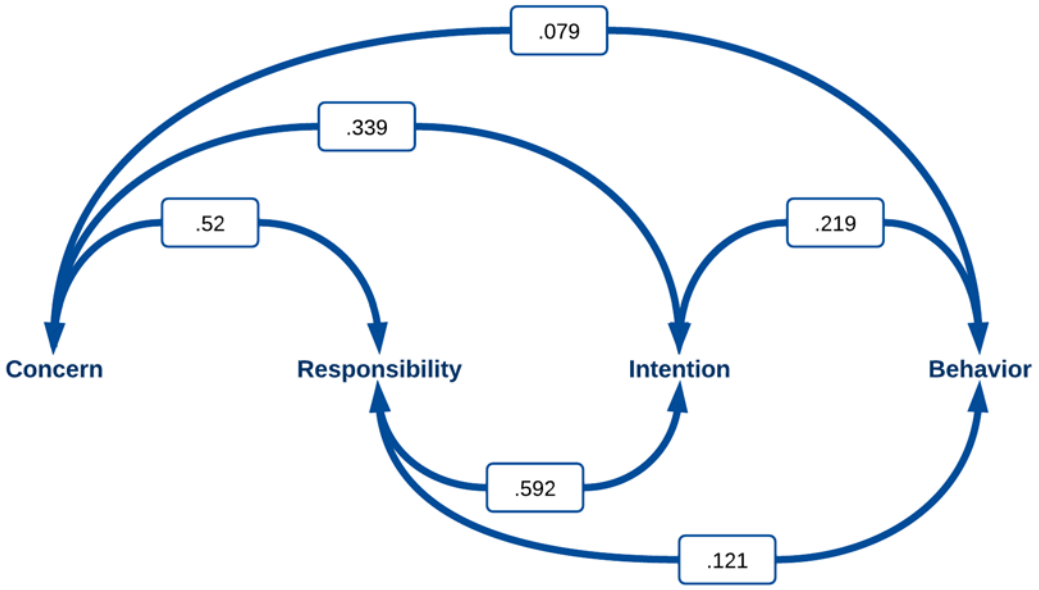


Figure 5: akAB Financial Model Correlations for GPS Respondents



Next, we separated the GPS respondents into those with the highest *intention* score ("10") and those without the highest *intention* score ("0-9"). We did this because *intention* scores were highly skewed. We wanted to know whether those with the highest *intention* score also had higher scores on other akAB constructs than those without the highest *intention* score. Our analysis revealed that respondents with the highest *intention* score had higher mean scores on other akAB constructs than respondents without the highest *intention* score (Figure 6 and Figure 7).

Figure 6: akAB Environmental Model Mean Scores

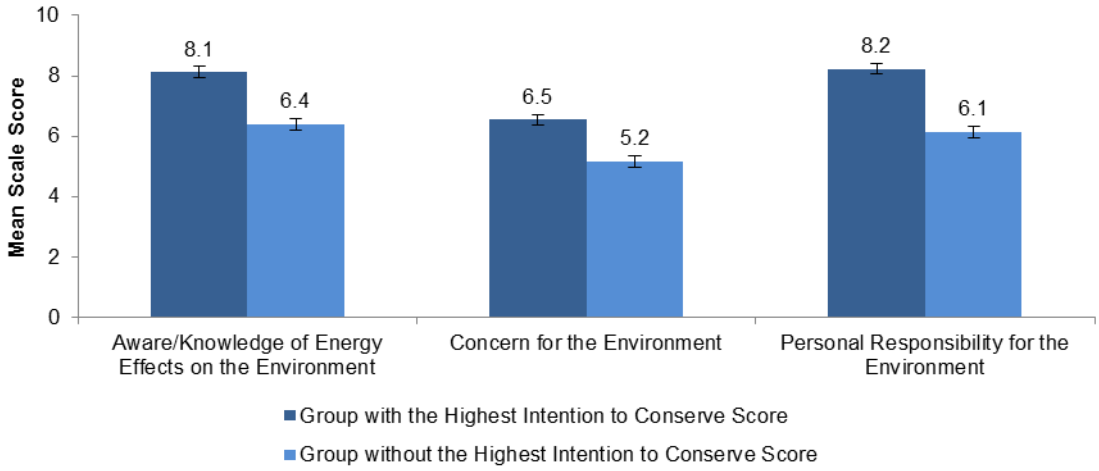
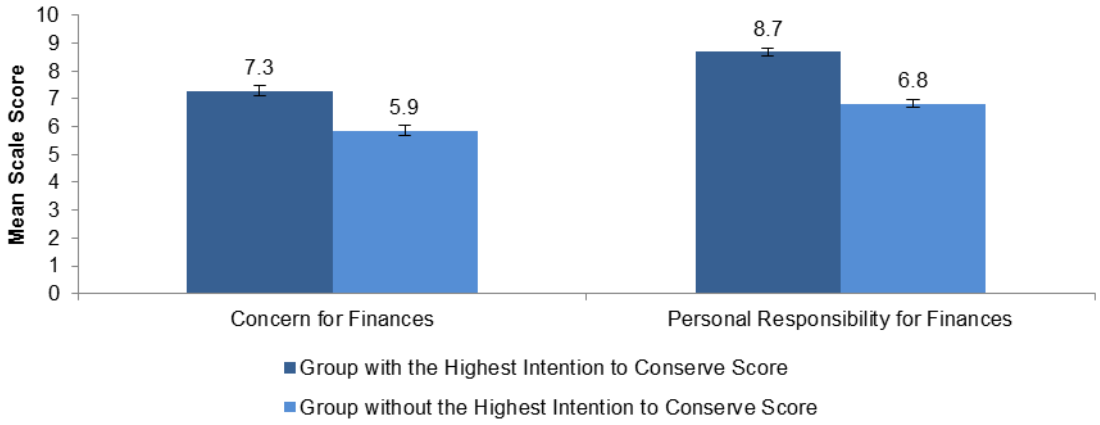


Figure 7: akAB Financial Model Mean Scores



These results show that the empirical relationships between the akAB constructs and behaviors are consistent with a priori hypotheses. This indicates that the akAB model behaves as expected.

AKAB DIFFERENCES BETWEEN HEER AND GPS GROUPS

After exploring whether the akAB model behaves as expected, we compared akAB responses from the GPS survey to the akAB responses from the 2012 HEER evaluation. The HEER process evaluation survey included similar akAB questions, so selected comparisons are made to obtain results that are more meaningful.

Appliance Behavior-Based Groups

First, we divided the respondents from the GPS survey into behavior-based groups. We determined these groups based on the following logic[13]:

- If respondents reported they had recently done a comprehensive home upgrade, we categorized them as "comprehensive upgraders."
- If respondents who were NOT classified as "comprehensive upgraders" reported they had received a utility rebate for an appliance they had bought recently, we categorized them as "rebate reporters."
- If respondents who were NOT classified as "comprehensive upgraders" or "rebate reporters" reported they had gotten a utility rebate for recycling a refrigerator or a freezer, we categorized them as "appliance recyclers."

[13] In order to statistically test differences between groups we divided respondents into mutually exclusive groups. Further, customers reporting doing a comprehensive home upgrade (comprehensive upgraders) are very distinct from those who only purchased an appliance or recycled an appliance. For this reason, we treated comprehensive upgraders separately even though some comprehensive upgraders bought an appliance or recycled an appliance during their upgrade.

- If respondents who were NOT classified as "comprehensive upgraders," "rebate reporters," or "appliance recyclers" reported recently buying an appliance and had NOT planned to buy an ENERGY STAR® appliance when they bought that appliance, we categorized them as "nonparticipants not seeking ENERGY STAR products."
- If respondents who were not classified as "comprehensive upgraders," "rebate reporters," or "appliance recyclers" reported recently buying an appliance and said they had planned to buy an ENERGY STAR appliance when they bought that appliance, we categorized them as "nonparticipants seeking ENERGY STAR products."
- If respondents who were NOT classified as "comprehensive upgraders," "rebate reporters," or "appliance recyclers" reported not buying an appliance recently, we categorized them as "non-purchasers."

Group proportions are displayed in Table 3.

Table 3: GPS Sample Group Categories with Proportions of Sample

GROUP	COUNT	% OF SAMPLE
Comprehensive Upgraders	217	23%
Rebate Reporters	28	3%
Appliance Recyclers	43	5%
Nonparticipants not seeking ENERGY STAR products	47	5%
Nonparticipants seeking ENERGY STAR products	93	10%
Non-purchasers	499	54%
Total	**927**	**100%**

After we completed this characterization, we compared akAB responses between GPS groups and the HEER group. The HEER group consists of participants who had received a rebate for a HEER-qualifying appliance. In January 2012, we surveyed 507 HEER participants across PG&E and SCE territories. Responding participants had received a rebate for at least one of six qualifying products (water heater, evaporative cooler, pool pump, refrigerator, room air conditioner, and whole-house fan). These respondents also had received their rebate per at least one of three rebate methods (mail-in, online, and point-of-sale).

We discuss notable akAB results in the next sections.

akAB Comparisons- HEER Participants and Nonparticipants

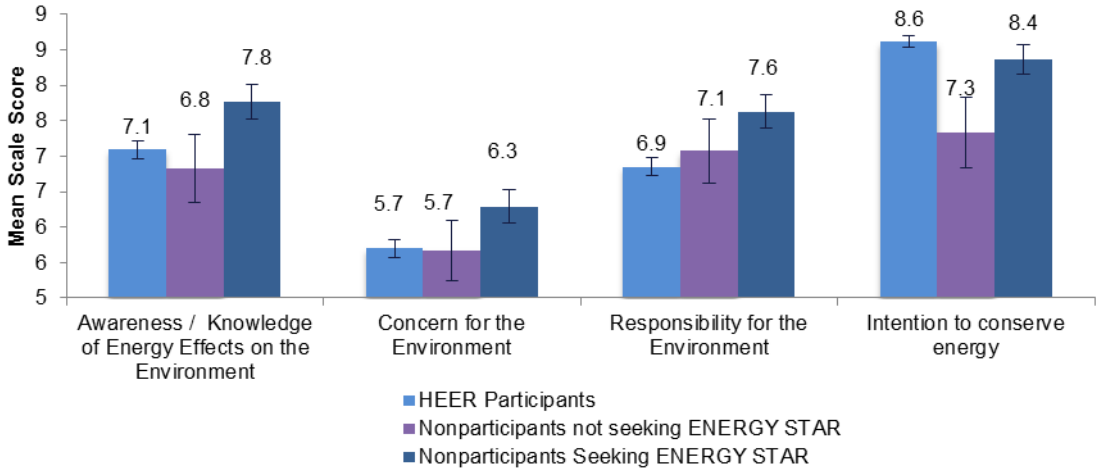
Nonparticipants seeking ENERGY STAR appliances were more *aware* of, *concerned* about, and felt a greater *responsibility* for the environment than did HEER participants.[14] These results,

[14] t-tests - $t(112)_{awareness}=2.49$, p=0.01; $t(112)_{concern}=2.21$, p=0.03; and $t(111)_{responsibility}=2.94$, p=0.004 (environment domain)

displayed in Figure 8, suggest that appliance purchasers who were motivated to buy ENERGY STAR products on their own were doing so without going through the program.

Furthermore, nonparticipants not seeking ENERGY STAR appliances had similar levels of *awareness*, *concern*, and *responsibility* about the environment as did HEER participants,[15] but lower *intention* to act on the behavior than HEER participants[16] (Figure 8). This further suggests that the program is influencing the right types of customers (i.e., customers who would not have taken the action on their own), since HEER participants are similar in the akAB profile to nonparticipants not seeking ENERGY STAR appliances, except for *intention*.

Figure 8: Mean Environment Scale Differences between HEER Participants and Both Nonparticipant Groups*



* Shows the standard error for each group by construct

akAB Comparisons - Non-Purchasers and HEER/GPS Groups

In addition to comparing HEER participants and nonparticipants, we compared non-purchasers with other behavior-based groups to highlight differences that may be useful for targeting future program participants. As noted earlier, non-purchasers are respondents who have not recently bought an appliance or completed a comprehensive home upgrade. Since these respondents have not bought a large appliance or done a comprehensive retrofit of their homes, they are more likely to do so in the future than those who recently did either activity.

Overall, we found that in comparison to non-purchasers:

[15] t-tests examining the mean environmental akAB scores were not significant for both environmental and financial domains.

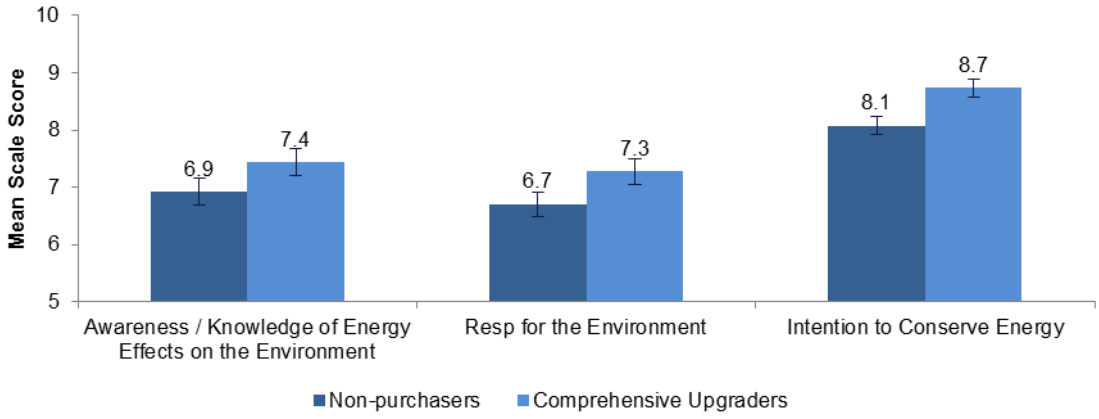
[16] t-test, $t(47)_{intention}$=-2.57, p=0.01

- Comprehensive upgraders had higher akAB scores in both financial and environmental domains
- HEER participants had lower akAB scores in the financial domain, but had similar scores in the environmental domain
- Nonparticipants seeking ENERGY STAR appliances had higher akAB scores in the environmental domain but had similar scores in the financial domain
- Appliance recyclers had higher akAB scores in the financial domain but similar scores in the environmental domain

Below, we describe relevant results that provide evidence for these overall findings.

First, we compared non-purchasers with those who had completed a comprehensive home upgrade. We found that non-purchasers were less *aware* of energy effects on the environment and had a lower mean score on the *responsibility* for protecting the environment than those who did a comprehensive home upgrade.[17] Non-purchasers also had a lower *intention* to conserve energy than respondents who did a comprehensive home upgrade.[18]These results, displayed in Figure 9, suggest that non-purchasers are less engaged with environmental issues and less responsive to environmentally focused messaging than comprehensive upgraders.

Figure 9: Environmental Domain Differences between Non-Purchasers and Comprehensive Upgraders



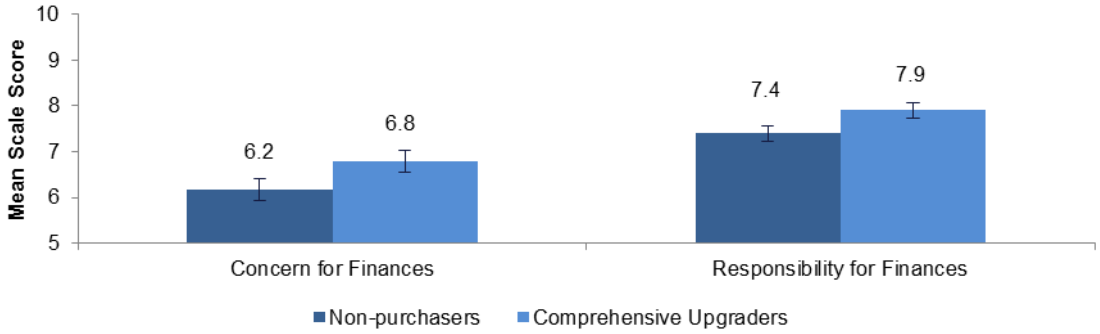
Similarly, non-purchasers were less focused on the financial benefits of energy savings than were the comprehensive upgraders. Non-purchasers were less *concerned* about energy use impacts on

[17] t-test, $t_{awareness}(265)=-2.18$, p=0.03; $t_{responsibility}(268)=-2.61$, p=0.01 (environment domain)

[18] t-test, $t_{intention}(279)=-4.24$, p<.001

finances and had a lower mean score on the *responsibility* for finances than did those who did a comprehensive home upgrade[19] (Figure 10).

Figure 10: Financial Domain Differences between Non-Purchasers and Comprehensive Upgraders



Next, we compared non-purchasers with HEER participants (Figure 11). In contrast to the findings we discussed above, where we found that non-purchasers were less *concerned* than comprehensive upgraders about the impact energy use has on finances, non-purchasers were more *concerned* about energy use impacts on finances than HEER participants.[20] However, non-purchasers had a lower *intention* to conserve energy than HEER participants.[21] These results suggest that, although non-purchasers were concerned about energy use impact on finances, they were still less intent than HEER participants on conserving energy. Additionally, significantly more HEER participants make over $100,000 per year than non-purchasers,[22] which may explain why HEER participants have lower *concern* for finances.

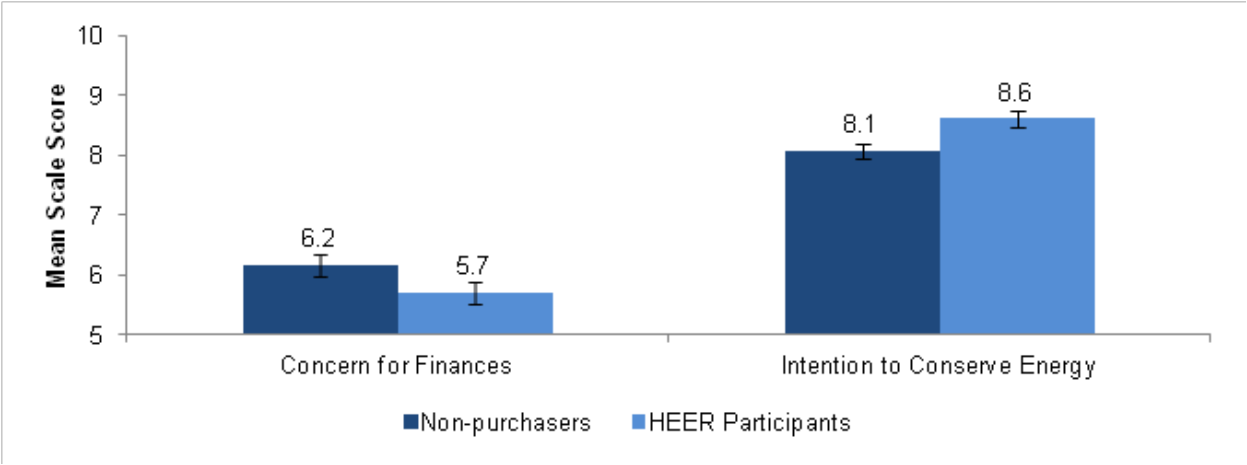
19 t-test, $t_{concern}(262)=-2.61$, p=0.01; $t_{responsibility}(269)=-2.88$, p=0.01 (financial domain)

20 t-test, $t(500)=2.59$, p=0.01

21 t-test, $t(502)=-4.07$, p<0.001

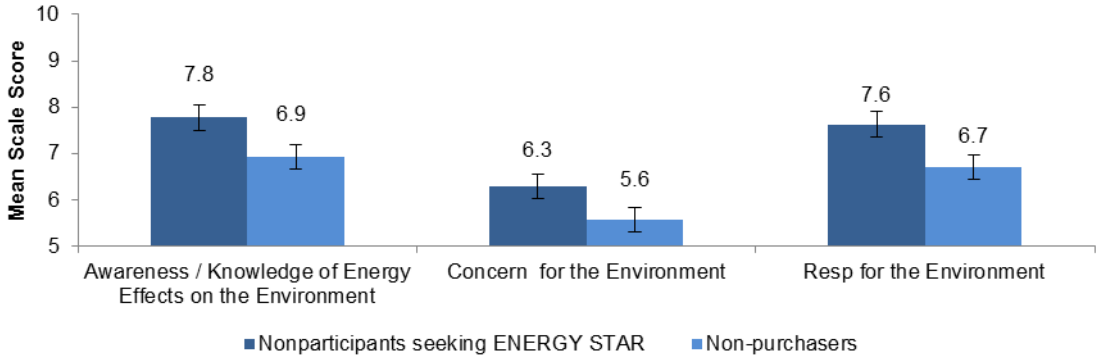
22 Chi-square, $\chi^2(2)=57.59$, p<0.001

Figure 11: Financial Domain Differences between Non-Purchasers and HEER Participants



Then, we compared non-purchasers and nonparticipants seeking ENERGY STAR products. We found that non-purchasers had lower *awareness*, *concern*, and *responsibility* for the environment than nonparticipants seeking ENERGY STAR products.[23] These results mirror the environmental domain results for non-purchasers and comprehensive upgraders, indicating similar levels of *awareness*, *concern*, and *responsibility* for the environment between nonparticipants seeking ENERGY STAR products and comprehensive upgraders. akAB environmental scores for comprehensive upgraders and nonparticipants seeking ENERGY STAR are the highest across all GPS groups, and t-tests between these two groups indicate they are not statistically different from one another.

Figure 12: Environmental Domain Differences Between Non-Purchasers and Nonparticipants Seeking ENERGY STAR

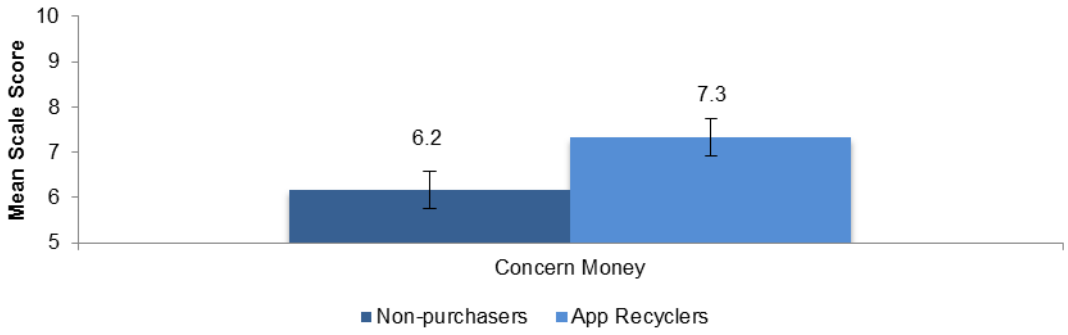


We then compared non-purchasers to appliance recyclers. Non-purchasers were less financially focused than appliance recyclers. Specifically, non-purchasers were less *concerned* about

[23] t-tests, $t(115)_{awareness}$=-3.09, p=0.003; $t(112)_{concern}$=-2.71, p=0.01; and $t(114)_{responsibility}$=3.46, p=0.001

finances than appliance recyclers.[24] Additionally, marginally fewer appliance recyclers than non-purchasers make $50,000 or more,[25] suggesting that appliance recyclers' lower income leads to a higher *concern* for energy finances.

Figure 13: Financial Domain Differences Between Non-Purchasers and Appliance Recyclers



AKAB DIFFERENCES BETWEEN ELECTRONIC PRODUCT PURCHASERS AND NON-PURCHASERS

In the GPS, we asked respondents to tell us whether they had purchased a TV or a desktop computer. We defined electronic product purchasers and non-purchasers as respondents who had or had not recently purchased a TV or a desktop computer, respectively.

Then, we divided the electronic product purchasers by those who sought an ENERGY STAR TV or desktop computer from those who did not seek an ENERGY STAR TV or desktop computer. We discuss notable findings in the subsequent sections.

akAB Comparisons - TV Purchasers Seeking ENERGY STAR and Not Seeking ENERGY STAR

We further divided the 249 TV purchasers from the GPS survey[26] into specific purchasing groups. We determined these groups based on the following logic:

- If the respondents bought a TV only but *did not* plan to seek an ENERGY STAR model, we categorized them as "TV purchasers NOT seeking ENERGY STAR product."
- If the respondents bought a TV only and *did* plan to seek an ENERGY STAR model, we categorized them as "TV purchasers seeking ENERGY STAR product."

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24 t-test - $t(46)=-2.80$, p=0.01

25 Pearson Chi-square test - $\chi^2(2)=5.44$, p=0.07

26 We also explored akAB differences between purchasers seeking an ENERGY STAR desktop computer and purchasers not seeking an ENERGY STAR desktop computer and we found no significant differences.

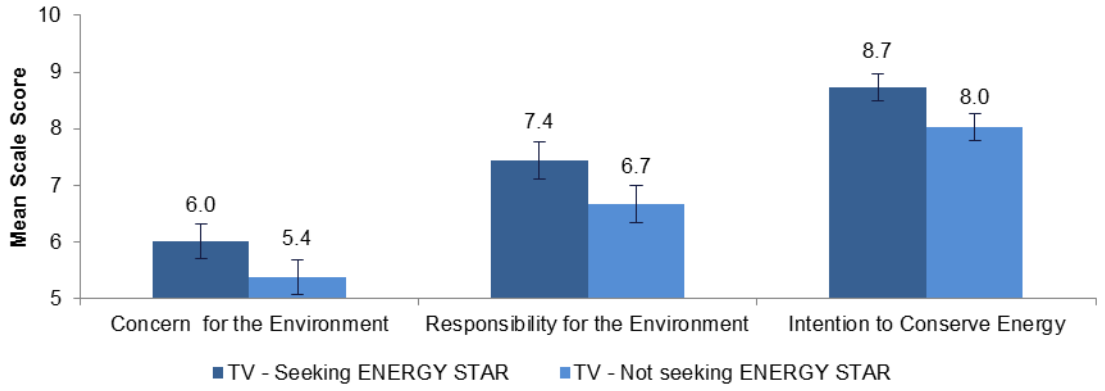
Group proportions are displayed in Table 4.

Table 4: GPS Sample Electronic-Behavior-Based Group Categories with Proportions of Sample[27]

GROUP	COUNT	PERCENT
TV - Seeking ENERGY STAR	125	50%
TV - Not seeking ENERGY STAR	124	50%
Total	**249**	**100%**

Overall, we found that, in comparison to TV purchasers who did not seek an ENERGY STAR model, those seeking an ENERGY STAR TV had higher akAB scores in both the environmental and financial domains. Specifically, TV purchasers seeking an ENERGY STAR TV were more *concerned* for the environment, felt greater *responsibility* for the environment,[28] and had a higher *intention* to conserve energy than TV purchasers not seeking an ENERGY STAR model (Figure 14). TV purchasers seeking ENERGY STAR models were also more *concerned* and felt a higher *responsibility* about energy use impacts on finances than TV purchasers not seeking an ENERGY STAR model[29] (Figure 15).

Figure 14: Environmental Domain Differences Between TV Purchasers Seeking ENERGY STAR vs. Not Seeking ENERGY STAR

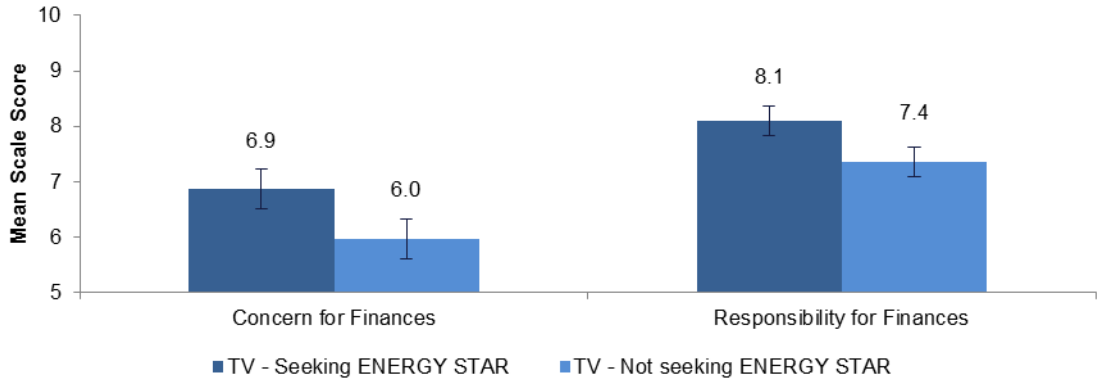


27 Note that there are no participant vs. nonparticipant groups as the BCE program is a mid-stream program.

28 t-tests, $t_{concern}(123)=2.02$, p=.05; $t_{responsibility}(123)=2.37$, p=.02; $t_{intention}(122)=3.04$, p=.003 (environmental domain)

29 t-tests, $t_{concern}(123)=2.50$, p=.01; $t_{responsiblility}(121)=2.76$, p=.01 (financial domain)

Figure 15: Financial Domain Differences Between TV Purchasers Seeking ENERGY STAR vs. Not Seeking ENERGY STAR



CONCLUSIONS AND MARKETING RECOMMENDATIONS

Overall, the akAB analysis revealed the following:

- The akAB model behaves as expected.
- The HEER program is targeting the right type of customer.
- The akAB environment scores for comprehensive upgraders and nonparticipants seeking ENERGY STAR products are the highest across all GPS behavior-based groups.
- Non-purchasers exhibit lower *intention* to conserve energy at home compared to comprehensive upgraders and HEER participants.
- Appliance recyclers have higher *concern* about energy use impact on finances than non-purchasers.
- Only half of those who bought a TV searched for an ENERGY STAR TV; Those seeking an ENERGY STAR TV have higher *awareness*, *concern*, and *responsibility* about the impacts of energy use on the environment and finances, and higher *intention* to conserve energy at home than those not seeking an ENERGY STAR model.

Given these results, **we recommend** that utility program staff target residential customers using marketing messages that focus on financial and environmental benefits of energy efficiency. Financially focused messages will resonate well with appliance recyclers, since they worry about the impacts of energy use on finances. As for environmentally focused messages, these messages should continue since higher *awareness/knowledge* of, higher *concern* about, and higher *personal responsibility attitudes* toward energy effects on the environment are key traits of those who have done comprehensive home upgrades and of nonparticipants who have bought ENERGY STAR appliances. Pro-environmental messaging strategy is likely important in

influencing attitudes of those who are less *aware* of, less *concerned* about, or feel less *responsible* for energy effects on the environment.

We also recommend continuing current marketing and outreach efforts for the HEER program, since this program is targeting the right types of customers.

4 GPS SEGMENTATION RESULTS

To better understand utility customers in the California residential sector, we applied a segmentation algorithm to the sample to divide the sample into unique market segments. This chapter presents the segmentation approach, describes characteristics of the five identified market segments, and provides an overview of marketing and outreach opportunities for PG&E and SCE.

SEGMENTATION APPROACH

In 2009, ODC conducted a household segmentation study on behalf of the California investor-owned utilities about marketing and outreach opportunities in the residential sector. ODC developed a segmentation algorithm that predicts the type of segment a resident falls into based on the resident's responses to a set of nine questions:

- Whether residents own or rent their home;
- Whether residents have installed an attic vent, ceiling fan, programmable thermostat, or motion detector for lights (four questions);
- Whether residents are aware of the term "carbon footprint";
- Whether residents are likely to compare a product price with another;
- Whether residents feel responsible for conserving energy; and,
- Whether saving money, protecting the environment, or other reasons would motivate residents to save energy.

To develop this algorithm, the ODC team used cluster and CART analyses. Cluster analysis was used to identify groups of people with similar attitudes and behaviors toward energy efficiency. CART analysis produced a predictive model that determined attributes of people most likely to exhibit an energy-saving behavior. A more detailed explanation of ODC's segmentation methodology can be found in their final report.[30]

We used ODC's segmentation algorithm to divide the GPS sample into five distinct groups. We further explored the derived segments through crosstab Pearson Chi-square[31] procedures, one-

[30] Opinion Dynamics (2009). Market Segmentation Study of California Residents. Final Report retrieved from the California Public Utility Commission on February 30, 2010.

[31] Pearson Chi-square test is used to assess response differences between groups when data are nominal (for example, nominal responses are "yes" "no" or "don't know" answers).

way analysis of variance (One-way ANOVA)[32] procedures, and non-parametric Kruskal-Wallis[33] tests of significance. We report only the weighted results in the subsequent sections (see Appendix B for weighting details).

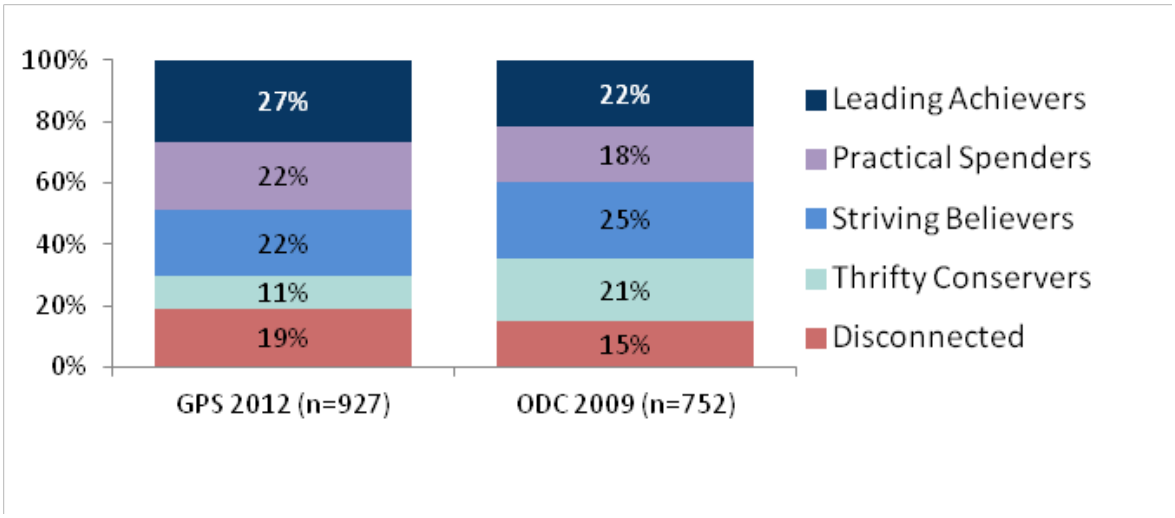
FIVE SEGMENTS

Each of the five segments has distinct demographic, behavioral, and attitudinal characteristics. To aid the reader, each segment has a name that characterizes the group:

- ***Leading Achievers*** (27%)
- ***Practical Spenders*** (22%)
- ***Striving Believers*** (22%)
- ***Thrifty Conservers*** (11%)
- ***Disconnected*** (19%)

Figure 16 compares segment distributions between the GPS and the 2009 ODC study. We found one notable difference; the proportion of ***Thrifty Conservers*** in the ODC sample was higher than in the GPS sample.[34]

Figure 16: 2012 GPS, and 2009 ODC Segment Distributions



[32] One-way analysis of variance (ANOVA) is a technique used to compare means between two or more groups. This technique is used when data are continuous (for example, age is a continuous variable).

[33] Kruskal-Wallis test, a non-parametric test, is used to examine response differences between multiple groups when data are ordinal (for example, ordinal data are satisfaction ratings on a scale of 1 to 5 where 1 means *not at all satisfied* and 5 means *extremely satisfied*).

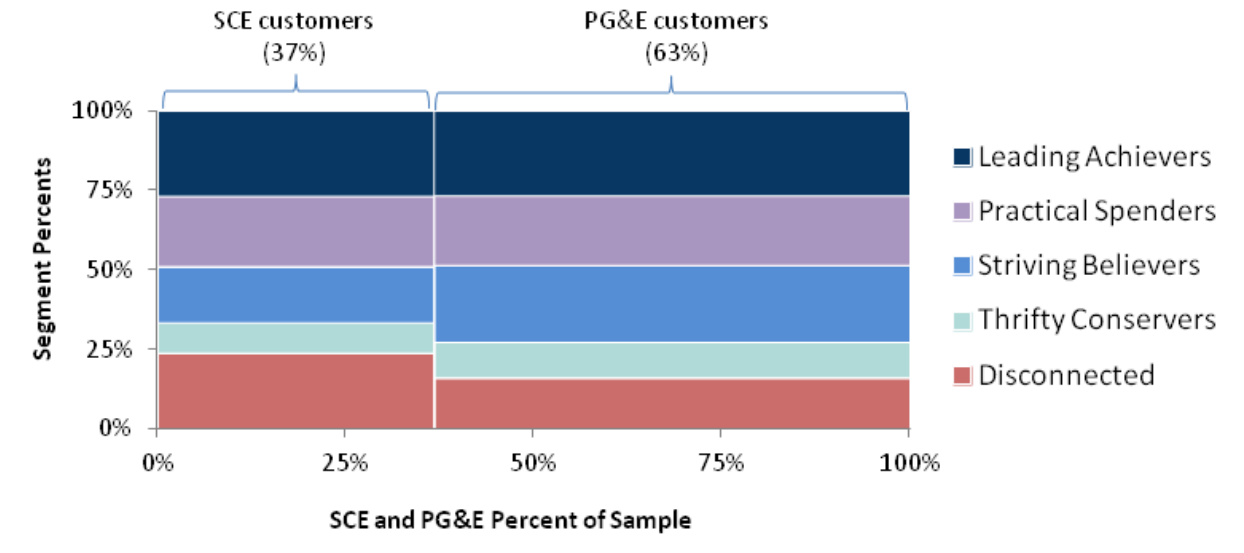
[34] z-proportion test, z-score=5.5, p<0.01

Next, we describe the demographic, behavioral, and attitudinal characteristics of the five distinct groups in the GPS sample.

DEMOGRAPHIC PROFILE

Figure 17 shows the distribution of GPS respondents in the five segments across the PG&E and SCE service territories. There were significantly fewer ***Disconnected*** and more ***Striving Believers*** in the PG&E territory than in the SCE territory.[35]

Figure 17: Percent of SCE and PG&E Customers in Each Segment in 2012 (n=927)



In Figure 18 and Figure 19, we display patterns of homeownership[36] (owner versus renter) and house type found to be significantly different across segments.[37] ***Leading Achievers*** and ***Practical Spenders*** were predominantly homeowners, and most of them lived in detached single-family homes. More than half of ***Striving Believers***, ***Thrifty Conservers,*** and ***Disconnected*** were renters, and a little less than half of customers in these segments lived in attached single-family homes or apartments.

35 Pearson Chi-square test, χ^2=91.3, p<0.01

36 We included the homeownership question in the set of variables used for defining the segments.

37 Pearson Chi-square tests, $\chi^2_{(ownership)}$=137.8 and $\chi^2_{(housetype)}$=125.8, p<0.01

Figure 18: Homeownership within Each Segment (n=927)

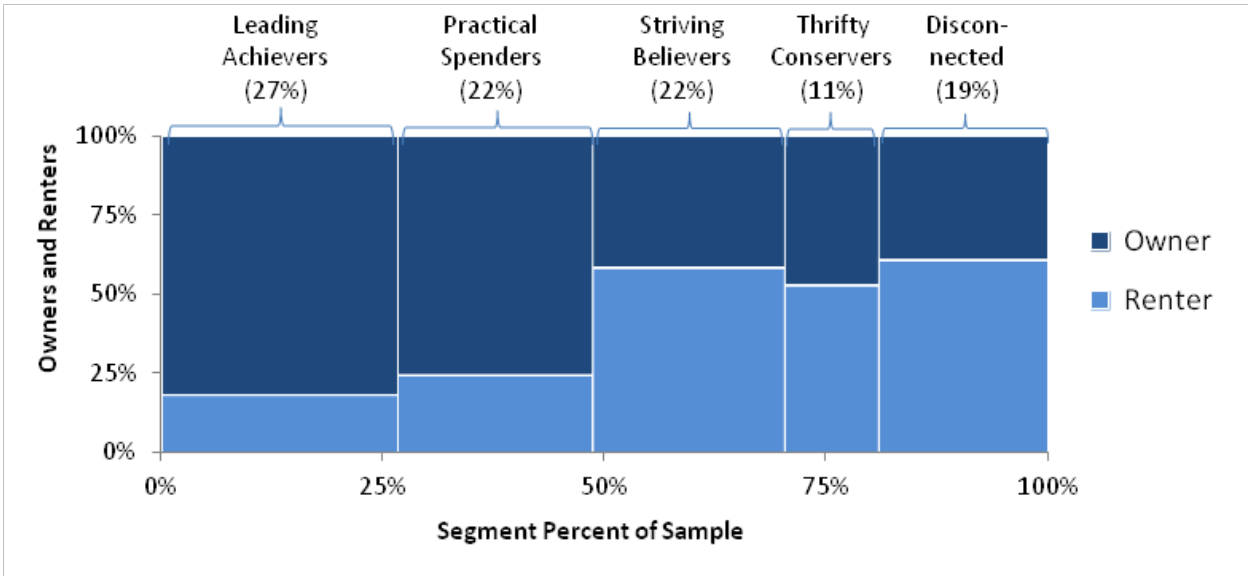


Figure 19: House Type within Each Segment (n=919)

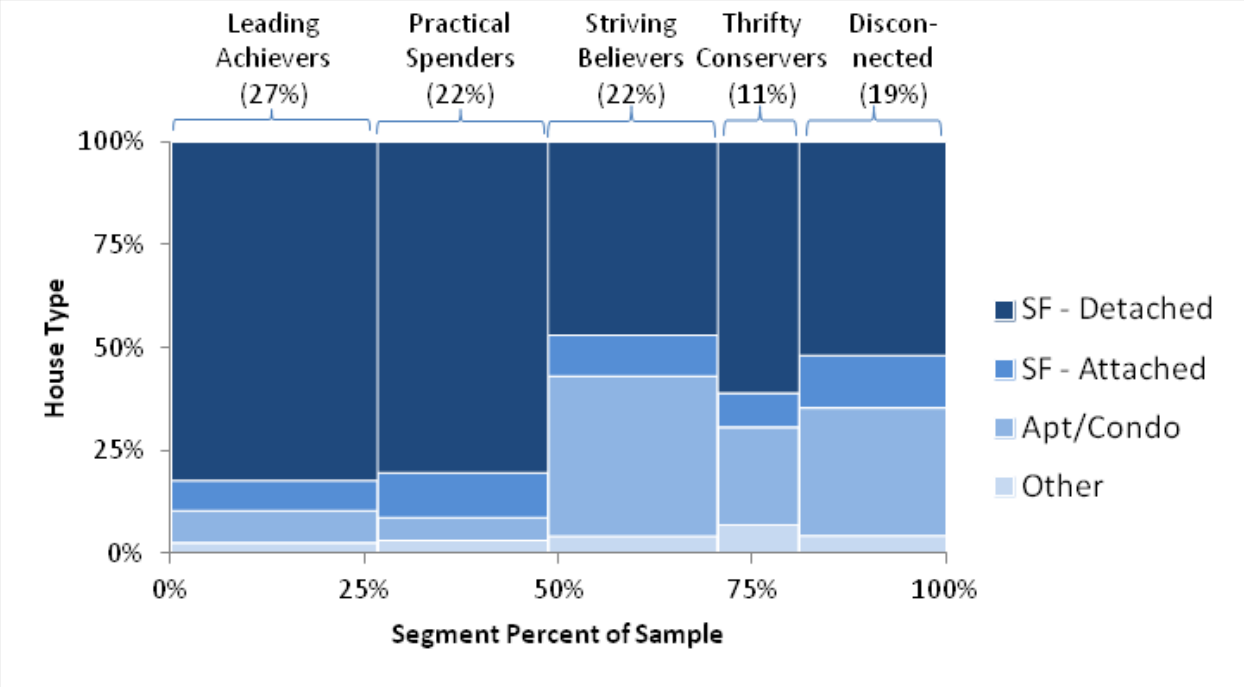


Figure 20 presents notable differences in household income ranges across segments.[38] ***Leading Achievers*** predominated in the highest income bracket. ***Practical Spenders*** were dominant in the

[38] Kruskal-Wallis test, χ^2=86.9, p<0.01

second-to-highest income bracket ($60,000-$100,000). ***Striving Believers*** and ***Thrifty Conservers*** were more evenly distributed across income ranges than households in any other segments. ***Disconnected*** were dominant in the less-than-$40,000 income range.

Figure 20: Household Income within Each Segment (n=746)

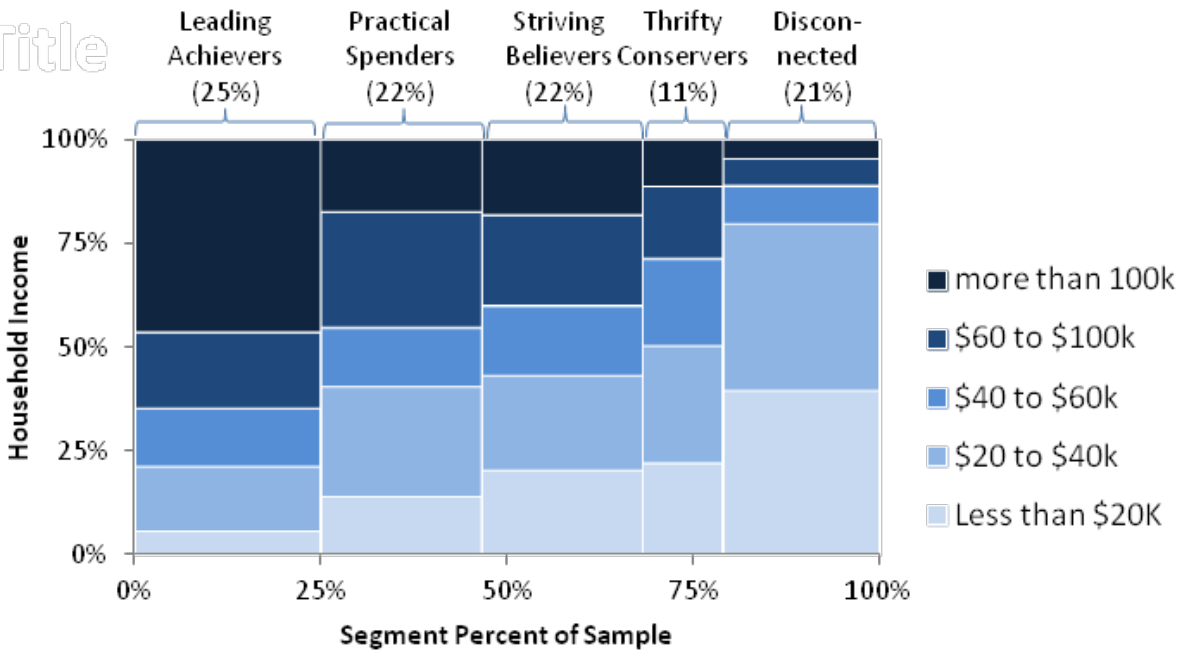


Figure 21shows the distribution of educational achievement across segments. ***Leading Achievers*** and ***Striving Believers*** were the most educated groups, followed closely by ***Thrifty Conservers.*** *The* ***Disconnected*** group was the least educated group. These differences were significant.[39]

[39] Kruskal-Wallis test, χ^2=48.6, p<0.01

Figure 21: Education within Each Segment (n=906)

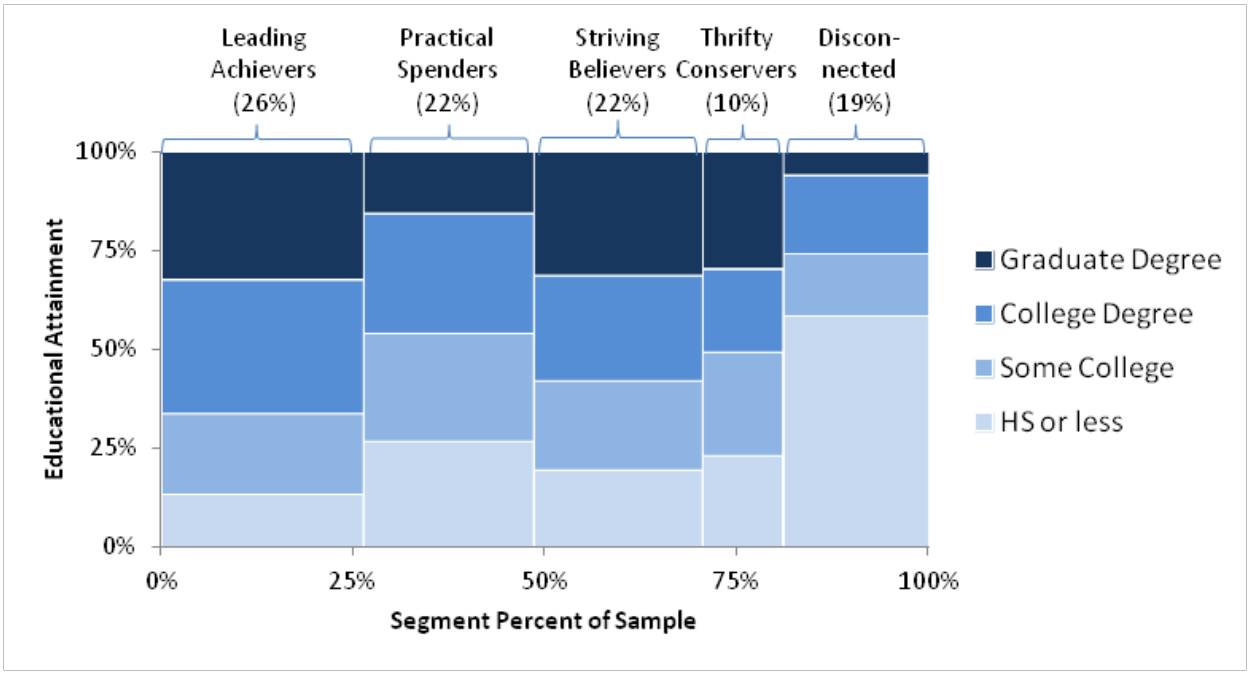


Table 5 depicts the average age of respondents within each segment. On average, ***Striving Believers*** and ***Disconnected*** were younger than ***Leading Achievers***, ***Practical Spenders***, and ***Thrifty Conservers***. These findings were significant.[40]

Table 5: Average Age within Each Segment

SEGMENTS	MEAN AGE	STD. ERROR
Leading Achievers (n=212)	54	0.99
Practical Spenders (n=178)	52	1.28
Striving Believers (n=189)	48	1.22
Thrifty Conservers (n=93)	53	1.83
Disconnected (n=167)	47	1.32

In Table 6, we display the average household size within each segment. On average, those in the ***Disconnected*** and ***Practical Spenders*** segments lived in households with more occupants than those in other segments. These findings were significant.[41]

[40] One-way ANOVA, F=5.4, p<0.01

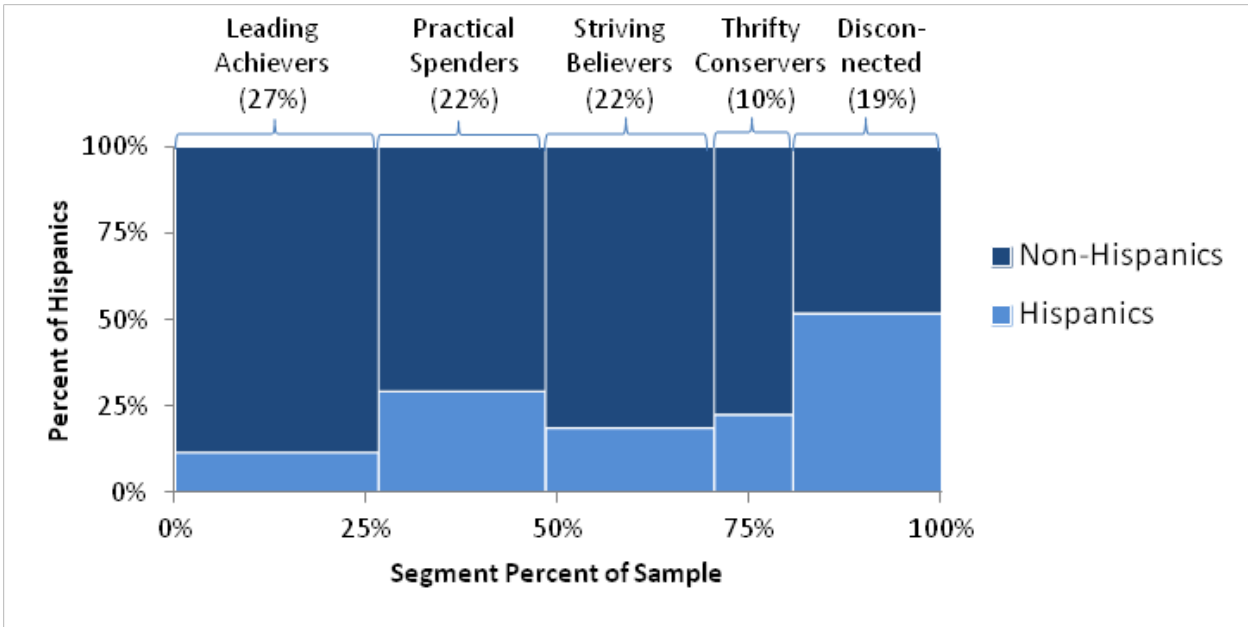
[41] One-way ANOVA, F=10.8, p<0.01

Table 6: Average Household Size within Each Segment

SEGMENTS	MEAN HOUSEHOLD SIZE	STD. ERROR
Leading Achievers (n=238)	2.9	0.09
Practical Spenders (n=196)	3.4	0.13
Striving Believers (n=196)	2.6	0.10
Thrifty Conservers (n=96)	3.0	0.18
Disconnected (n=172)	3.5	0.15

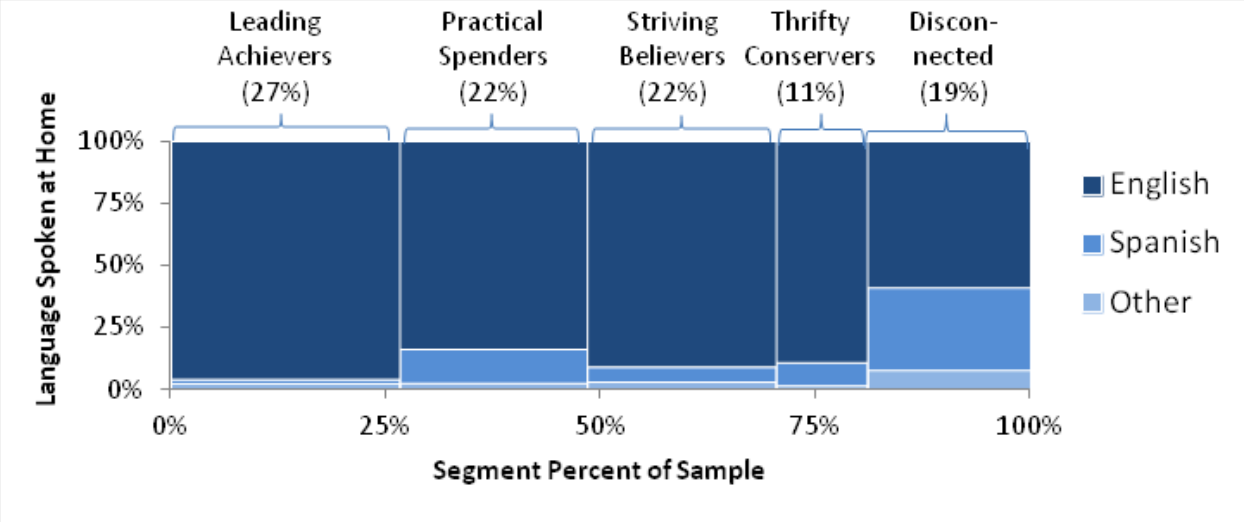
Finally, Figure 22 and Figure 23 present notable differences in ethnicity and primary language spoken at home across segments.[42] Half of those in the ***Disconnected*** segment were Hispanic. Moreover, one-third of those in the ***Disconnected*** segment spoke *primarily* Spanish at home. In all other segments, English was the dominant language.

Figure 22: Percent of Hispanics in Each Segment (n=886)



[42] Pearson Chi-square tests, $\chi^2_{(ethnicity)}=90.8$ and $\chi^2_{(language)}=120.6$, $p<0.01$

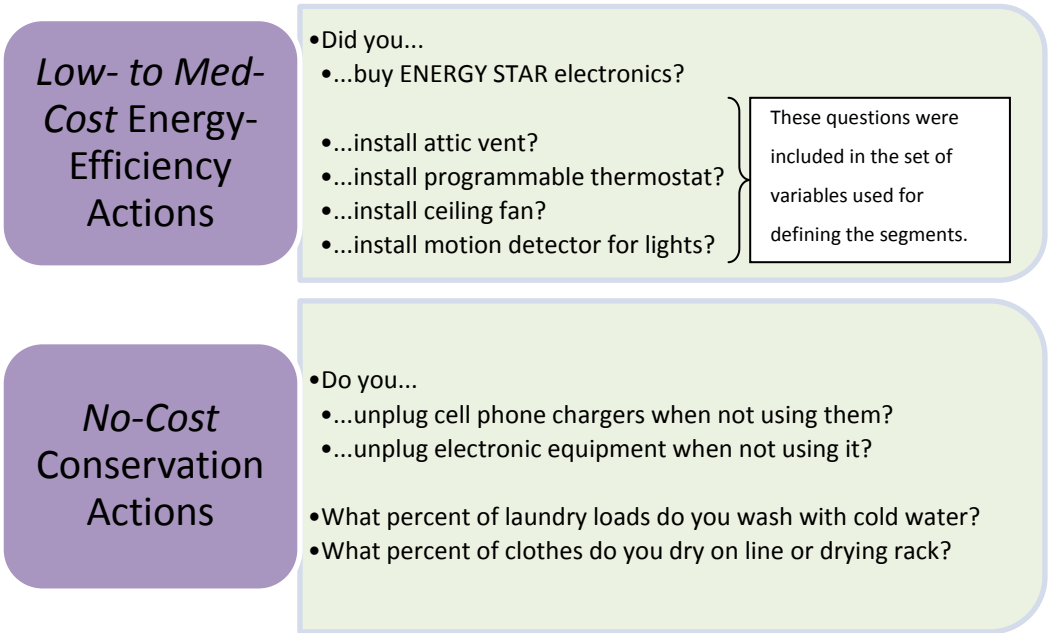
Figure 23: Primary Language Spoken in Each Segment (n=909)



BEHAVIOR PROFILE

We asked California residents who agreed to take the GPS survey about the efficiency behaviors they have done or regularly do to save energy in their homes (Figure 24). The behavior actions we inquired about in the GPS survey fit into two categories: *low- to medium-cost* efficiency actions and *no-cost* conservation actions (Figure 24). Unless otherwise noted, the behavior responses refer to whether GPS respondents had ever performed these actions.

Figure 24: Behavior Questions in the GPS



We counted the number of *low- to medium-cost* efficiency actions and the number of *no-cost* conservation actions that respondents reported performing, for each case in our dataset. Then, we estimated the average number of *low- to medium-cost* efficiency actions and the average number of *no-cost* conservation actions within each segment.

In Table 7 and Table 8, we display patterns of *low- to medium-cost* and *no-cost* energy-curtailment behavior across segments. On average, ***Leading Achievers*** and ***Practical Spenders*** did more *low- to medium-cost* efficiency actions than ***Striving Believers***, ***Thrifty Conservers***, and ***Disconnected.***[43] Furthermore, ***Thrifty Conservers*** reported doing slightly less than two *no-cost* conservation actions, whereas households in all other segments reported having done two or slightly more than two *no-cost* conservation actions, on average.[44]

Table 7: Average Number of Low- to Medium-Cost Efficiency Actions

Segments	Mean Number Of Actions	Std. Error
Leading Achievers (n=247)	3.4	0.053
Practical Spenders (n=203)	3.3	0.062
Striving Believers (n=201)	1.1	0.053
Thrifty Conservers (n=98)	1.2	0.078
Disconnected (n=177)	1.1	0.073

Table 8: Average Number of No-Cost Conservation Actions

Segments	Mean Number Of Actions	Std. Error
Leading Achievers (n=247)	2.1	0.062
Practical Spenders (n=203)	2.0	0.069
Striving Believers (n=201)	2.2	0.062
Thrifty Conservers (n=98)	1.8	0.103
Disconnected (n=177)	2.1	0.071

Next, we grouped residents who agreed to take the GPS or HEER process evaluation survey[45] into specific behavior-based groups. We used the following logic to define these groups:

- ➡ If GPS respondents reported that they had made comprehensive energy efficiency upgrades to their homes, we categorized them as "Comprehensive Upgraders."

[43] One-way ANOVA, F=415.8, p<0.01

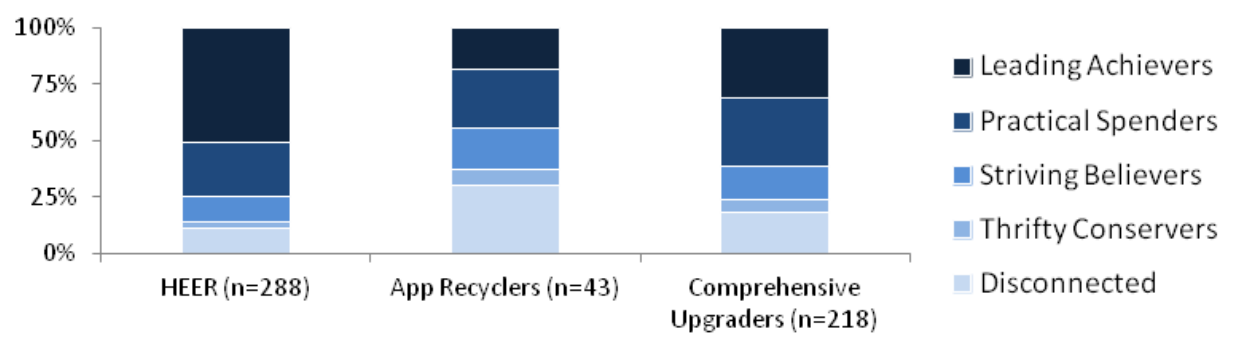
[44] One-way ANOVA, F=2.9, p<0.01

[45] As noted earlier, the GPS survey was conducted in coordination with the HEER process evaluation survey of 500 participants in PG&E SCE and service territories.

- If GPS respondents, who were not classified as "Comprehensive Upgraders," reported that they recycled an old refrigerator or a freezer and got a utility rebate for this, we categorized them as "Appliance Recyclers."
- All respondents of the HEER Process Evaluation Survey bought an efficient appliance and got a utility rebate for it. Therefore, we categorized these respondents as "HEER Participants."

We examined segment distributions among these three behavior groups: *Comprehensive Upgraders*, *Appliance Recyclers*, and *HEER Participants*. We found that ***Leading Achievers*** and ***Practical Spenders*** were dominant among *HEER Participants* and *Comprehensive Upgraders*. ***Disconnected*** were dominant among *Appliance Recyclers*.

Figure 25: Segment Distributions across Groups Engaged in Energy Efficiency Behaviors



AKAB PROFILE

When we examined akAB score differences by segments, we found that ***Thrifty Conservers*** and ***Practical Spenders*** tended to have the lowest mean scores across all environmental akAB constructs (Figure 26). ***Disconnected*** had the highest *concern* for and *responsibility* for energy use impacts on finances across all segments (Figure 27). ***Disconnected*** also had the lowest incomes among all the groups.

Figure 26: Mean akAB Environmental Scores by Market Segment[46]

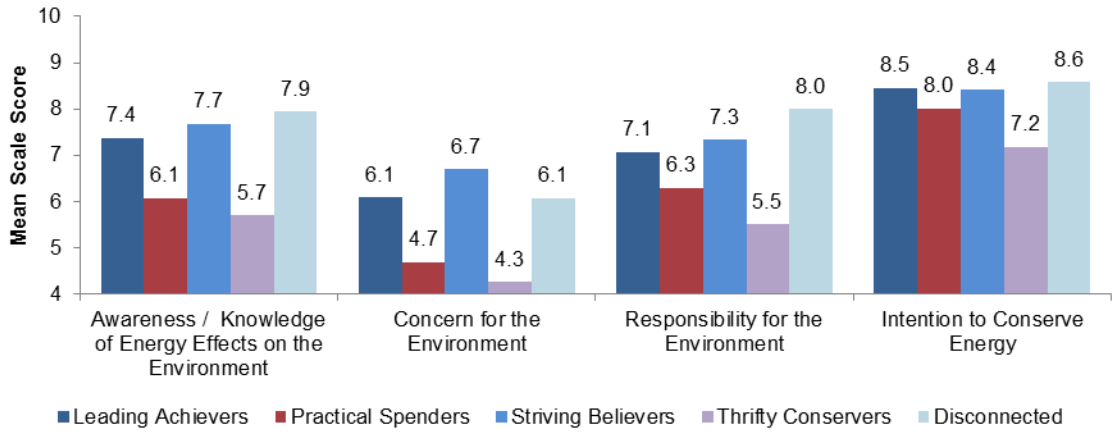
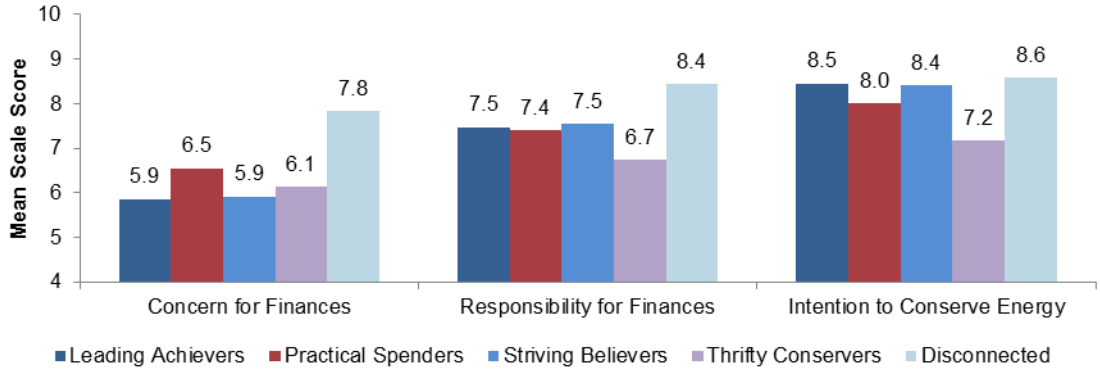


Figure 27: Mean akAB Financial Scores by Market Segment



BRAND AND PROGRAM AWARENESS

To examine customer awareness of energy efficiency brands and programs in the California residential sector, we asked California residents who agreed to take the GPS survey to report whether they had heard of the following labels or programs:

- ENERGY STAR;
- ENERGY STAR Most Efficient;
- TopTen,[47]

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46 ANOVAs for each akAB construct was significant with a p<.001.

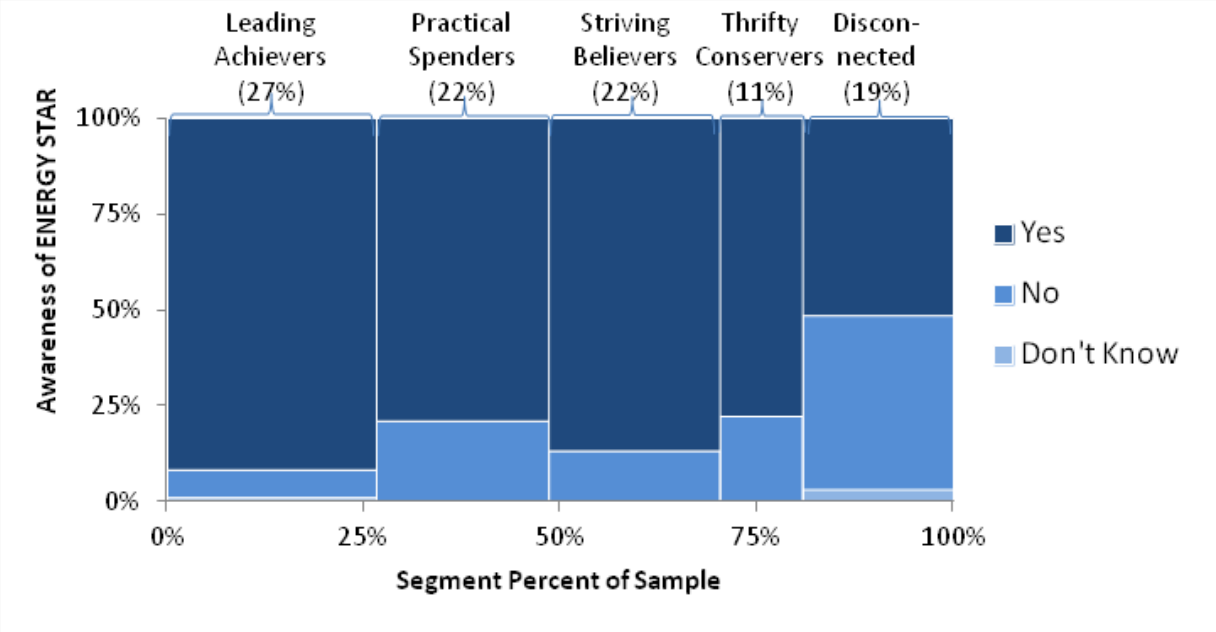
47 TopTen, a non-profit organization, identifies and publishes information about the most energy-efficient products on the market at www.toptenusa.org.

- Flex Your Power; and,
- Energy Upgrade California.

In Figure 28 through Figure 32, we display levels of brand and program awareness across segments. ***Disconnected*** were significantly less likely to be aware of ENERGY STAR and Flex Your Power program.[48] Awareness of ENERGY STAR Most Efficient, Energy Upgrade California, and TopTen was low and did not vary across segments.

ENERGY STAR Most Efficient and Energy Upgrade California programs are relatively new, whereas ENERGY STAR, Flex Your Power, and TopTen label are not. We inquired about Flex Your Power, in particular, as a proxy for prior utility funded mass-media campaigns. Approximately half of the customers in all segments, except for those in the ***Disconnected*** segment, were aware of Flex Your Power, and almost all customers in all segments, except for those in the ***Disconnected*** segment, knew about the ENERGY STAR logo. This shows the effect of a 10-year statewide mass media marketing campaign (Flex Your Power) compared to the national 20-year ENERGY STAR marketing campaign.

Figure 28: ENERGY STAR Awareness in Each Segment (n=927)



[48] Pearson Chi-square test, $\chi^2_{ENERGY\ STAR}=116.1$ and $\chi^2_{FlexYourPower}=63.2$, $p<0.01$

Figure 29: ENERGY STAR Most Efficient Awareness in Each Segment (n=927)

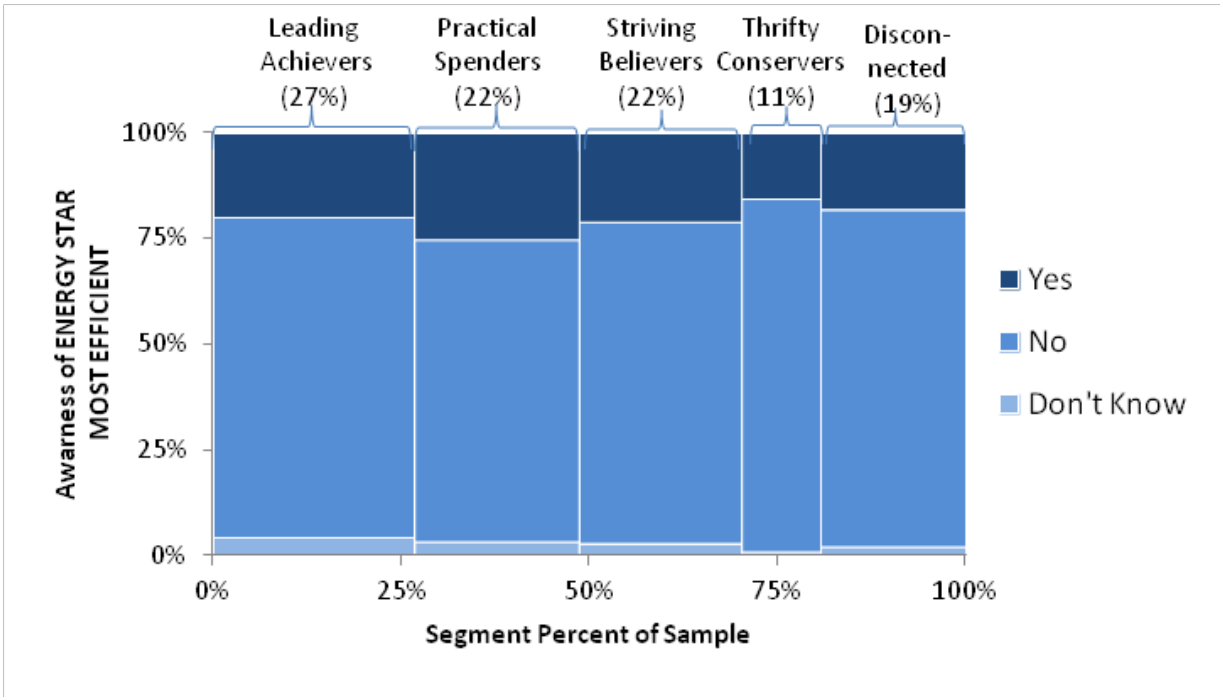


Figure 30: TopTen Awareness in Each Segment (n=927)

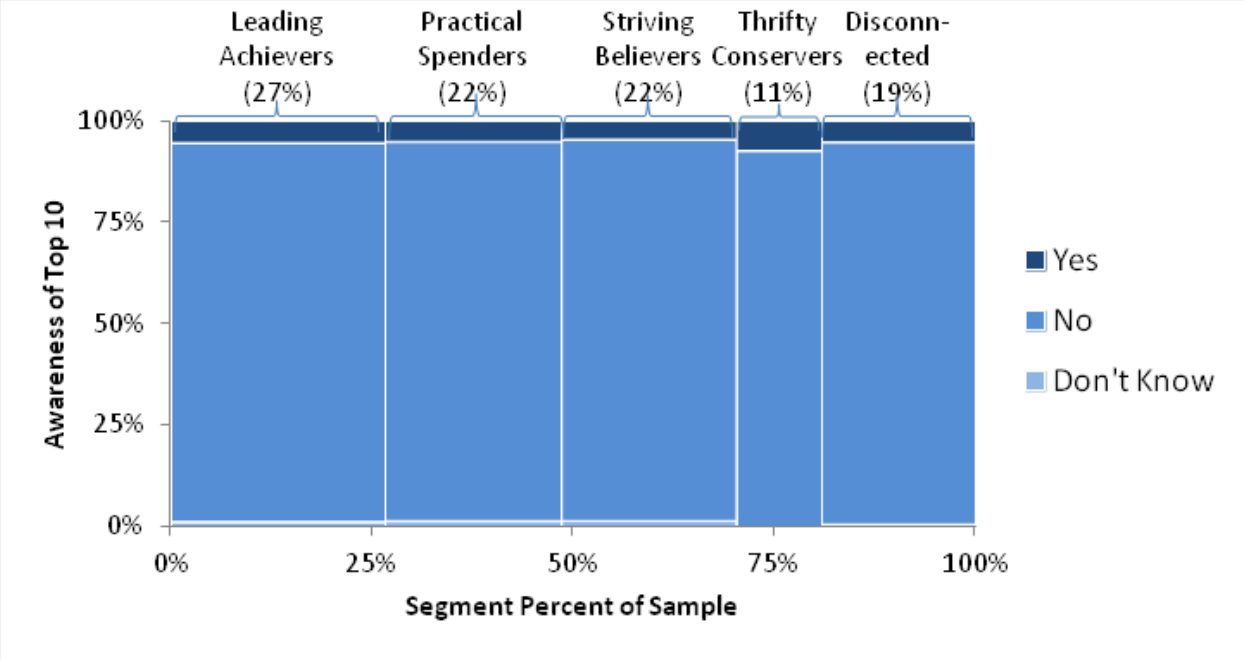


Figure 31: Flex Your Power Awareness in Each Segment (n=927)

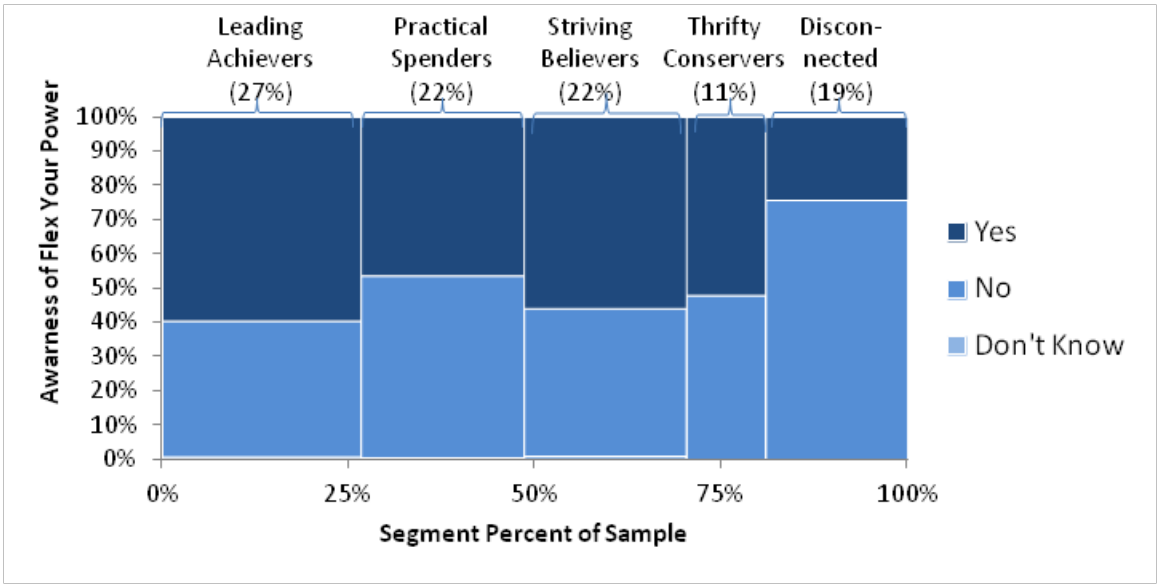
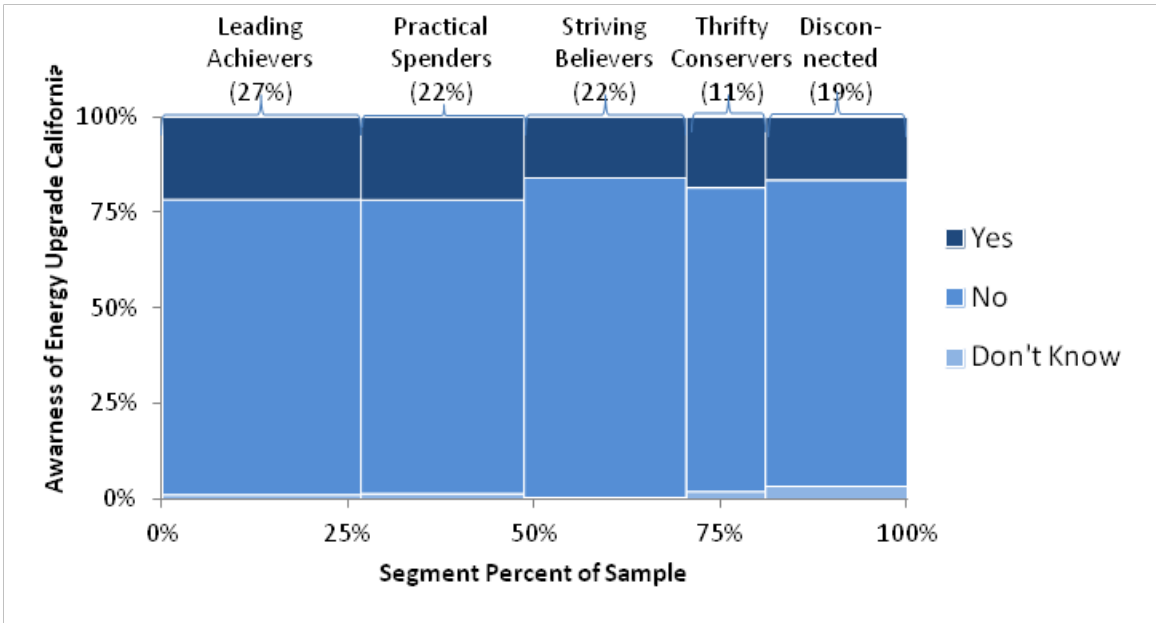


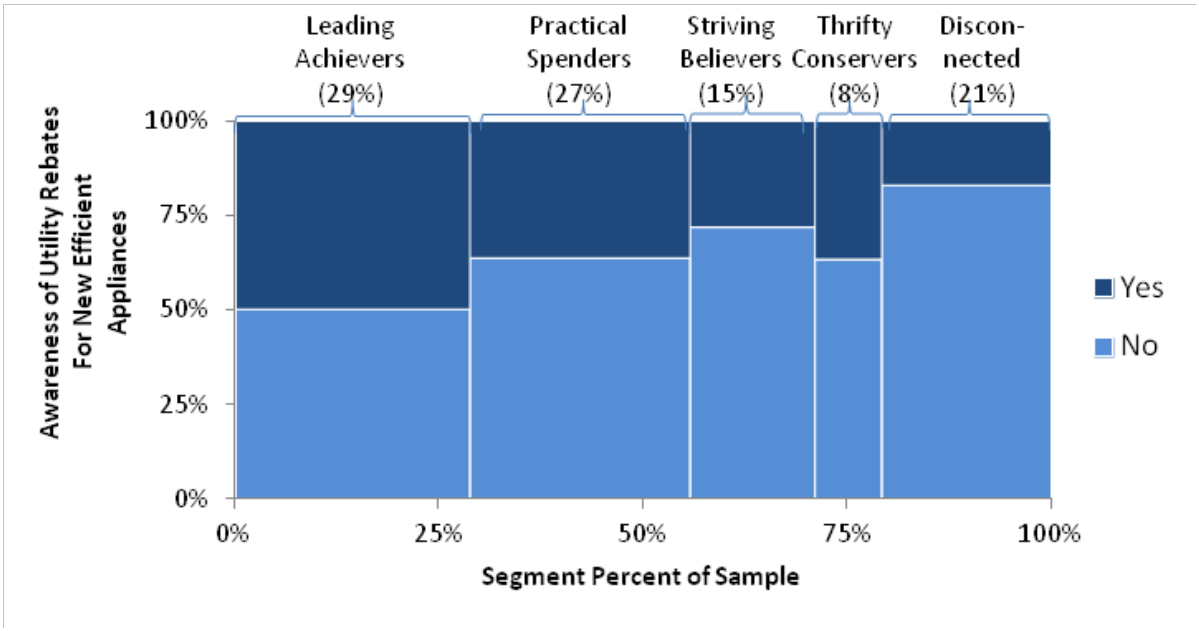
Figure 32: Energy Upgrade California Awareness in Each Segment (n=927)



We also asked GPS respondents who recently bought a refrigerator, clothes washer, water heater, or room air-conditioner whether they had heard that their utility offers rebates for an energy-efficient version of the appliance they had bought. Of 927 GPS respondents, 400 had bought an appliance and responded to this question. Analysis of this data revealed that one-half of ***Leading Achievers*** and less than half of ***Practical Spenders***, ***Thrifty Conservers***, and ***Striving Believers***

were aware of these rebates. ***Disconnected*** had the lowest awareness of HEER rebates - only 17% were aware of these rebates. These differences were significant[49] (Figure 33).

Figure 33: HEER Rebate Awareness in Each Segment (n=400)

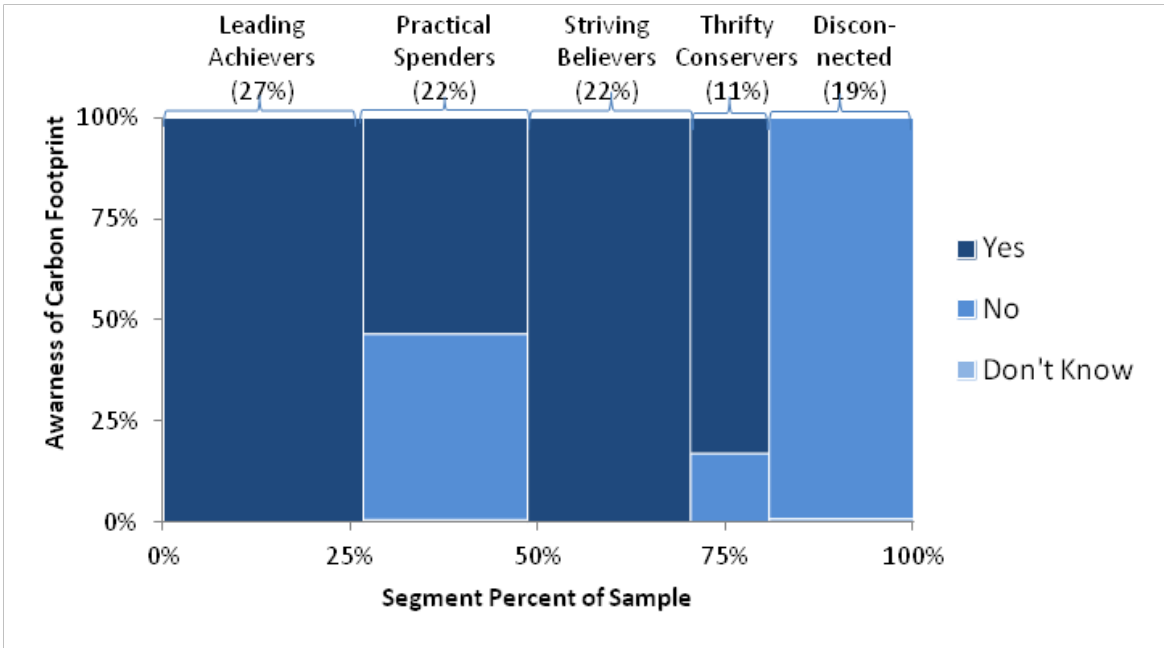


Last, we present notable differences in respondents' awareness of the "carbon footprint" concept.[50] Responses to this question were included in the set of variables used for defining the segments. Figure 34 shows that all ***Striving Believers*** and ***Leading Achievers***, and nearly all ***Thrifty Conservers*** had heard of the "carbon footprint" term. The opposite was found in the ***Disconnected*** segment; all were unaware of this concept. Additionally, half of ***Practical Spenders*** were aware of this concept.

[49] Pearson Chi-square test, $\chi 2=24.24$, $p<0.05$)

[50] Pearson Chi-square test, $\chi^2=627.5$ $p<0.05$

Figure 34: Awareness of Carbon Footprint in Each Segment (n=927)



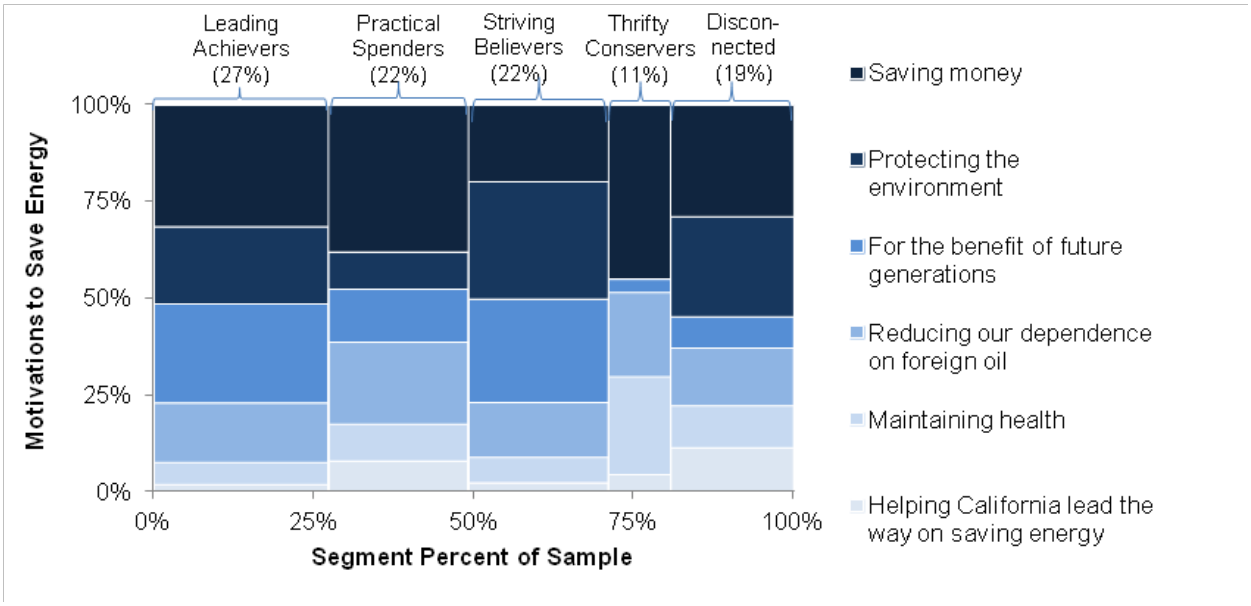
MOTIVATION TO SAVE ENERGY

To assess people's motivations for reducing energy use in their homes, we asked residents who agreed to take the GPS survey about their motivations for saving energy. Specifically, we listed six motivations why people may choose to reduce their home energy use and asked respondents which of these six motivations would most motivate them to conserve energy in their home. Responses to this question were included in the set of variables used for defining the segments.

We display notable differences in motivations for saving energy across segments[51] (Figure 35). For nearly one-half of ***Thrifty Consumers*** and for more than one-third of ***Practical Spenders,*** "saving money" was their primary reason to reduce energy use in their homes. The top two reasons ***Disconnected*** gave for saving energy in their home were "saving money" and "protecting the environment" (Figure 35). The top two reasons for saving energy in a home among ***Striving Believers*** were "protecting the environment" and "for the benefit of future generations" (Figure 35). One-third of ***Leading Achievers*** said that "saving money" motivates them to conserve energy, and another one-quarter of ***Leading Achievers*** reported wanting to save energy "for the benefit of future generations."

[51] Pearson Chi-square test, χ^2=154.4, p<0.05

Figure 35: Motivations for Saving Energy in the Home (n=903)



CONCLUSIONS AND MARKETING RECOMMENDATIONS

Overall, the segmentation analysis revealed the following:

- ***Leading Achievers*** comprise 27% of the overall GPS sample. They are highly educated and older homeowners with the highest incomes. They are readily adopting energy efficiency goods and services, since they have invested in various *low- to medium-cost* energy efficiency measures. Additionally, one-quarter of them have done a comprehensive home energy upgrade. They also are very aware of the *ENERGY STAR* label and "carbon footprint" concept. Their *awareness*, *concern*, and *responsibility* akAB scores for the environment are relatively high. However, only half of them are aware of HEER rebates, and hardly any of them are aware of *Energy Upgrade California* and *ENERGY STAR Most Efficient*.

- ***Practical Spenders*** comprise 22% of the overall GPS sample. They are older homeowners with high incomes and moderate levels of education. They have installed various *low- to medium*-cost energy efficiency measures. Additionally, one-quarter of them have done a comprehensive home energy upgrade. However, less than half of them are aware of HEER rebates, and hardly any of them are aware of *Energy Upgrade California* and *ENERGY STAR Most Efficient*. Their *awareness* and *concern* akAB scores for the environment are relatively low.

- ***Striving Believers*** comprise 22% of the overall sample. They are relatively younger residents (on average around 48 years old) with moderate incomes and high education. Although their *awareness*, *concern*, and *responsibility* akAB scores for the environment

are relatively high, they are less likely to install *low-to medium-cost* energy efficiency measures in their homes since slightly more than half of them are renters. They have low awareness of *ENERGY STAR Most Efficient*, HEER rebates, and *Energy Upgrade California.*

- ***Thrifty Conservers*** comprise 11% of the overall sample. Half of them are renters and they are less likely to install *low- to medium-cost* efficiency measures in their homes. These residents are older and their incomes are moderate. They have low awareness of *ENERGY STAR Most Efficient*, HEER rebates, and *Energy Upgrade California.* Their *awareness*, *concern*, and *responsibility* akAB scores for the environment are relatively low.

- ***Disconnected*** comprise 19% of the overall sample. They are relatively younger residents (on average around 47 years old). They are more likely to speak Spanish at home and half of them are Hispanic. Although their *awareness*, *concern*, and *responsibility* akAB scores for the environment are relatively high, they are less likely to install *low-to medium-cost* energy efficiency measures in their homes since more than half of them are renters and earn less than $40,000 per year. One-third of them recycled an old refrigerator or freezer and received a utility rebate for this action. They have the lowest awareness of the *ENERGY STAR* logo, and generally, have never heard of the term "carbon footprint."

We recommend targeting ***Practical Spenders*** with financially focused messages and targeting ***Leading Achievers*** with the environmentally focused messages about energy efficiency. ***Leading Achievers*** and ***Practical Spenders*** have the financial means to invest in more expensive energy efficiency upgrades; however, ***Practical Spenders***, unlike ***Leading Achievers***, are less *aware* of and less *concerned* about the energy effects on the environment.

We also recommend targeting middle-income households with lower price-point appliances. ***Striving Believers*** are middle-income households that are responsive to environmentally focused messages because they are *aware* of, *concerned* about, and feel *responsible* for the effects of energy use on the environment. However, half of ***Striving Believers*** are renters, so we recommend tailoring energy efficiency messages to homeowners and renters separately.

Finally, we recommend targeting the ***Disconnected*** with financially and environmentally focused messages that emphasize environmental and financial benefits of ENERGY STAR products. ***Disconnected*** are generally unaware of ENERGY STAR logo. They care for the environment, but are also highly *concerned* about energy use impact on finances. Half of ***Disconnected*** are Hispanic and majority of them have low incomes. Thus, an outreach approach focusing on low-cost efficiency measures by using messages in Spanish and English may be most effective.

5 GPS PRODUCT-SPECIFIC RESULTS

The GPS was intended to support the Home Energy Efficiency Rebate (HEER) and Business and Consumer Electronics (BCE) program evaluations. Therefore, the overall GPS sample had to include households who were or could be HEER or BCE participants.

To identify these households, we asked residents in PG&E and SCE service territories whether they had bought selected appliances or electronic products relevant to HEER and BCE programs. Table 9 shows the HEER and BCE program product types we targeted with the GPS survey, and the product we targeted in each utility.

Table 9: Targeted Appliances and Electronics by Utility

PROGRAM	PRODUCTS	PG&E	SCE
HEER	Refrigerators	--	✓
	Clothes Washers	✓	--
	Water Heaters	✓	✓
	Room Air-conditioners	✓	✓
BCE	TVs	✓	✓
	Desktop Computers	✓	✓
	Streaming Media Devices[1]	--	--

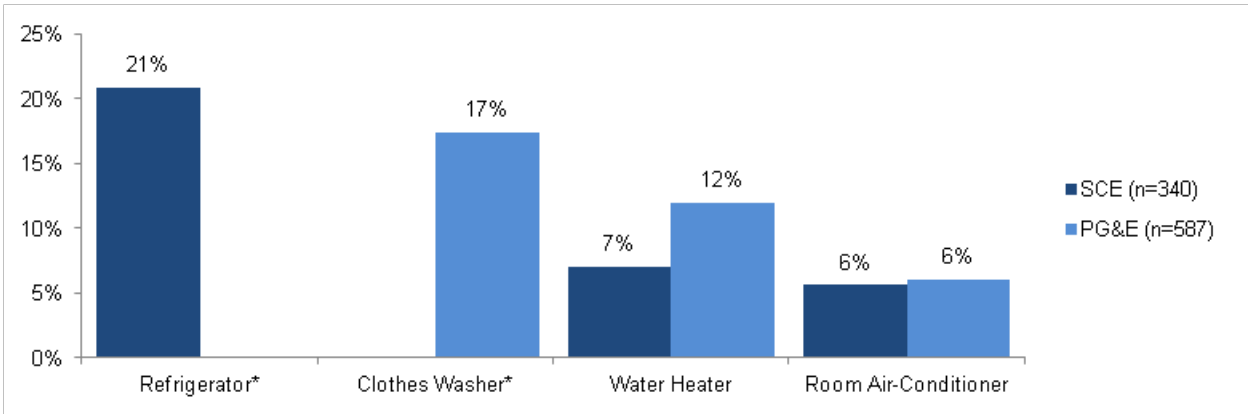
1 We targeted streaming media devices to assess future BCE program opportunities for utilities.

We discuss product-specific results in the next sections and when possible, we compare our results with findings from the 2012 HEER program evaluation. We present only the weighted results.

APPLIANCE PURCHASES AND UTILITY REBATES

In the GPS, we asked residents who were customers of PG&E and SCE to tell us whether they recently had bought a refrigerator, clothes washer, water heater, or room air-conditioner. Of 587 PG&E customers, 17% purchased a clothes washer, 12% purchased a water heater, and 6% purchased a room air-conditioner in the past two years. Of 340 SCE customers, 21%, had bought a refrigerator, 7% bought a water heater, and 6% bought a room air-conditioner since 2010 (Figure 36).

Figure 36: Appliance Product Purchases since 2010



* PG&E customers were not asked about refrigerators. SCE customers were not asked about clothes washers.

Customers who bought any of the selected appliances reported whether they had heard that their utility offered rebates for the energy-efficient version of the appliance they bought. Between one-half and two-thirds of PG&E customers had heard of the PG&E rebates for new efficient clothes washers and water heaters, and nearly three-quarters of SCE customers knew about SCE's rebates for new efficient refrigerators (Table 10). A minority of PG&E and SCE customers were aware of the utility rebates for air-conditioners (Table 10).

Table 10: Percent of Customers Aware of the Utility Rebate for a Select Product

Appliance Purchasers	PG&E	SCE	California
Refrigerator (n=70)	-	71%	-
Clothes Washer (n=102)	67%	-	-
Water Heaters (n=95)	57%	41%	53%
Room Air-Conditioners (n=52)	39%	21%	33%

To assess program participation in the PG&E and SCE HEER program, we asked customers who bought an appliance and heard of utility rebates whether they received a rebate check from the utility for the appliance they bought. We considered the respondents who reported receiving a rebate check from the utility to be participants of the PG&E and SCE HEER program.

Table 11 compares the participation rate in the PG&E and SCE HEER program by appliance type. The program participation rate was highest among those who bought refrigerators and clothes washers and relatively low among those who purchased water heaters and room air-conditioners.

Table 11: Percent of Customers Receiving a Utility Rebate for the Select Product

Appliance Purchasers	PG&E	SCE	California
Refrigerator (n=70)	-	30%	-
Clothes Washer (n=102)	26%	-	-
Water Heaters (n=95)	3%	5%	3%
Room Air-Conditioners (n=52)	3%	0%	2%

PREFERENCES FOR ENERGY-EFFICIENT PRODUCTS AND INFORMATION SOURCES

To understand residents' preferences for an energy-efficient appliance, we asked those who bought a selected appliance whether they intended to buy an ENERGY STAR appliance at the time that they were purchasing an appliance. At least two-thirds of those who bought a refrigerator, clothes washer, water heater, or a room air-conditioner said they planned to buy an ENERGY STAR appliance (Table 12).

Table 12: Appliance Purchasers' Intention to Buy an ENERGY STAR Product

Appliance Purchasers	Planned To Buy An ENERGY STAR Appliance
Refrigerator (n=70)	82%
Clothes Washer (n=102)	76%
Water Heaters (n=95)	67%
Room Air-Conditioners (n=52)	73%

Next, we identified residents who did not receive a rebate from the utility for the purchase of their appliance, and classified them as "nonparticipants" of the HEER program. We subdivided nonparticipants into those who looked for an ENERGY STAR appliance and those who did not. Then, we compared these nonparticipants from the GPS dataset with HEER participants from the HEER process evaluation dataset[52] to examine where these groups found information for the appliances they had bought.

More HEER participants who bought water heaters and room air-conditioners said they looked for information via the internet than either nonparticipant group. More HEER participants looked for refrigerator information via the internet than nonparticipants not seeking ENERGY STAR refrigerators; however, more nonparticipants seeking ENERGY STAR refrigerators searched for information via the internet than did HEER participants. We display these results in Table 13.

[52] The GPS survey was conducted in coordination with the HEER process evaluation survey of 500 participants in SCE and PG&E service territories.

A greater number of higher-income HEER participants[53] (44%) sought appliance information via the internet than did HEER participants with a lower household income (33%, z=2.16, p=.02).

Table 13: Methods of Gathering Appliance Information, by Population and Product Type (Multiple Responses Allowed)

	Water Heater			Refrigerator			Room A/C		
	Nonparticipant			Nonparticipant			Nonparticipant		
Methods	Seeking ES[1] (N=36)	Not Seeking ES[1] (N=18)	HEER % (N=53)	Seeking ES[1] (N=25)	Not Seeking ES[1] (N=10)	HEER % (N=130)	Seeking ES[1] (N=22)	Not Seeking ES[1] (N=12)	HEER % (N=116)
Retailers/ Salesperson	50%	33%	34%	60%	60%	56%	45%	58%	45%
Installation Contractor	22%	44%	19%	4%	-	1%	-	-	1%
Internet	22%	6%	43%	32%	10%	25%	23%	17%	37%
Word-of-mouth	3%	11%	8%	-	10%	6%	5%	17%	3%
Investor-Owned Utility	-	-	6%	-	-	2%	-	-	10%
Other gas/ electric utility	-	-	-	-	-	-	-	-	1%
Consumer Reports	-	-	6%	12%	20%	12%	9%	-	3%
Other magazines	-	-	2%	-	-	-	-	-	-
Newspaper	-	-	-	-	-	5%	-	-	5%
Radio	-	-	-	-	-	-	-	-	2%
TV	-	-	-	-	-	-	5%	8%	3%
Didn't look	-	11%	4%	-	-	8%	5%	-	15%
Other	-	-	4%	4%	10%	6%	9%	8%	3%
Don't know	3%	6%	-	-	-	2%	5%	-	3%
Refused	-	-	-	4%	-	1%	-	8%	-

1 ES = ENERGY STAR

We also asked nonparticipants in the GPS survey and HEER participants in the HEER process evaluation survey to report their reasons for selecting the particular appliance model they bought.

53 The evaluation team broke household income into two groups: “higher income” households, which made $50,000 or more, and “lower income” households, which made less than $50,000 annually.

Across all three appliances displayed in Table 14, more HEER participants than both nonparticipant groups said they bought their appliance because it had the features they wanted. More HEER participants and nonparticipants seeking ENERGY STAR appliances bought them because they cost less to operate.

Fewer HEER participants than nonparticipants bought their water heater because it was the right size for their home.

Table 14: Reasons for Buying Specific Model, by Population and Product Type (Multiple Responses Allowed)

Reasons For Purchase	Water Heater			Refrigerator			Room A/C		
	Nonparticipant			Nonparticipant			Nonparticipant		
	Seeking ES[1] (N=36)	Not Seeking ES[1] (N=18)	HEER % (N=53)	Seeking ES[1] (N=25)	Not Seeking ES[1] (N=10)	HEER % (N=130)	Seeking ES[1] (N=22)	Not Seeking ES[1] (N=12)	HEER % (N=116)
It was a good value/in my price range	25%	13%	30%	28%	36%	31%	30%	31%	51%
It costs less to operate/energy savings	14%	-	25%	20%	-	18%	10%	-	13%
It was the right size, color	22%	38%	9%	44%	27%	56%	25%	38%	33%
It had an ENERGY STAR Label	6%	-	4%	8%	-	1%	10%	-	6%
The contractor/retailer recommended	17%	19%	19%	-	-	3%	-	8%	3%
It was energy-efficient	8%	-	15%	4%	-	5%	5%	-	7%
There was a rebate for it	-	-	6%	-	-	5%	-	-	15%
It had good reviews/recommended by others	3%	13%	17%	8%	9%	5%	15%	8%	9%
It had the features I wanted	8%	-	25%	20%	9%	37%	5%	-	29%
Same/similar to previous model	3%	6%	8%	-	-	4%	-	-	2%
I wanted that brand	3%	-	6%	4%	-	12%	5%	-	6%
It was all that was available/only choice	6%	13%	9%	-	9%	1%	5%	-	3%
It was good for the environment	-	-	2%	-	-	-	-	-	2%
Other	6%	6%	2%	8%	27%	2%	10%	23%	-
Don't know	3%	6%	6%	-	9%	2%	-	8%	2%

1 ES = ENERGY STAR

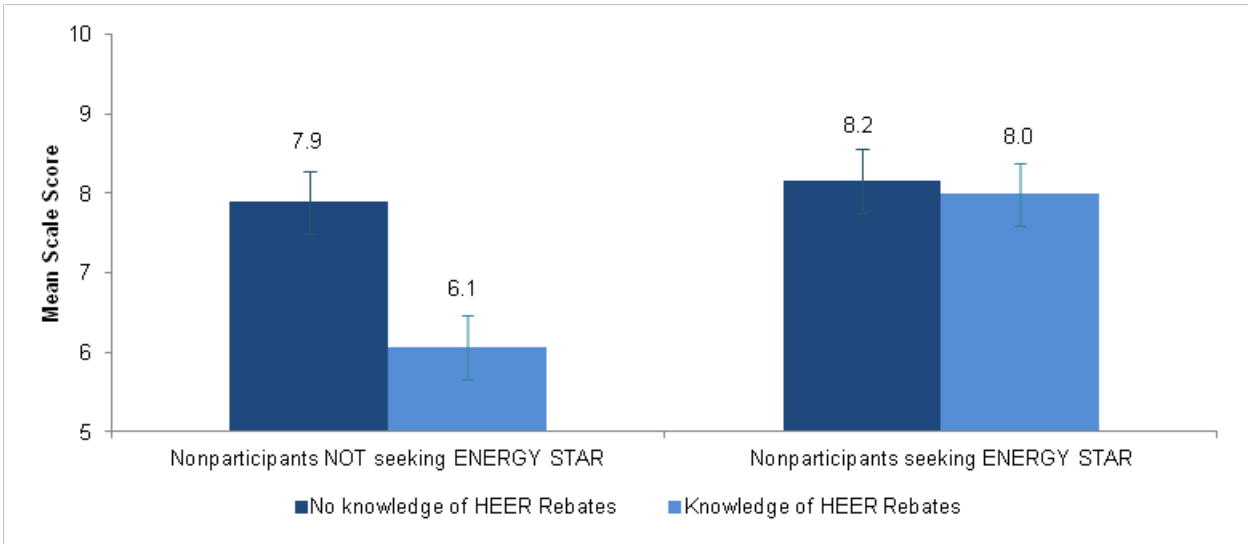
Finally, we examined the nonparticipant akAB responses between those who were aware and those who were unaware of the utility rebates for new energy-efficient appliances. The analysis revealed that half of nonparticipants who searched for an ENERGY STAR appliance and half of nonparticipants who had not looked for an ENERGY STAR appliance knew they could receive a utility rebate for a purchase of an energy-efficient appliance (Table 15). This means that knowledge of HEER rebates did not vary across nonparticipant groups.

Table 15: Nonparticipants' Knowledge of Utility Appliance Rebates

KNOWLEDGE OF REBATE	NONPARTICIPANTS SEEKING ENERGY STAR (N=93)	NONPARTICIPANTS NOT SEEKING ENERGY STAR (N=48)
Aware of Utility Rebates (HEER Rebates)	49%	50%
NOT Aware of Utility Rebates (HEER Rebates)	51%	50%

We also learned that nonparticipants seeking ENERGY STAR appliances expressed a high *responsibility* for finances irrespective of whether they knew about HEER rebates, but nonparticipants not seeking ENERGY STAR appliances expressed marginally lower *responsibility* for finances if they did know about HEER rebates[54] (Figure 37). These results suggest that nonparticipants not seeking ENERGY STAR appliances were more likely to feel *responsible* about energy effects on their finances when they were not aware of HEER rebates.

Figure 37: Interaction between Group and Knowledge of HEER Rebate for Responsibility for Finances Scale

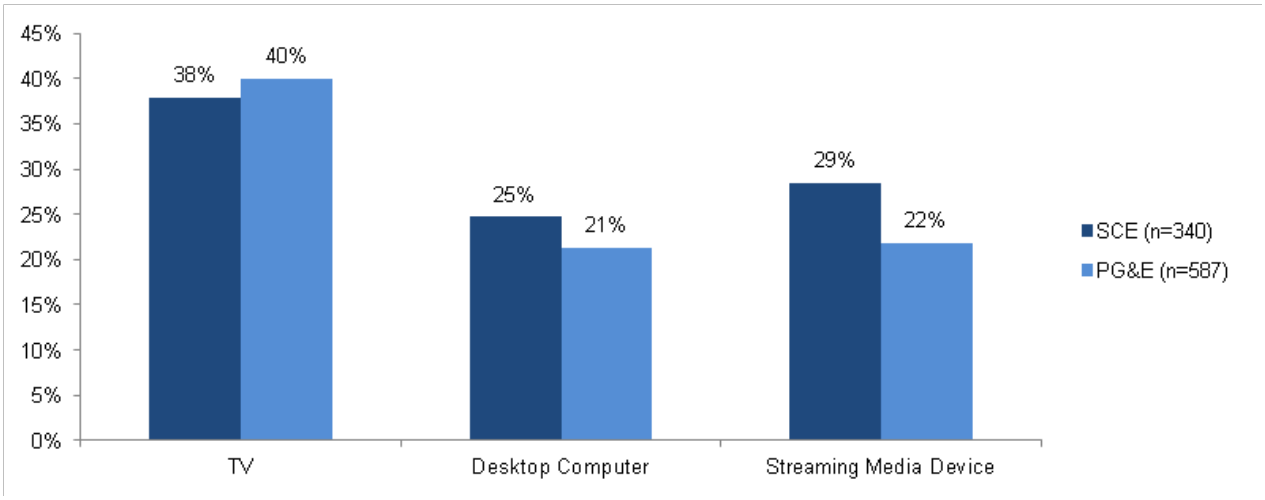


[54] Significant 2x2 ANOVA interaction between group and awareness of HEER rebates, $F(1,133)=3.30$, p=.07

ELECTRONICS PURCHASES

In the GPS, we asked residents who are customers of PG&E and SCE to tell us whether they had recently bought a TV, desktop computer, or a streaming media device. Of 587 PG&E customers, 40% had bought a TV, 21% had bought a desktop computer, and 22% had bought a streaming media device in the past two years Of 340 SCE customers, 38% bought a TV, 25% bought a desktop computer, and 29% bought a streaming media device (Figure 38).

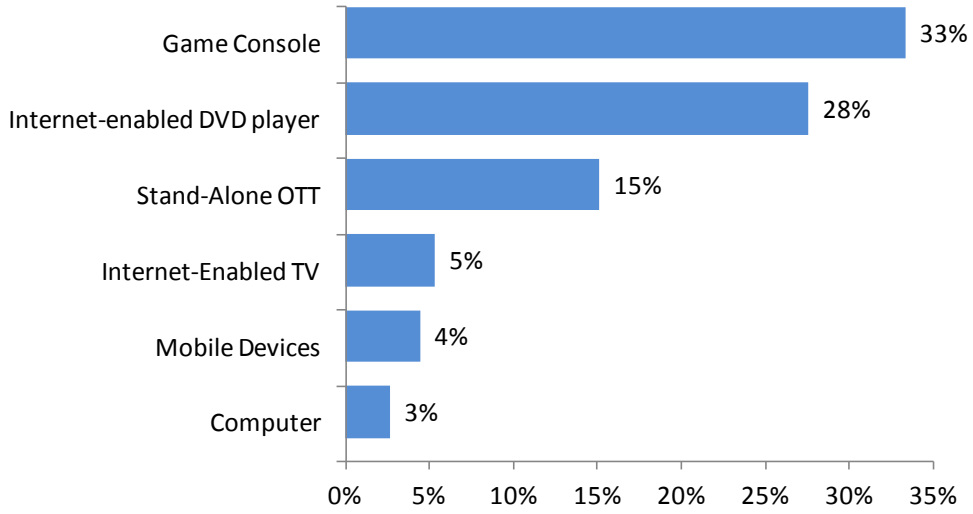
Figure 38: Electronic Product Purchases Since 2010



We asked residents who bought a streaming media device to identify the type of device they have purchased. Game consoles and internet-enabled DVD players were the most commonly purchased devices (Figure 39). Further analysis of this data revealed that households with children, higher-income households, and younger respondents were significantly more likely to buy streaming media devices in the last two years.[55]

[55] Pearson Chi-square $\chi^2_{\text{households with children}}$ =21.9; Mann-Whitney U $_{\text{income}}$,=34687; One-way ANOVA, F_{age} =32.8; all tests p<0.01

Figure 39: Types of Streaming Media Devices Bought in the California Market (n=225)[1]



1 Thirteen of 225 respondents (or 6%) bought more than one streaming media device.

Note: Stand-alone over-the-top (OTT) devices, like Roku or Apple TV, differ from other types of streaming media devices in that their sole function is to bring streaming content to users' TVs.

PREFERENCES FOR ENERGY-EFFICIENT PRODUCTS AND PLACE OF PURCHASE

To understand residents' preferences for energy-efficient electronic products, we asked those who bought a TV or desktop computer whether they intended to buy an ENERGY STAR TV or desktop computer when they were looking to buy such goods. One-half of those who bought a TV said they had planned to buy an ENERGY STAR TV, while less than one-third of those who bought a desktop computer had planned to buy an ENERGY STAR computer. (Table 16).

Table 16: Appliance Purchasers' Preference for an ENERGY STAR Product

ELECTRONICS	PLANNED TO BUY AN ENERGY STAR PRODUCT
TV (n=361)	50%
Desktop Computers (n=210)	29%

We also asked respondents who bought a TV or desktop computer where they had bought their product. A majority (82%) of customers who purchased a TV and nearly two-thirds (63%) of customers who purchased a desktop computer said they bought them new from a retail store (Table 17).

Table 17: Place of Purchase

PLACE OF PURCHASE	TV (N=363)	DESKTOP COMPUTER (N=210)
New at a retail store (e.g., Best Buy)	82%	63%
New from an online retailer	11%%	13%
Used from a website, garage sale, or some other place	4%	6%
New directly from manufacturer	2%	10%
Other- It was custom built by specialist	-	3%
Other	1%	4%
Don't Know	0%	2%

CONCLUSIONS AND MARKETING RECOMMENDATIONS

Overall, since 2010, many more electronic products have been bought than appliances. Additionally, vast majority of customers who bought an appliance intended to purchase an energy-efficient version of that appliance. In contrast, one-half of the customers who bought a TV and one-third of the customers who bought a desktop computer intended to buy an energy-efficient version of the product when they were looking to buy such goods. This suggests that some customers may not be aware of energy efficiency options for electronic goods.

> **Key Marketing Recommendation**: Marketing messages should emphasize that there are energy-efficient options for electronic goods such as ENERGY STAR TVs or ENERGY STAR settings for computers.

6 RESIDENTIAL PROGRAM PERFORMANCE METRICS (PPMS)

BACKGROUND

The residential Program Performance Metrics (PPM) accepted by the California Public Utility Commission (CPUC) and the investor-owned utilities (IOUs) in 2010 include one related to akA: "By targeted populations (homeowners, renters, property owners/managers), percent increase in the level of: (a) energy efficiency awareness (b) energy efficiency knowledge (c) energy efficiency attitude (i.e., akA)." In other words, IOUs are to track akA among homeowners, renters, and property owners/managers. Of those populations, those that apply to the current project are homeowners and renters. Since the akAB stage model is an expansion of the original akA concept, this research team has been asked to recommend a set of questions from the akAB battery that could serve as the PPM tracking metrics.

In order to commit to any PPM metrics, we first must address some basic issues we have not discussed earlier. Are the metrics meant to track the movement of the general population on akA? Or are they meant to track program participants? If it is the former, it is an enormous undertaking for utility programs to "move" the entire residential sector's awareness, knowledge, and attitudes. If it is the latter, and we determine that program participants have higher (better) scores over time, it is not clear how to interpret this change. Would it reflect better education and persuasion of participants by the programs? Or would it indicate that the programs had recruited more customers who already were convinced about conservation or energy efficiency—in other words, free-riders?

Another issue that we must consider is what the object of the awareness, knowledge, and attitudes should be. The akAB model has focused on environmental and financial motivations for change, as addressing these is most likely to lead to durable change in customers' energy-efficient behaviors. Presumably, the point of tracking akA over time is to track the effectiveness of the utility programs in getting people to change their attitudes and habits so the desired behaviors continue after a program has ended. Such a durable change would occur when customers become convinced that it is important to change their behaviors. That attitude likely would spring from their convictions about the environment and/or, to a lesser extent, their own financial interests. This is the reason we have focused on environmental and financial motivations for change, rather than on immediate triggers or motivations to participate in a program at the moment of decision.

However, it is not clear that residential programs have focused on environmental or financial motivations for change. If programs do not focus their messaging on environmental or financial concerns, it would be unfair to measure their successes in communicating those attitudes via environmental or financial akA items. Accordingly, researchers should measure success on other types of akA—perhaps awareness of the concept of energy efficiency or of ENERGY STAR. The difficulty with this approach is that a great deal of research in marketing and in social

psychology demonstrates that people do not change their behavior only on the basis of their awareness of a given topic or issue, or even on the basis of information alone. So, focusing on the akA with respect to being aware of energy efficiency concept, ENERGY STAR, or a utility program would not provide much information about whether people actually were being moved to change their behavior permanently.

We consider it more reasonable to focus on the akA of program participants, and how to interpret any changes in akA among participants over a period of years or program cycles. We suggest that the most meaningful approach would be to track and compare akA scores of participants and nonparticipants, and to connect any participant akA-related changes to other self-reported behaviors. The residential program logic models always include an expectation that participation in the program will cause customers to increase their awareness, knowledge, and attitudes, and that this will lead them to engage in spillover behavior. Indications of simultaneous increases in akA and spillover behavior will be worth tracking.

PROGRAM PERFORMANCE METRICS (PPMS)

The PPMs ideally should measure whether residential programs or campaigns changed customers' akA perceptions over time, and whether an increase in akA is related to self-reported spillover behavior. In this chapter, we present two possible options for residential PPMs.

General PPM

The CPUC asked utilities to track participants' akA. The akAB research reported in this study demonstrates that it is possible to track different akA factors: perceptions about energy effects on the environment, finances, or other relevant issues. The challenge is to connect what the akAB research has found with the purpose of an akA metric requested by the CPUC. For example, utilities could track the program participants' mean scores for each akA construct to determine whether there are any changes in the program akA scores over time, and then examine any akA changes with participants' responses to program spillover questions (Table 18). Furthermore, utilities could consider tracking akA responses of the same participants to determine if participants' akA perceptions changed because of the program. Achieving this second approach would optimally require a longitudinal approach, conducting surveys with participants just after their participation in the program, and then, one year later.

Table 18: Mean akA Construct Scores using HEER Participants as an Example

akAB Constructs	akA Mean Score in 2012[1]	akA Mean Score in 2013
Awareness/Knowledge of Energy Effects on the Environment		
Household electricity has an impact on the environment. Conserving electricity will help reduce global warming.	7.1	TBD[2]

akAB Constructs	akA Mean Score in 2012[1]	akA Mean Score in 2013
Concern for the Environment		
I am very concerned about how energy use affects the environment. How worried are you about global warming? (use 0-10 scale where 0= Not at all worried and 10=Extremely worried)	5.7	TBD
Responsibility for the Environment		
It is my responsibility to use as little energy as possible to help the environment. I feel guilty if I use too much energy.	6.9	TBD
Concern for Finances		
I sometimes worry whether there is enough money to pay my energy bill. I often worry that the cost of energy for my home will increase.	5.7	TBD
Responsibility for Finances		
If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs. I have to take the lead in my household if we're going to keep our utility bills down. If my utility bill goes up, I feel like I must do something to reduce it.	7.5	TBD

1 Means are from the 2012 HEER survey.

2 TBD= To Be Determined

Going forward, the following steps can be taken to analyze the data in Table 1818.

- If 2012 and 2013 akA means differ significantly, estimate the difference between means.
- Examine how this change relates to program spillover and motivations for participating in a program.

We believe that it is reasonable to use the general PPM for program participants across all programs, **but suggest caution** when comparing program participant groups, since not all utility programs focus on environmental or financial motivations for change.

Program-Specific PPM

Second, for a program-specific PPM, we suggest comparing mean akA scores for the nonparticipant groups with the program participant group over time (Table 4Table 19). As discussed earlier, nonparticipants seeking ENERGY STAR products generally have higher mean environmental akA scores than HEER participants. Furthermore, the mean environmental akA scores for nonparticipants NOT seeking ENERGY STAR products and HEER participants are similar. Given this finding, it could be useful to track differences between participants' and nonparticipants' akA perceptions to assess how different programs reach customers. For

instance, it would be useful to learn which programs are effective in reaching customers with relatively lower akA scores (i.e. those who are less motivated to invest in energy-efficient products or services).

Table 19: Mean akAB Scale Scores for HEER Participant and Nonparticipant Groups

akA Constructs	Nonparticipants: Seeking ENERGY STAR 2012 (N=93)	Nonparticipants: Not Seeking ENERGY STAR 2012 (N=48)	HEER 2012 (N=507)
Awareness/Knowledge of Energy Effects on the Environment			
Household electricity has an impact on the environment. Conserving electricity will help reduce global warming.	7.8*	6.8	7.1
Concern for the Environment			
I am very concerned about how energy use affects the environment. How worried are you about global warming? (use 0-10 scale where 0= Not at all worried and 10=Extremely worried)	6.3*	5.7	5.7
Responsibility for the Environment			
It is my responsibility to use as little energy as possible to help the environment. I feel guilty if I use too much energy.	7.6*	7.1	6.9
Concern for Finances			
I sometimes worry whether there is enough money to pay my energy bill. I often worry that the cost of energy for my home will increase.	6.6*	6.4	5.7
Responsibility for Finances			
If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs. I have to take the lead in my household if we're going to keep our utility bills down. If my utility bill goes up, I feel like I must do something to reduce it.	8.1*	7	7.5

* Significantly different from HEER participants, p<0.05.

Going forward, the following steps can be taken to analyze data in Table 19:19.

- Compare akA scores between relevant groups such as program participants, nonparticipants not planning an energy-efficient behavior, and nonparticipants planning an energy-efficient behavior.
- Repeat the analysis to assess patterns over time.

Additionally, we suggest analyzing the akA model in greater depth, in order to develop and validate program-specific PPM items to use as PPMs. In the GPS, we developed and validated general akA items, not program-specific akA items. To be most effective, each program could have a specific set of akAB items to facilitate program-specific comparisons.

7 RECOMMENDED AKAB RESEARCH

In this chapter, we provide recommendations for future akAB research.

First Recommendation: Develop and validate measures for financial *awareness/knowledge* and general behavior *maintenance* constructs

Since we found that we lack good measures for the financial *awareness/knowledge* construct and the general *behavior maintenance* construct (Table 20), we recommend that future research develop and validate measures for these two akAB constructs.

Table 20: Items That Reliably Measured the Hypothesized akAB Constructs

Contacts Rated The Following Statements On a Scale Of 0-10 Where 0=Not at All Agree & 10=Completely Agree	Percent Of Contacts Giving High Ratings (9 or 10)	Cronbach's Alpha
Awareness/Knowledge of Energy Effects on the Environment		
1. Household electricity has an impact on the environment.	44%	0.80
2. Conserving electricity will help reduce global warming.	45%	
Awareness/Knowledge of Financial Benefits of Energy Savings		
Tested Many; None Identified	-	-
Concern for the Environment		
1. I am very concerned about how energy use affects the environment.	43%	0.70
2. How worried are you about global warming? [1=Not at all to 5=Extremely worried; we transformed this 1-5 scale to a 0-10 scale.]	18%	
Concern for Finances		
1. I sometimes worry whether there is enough money to pay my energy bill.	30%	0.66
2. I often worry that the cost of energy for my home will increase.	50%	
Personal Responsibility for the Environment		
1. It is my responsibility to use as little energy as possible to help the environment.	53%	0.74
2. I feel guilty if I use too much energy.	32%	
Personal Responsibility for Finances		
1. If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs.	39%	0.69
2. I have to take the lead in my household if we're going to keep our utility bills down.	58%	
3. If my utility bill goes up, I feel like I must do something to reduce it.	55%	

Contacts Rated The Following Statements On a Scale Of 0-10 Where 0=Not at All Agree & 10=Completely Agree	Percent Of Contacts Giving High Ratings (9 or 10)	Cronbach's Alpha
General Intention to Conserve Energy in the Home		
1. I intend to conserve on gas or electricity consumption in my home this winter.	56%	0.80
2. I intend to conserve on electricity consumption in my home this summer.	60%	
Behavior Maintenance		
Tested Many; None Identified	-	-

Second Recommendation: Conduct additional research into motivators of behavior change and use of the akAB model to describe them

The akAB model can describe multiple types of motivations people might have for changing their behavior. The GPS tested this model by considering environmental and financial motivations for change. However, there are other motivations for behavior change such as comfort, health, or safety. Therefore, it would be useful to develop items that can effectively address these other motivations and determine whether the akAB model can incorporate them.

Third Recommendation: Include key behavior-related questions in future akAB research

In the GPS study, we found that California residents who received a utility rebate for buying an efficient appliance had lower akAB scores (lower *awareness/knowledge*, *concern*, etc.) than residents who planned to buy and bought an ENERGY STAR appliance without a rebate. This demonstrates that the akAB model is particularly effective assessing program effects in the market. Therefore, it is important to include questions that will allow researchers to separate respondents into appropriate groups. Thus, we recommend including behavior-related questions in the survey instruments using akAB items that will allow identification of:

- Nonparticipants who purchased or implemented the targeted behavior of the program,
- Nonparticipants who were planning to be energy-efficient when they pursued the behavior (e.g., whether they planned to buy an ENERGY STAR refrigerator when they were looking to buy a refrigerator), and
- Program participants.

Fourth Recommendation: Test the causal components of the model

This project had many objectives and this limited what parts of the larger model could be tested. We focused on the stage aspect of the model. The larger model hypothesizes how programs could target customers to move them from one stage to the next. If this connection were supported empirically, future program marketing campaigns could be more effectively targeted. It will likely not be feasible to test the entire model in one project, since going through stages

and documenting the movement of customers through stages takes considerable questionnaire space. However, it would be quite feasible to break the stages into smaller pieces (focusing on the most important, the most relevant, or a specific program first) and focus any given project on one piece.

Fifth Recommendation: Develop akAB items for specific behavior or program and conduct akAB research for all integrated DSM programs

The research team was charged with addressing *general* questions about akAB, not those specific to particular behaviors or programs. A careful reading of the literature will show that models such as these will be far more predictive (and therefore more useful) if the domain of interest is specific rather than general.

Further research therefore should be conducted to determine whether the akAB model is effective across all integrated Demand Side Management (DSM) programs (energy efficiency, smart connect, and demand response). A specific approach would be to develop program-specific akAB items for plug-load related programs to test the applicability of the akAB model for integrated DSM.

APPENDICES

A GPS SAMPLING PLAN AND SURVEY DEVELOPMENT

SAMPLING PLAN

The sample for the General Household Population Survey (GPS) had to closely represent the population of all PG&E electric and gas customers and all SCE electric customer households. PG&E and SCE serve many customers throughout California, including those in most of the metropolitan areas in the state. Thus, the sample for this study had to represent the general population of California. The sample also had to include participants and nonparticipants of these utilities' programs who recently had bought appliances and miscellaneous electronic equipment so we could learn about their purchase experience.

We stratified the GPS sample to ensure that it reflected key demographic proportions of the study population. The overall sample needed to be representative of homeowners, renters, the age of the primary householder, and household population proportions in PG&E and SCE service territories. In addition, we took extra steps to ensure that African American households, which often are hard-to-reach, are represented in the study. (The 2010 Census shows that 6% of the population in PG&E and SCE service territories is African American.) Last, we monitored the number of completed surveys with respondents to ensure we completed surveys with at least 68 residents who recently had bought appliances and electronics in each utility's service territory.

To select households for the GPS survey, we purchased Random Digit Dialing (RDD) landline and cell-phone lists with telephone numbers that likely were in the PG&E and SCE service area ZIP codes. We purchased RDD cell-phone lists because it was important to reach cell-phone users. The Centers for Disease Control (CDC) most recently estimated that 18% of California households were wireless-only.[56] That percentage is increasing. This presents a significant challenge to traditional data collection methods. We addressed this challenge by ensuring that 20% of all called numbers were for cell-phones.

The final sample consisted of 928 surveys. This sample size provides more than 5% precision at more than 95% confidence. We applied post-stratification weights to the final sample to ensure that it appropriately represented the population per key demographic characteristics. (For more details about post-stratification weights, see Appendix B.) Table 21 summarizes our sampling strategy and displays unweighted and weighted percents per key demographic characteristics. In the body of the report, we describe all sample sizes using a weighted sample.

[56] Blumberg S.J., J.V. Luke, N. Ganesh, M.E. Davern, M.H. Boudreaux, and K. Soderberg. 2011. *Wireless Substitution: State-Level Estimates from the National Health Interview Survey, January 2007–June 2010*. National Health Statistics Reports. Number 39. Hyattsville, MD: U.S. Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Table 21: Sampling Strategy and GPS Sample vs. Population Comparisons

STRATA	CALIFORNIA POPULATION[1]	GPS UNWEIGHTED	GPS WEIGHTED
	-	(n=928)	(n=927)
HOUSEHOLD POPULATION			
PG&E	63%	63%	63%
SCE	37%	37%	37%
HOMEOWNERSHIP			
Owner	59%	64%	60%
Renter	41%	36%	40%
HOUSEHOLDER'S AGE[2]			
Under 55 years	61%	52%	61%
55 years or over	39%	48%	39%
RACE[2]			
White	58%	62%	58%
African American	6%	5%	5%
Other	36%	33%	36%
PHONE STATUS[3]			
Cell Phone Completes	-	20%	-
Cell Phone Only Households	18%	11%	13%
PRODUCT QUOTA (MINIMUM SAMPLE SIZE OF 68 PER UTILITY TERRITORY FOR 90% CONFIDENCE LEVEL / 10% PRECISION)			
		PG&E SCE	PG&E SCE
TV	-	227 128	235 129
Desktop Computer	-	124 82	125 84
Streaming Media	-	120 92	128 97
Refrigerator (SCE Only)	-	- 71	- 71
Clothes Washer (PG&E Only)	-	99 -	102 -
Water Heater[4]	-	76 23	72 22
Room AC[4]	-	32 19	33 19

1 We obtained population percents from the 2010 Census and 2010 American Community Survey for California.

2 Six percent of respondents refused to answer age and race questions.

3 Two percent of respondents refused to answer phone status question.

4 A quota of 68 completes per utility territory was not reached due to low incidence rate.

DATA COLLECTION

The telephone interviews were conducted from Opinion Dynamics' (ODC) call center in Utah, using trained, professional survey managers and interviewers who employ a computer-assisted telephone interview system (CATI). In order to maximize meaningful participation in the survey, ODC project managers trained all staff about the nature of the study, the importance of the information being collected, and management of the sample.

Prior to the full-scale fielding of the survey, we conducted two pre-tests of the survey instrument to identify any potential issues related to respondents' or interviewers' understanding of questions, or with the length of the survey. Each pre-test consisted of 200 completed surveys with a randomly selected sample of California residents. Based on the results from the pre-tests, we made major modifications to the survey instrument, which we discuss in detail in Appendix A under the Survey Development section. The pre-test data are not included in the final dataset.

ODC conducted the fielding of the final survey from January 5, 2012 to February 23, 2012. Interviewers called during day, evening, and weekend hours to reach as many contacts as possible. To counteract nonresponse bias, ODC made at least three attempts per contact to complete the surveys. ODC also provided a $10 incentive to contacts who initially refused to take the survey. Of 928 respondents, 82 received the incentive. Interviews lasted an average of 16.5 minutes, including the screening questions. The overall response rate was 2% (Table 22).

Table 22: GPS Survey Disposition

DISPOSITION	COUNT	PERCENT
Complete	928	2%
Partial Complete	281	0.5%
Refused	10,077	16%
Not Qualified (Business number or not a PG&E/SCE customer)	12,981	21%
Unable to Reach	37,194	61%
No Answer, Answering Machine, Busy or Blocked	(31,996)	(52%)
Callbacks	(4,359)	(7%)
Other (Quota Filled or Language/Hearing Barrier)	(839)	(1%)
Total	**61,461**	**100%**
Response Rate[1]	-	2%

[1] Response rate is the number of completed interviews divided by the number of eligible contacts in a sample.

SURVEY DEVELOPMENT

The initial draft of the survey instrument included a revised set of questions from the akAB White Paper[57] and several other key questions to assess appliance recycling, comprehensive house upgrades, and customers' recent purchases of appliances and miscellaneous plug-load equipment. The survey instrument also contained segmentation and demographic questions. Only the akAB questions were thoroughly pre-tested.

Pre-Test Analysis

Prior to full-scale implementation of the GPS, we conducted two pre-tests to further develop the akAB questions.

The pre-tests allowed us to do the following: (1) identify problems with respondents' and interviewers' understanding of questions, (2) eliminate questions with highly skewed responses, (3) identify items which reliably measured the hypothesized akAB constructs, and (4) test for construct validity[58] with respect to the akAB model. Specifically, our team carried out the following analyses using pretest data:

1. Calculated the skewness statistic of each item to check for normality
2. Performed exploratory factor analyses to see the underlying structure of the pretest data and how this structure corresponded to the theorized akAB constructs
3. Calculated a coefficient of reliability (Cronbach's Alpha) to determine which items reliably measure akAB constructs
4. Conducted predictive validity tests using behaviors as the target variables to assess how consistent the akAB model is with empirical relationships between akAB measures and behaviors.

Overall, we evaluated 67 questions or items during pre-tests. Of the 67 items, 11 proved to be reliable measures of the hypothesized akAB constructs. We identified these11 items by using the following methodology. First, we eliminated questions with highly skewed distributions. Next, we dropped items that did not reliably correspond to other items in a given construct. To test for construct reliability, we used Cronbach's Alpha.[59] Out of 67 items, the final 11 items were less skewed and had higher Cronbach's Alpha values; they are displayed in Table 23.

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57 Randazzo, K.V. and J.S. Peters. 2011. *Ibid.*

58 "Construct validity" is the extent to which empirical relationships between constructs and other measures are consistent with *a priori* hypotheses concerning the constructs that are being measured.

59 Cronbach's Alpha determines if items have internal consistency, that is, if they measure the same thing. The alpha values range from 0 to 1 and are higher when the correlations between items increase. Generally, values of 0.7 and no higher than 0.9 are good indicators of reliability.

We also used exploratory factor analysis[60] to visualize the underlying structure of the pre-test data. Prior to the analysis, we expected that factors should reflect the theoretical structure of the akAB model. We generally observed a separation of items relating to environmental and financial akAB constructs.

Table 23: Items That Reliably Measured the Hypothesized akAB Constructs

Contacts Rated The Following Statements on a Scale of 0-10, Where 0=Not at All Agree & 10=Completely Agree	Skewness Statistic[1]	Cronbach's Alpha
Awareness/Knowledge of Energy Effects on the Environment[2]		
1. Household electricity has an impact on the environment.	-12.66	0.80
2. Conserving electricity will help reduce global warming.	-11.45	
Awareness/Knowledge of Financial Benefits of Energy Savings		
Tested Many; None Identified	-	-
Concern for the Environment		
1. I am very concerned about how energy use affects the environment.	-4.17	0.79
2. How worried are you about global warming? [1=Not at all to 5=Extremely worried; we transformed this 1-5 scale to a 0-10 scale.]	1.54	
Concern for Finances		
1. I sometimes worry whether there is enough money to pay my energy bill.	0.02	0.68
2. I often worry that the cost of energy for my home will increase.	-6.49	
Personal Responsibility for the Environment		
1. It is my responsibility to use as little energy as possible to help the environment.	-6.84	0.72
2. I feel guilty if I use too much energy.	-2.10	
Personal Responsibility for Finances		
1. If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs.	-3.53	0.68
2. I have to take the lead in my household if we're going to keep our utility bills down.	-6.97	
3. If my utility bill goes up, I feel like I must do something to reduce it.	-6.48	

[60] Factor analysis describes variability among items and identifies related items by combining them into groups. Each item in an exploratory factor analysis has a statistic showing how highly it correlates with a grouping.

CONTACTS RATED THE FOLLOWING STATEMENTS ON A SCALE OF 0-10, WHERE 0=NOT AT ALL AGREE & 10=COMPLETELY AGREE	SKEWNESS STATISTIC[1]	CRONBACH'S ALPHA
GENERAL INTENTION TO CONSERVE ENERGY IN THE HOME		
1. I intend to conserve on gas or electricity consumption in my home this winter.	-9.33	0.69
2. I intend to conserve on electricity consumption in my home this summer.	-8.30	
BEHAVIOR MAINTENANCE		
Tested Many; None Identified		

1 Skewness statistic = skewness ÷ standard error of skewness (higher numbers mean data are more skewed)

2 We tested multiple items; however, responses to these items were highly skewed. We selected another three items to test in the GPS survey. Two of those GPS items measured this construct reliably. We report these two items and relevant statistics in this table.

Finally, we conducted a predictive validity test using behaviors as the target variables to assess how consistent our theoretical assumptions were with the empirical relationships between the akAB constructs and behaviors. We hypothesized the following:

1. Correlations between akAB constructs farther away from the behavior are lower than correlations between akAB constructs closer to the behavior.

2. akAB constructs closest to each other are more correlated than akAB constructs farther away from each other.

The results of this predictive validity test support our hypotheses, since the observed correlations are lower between constructs farther away from the behavior than constructs closer to the behavior (Figure 40). In addition, neighboring akAB constructs are more highly correlated than non-neighboring akAB constructs. (See Figure 41for environmental domain correlations and Figure 40 for financial domain correlations.)

Figure 40: akAB Environmental Model Correlations for all General Population Study Respondents

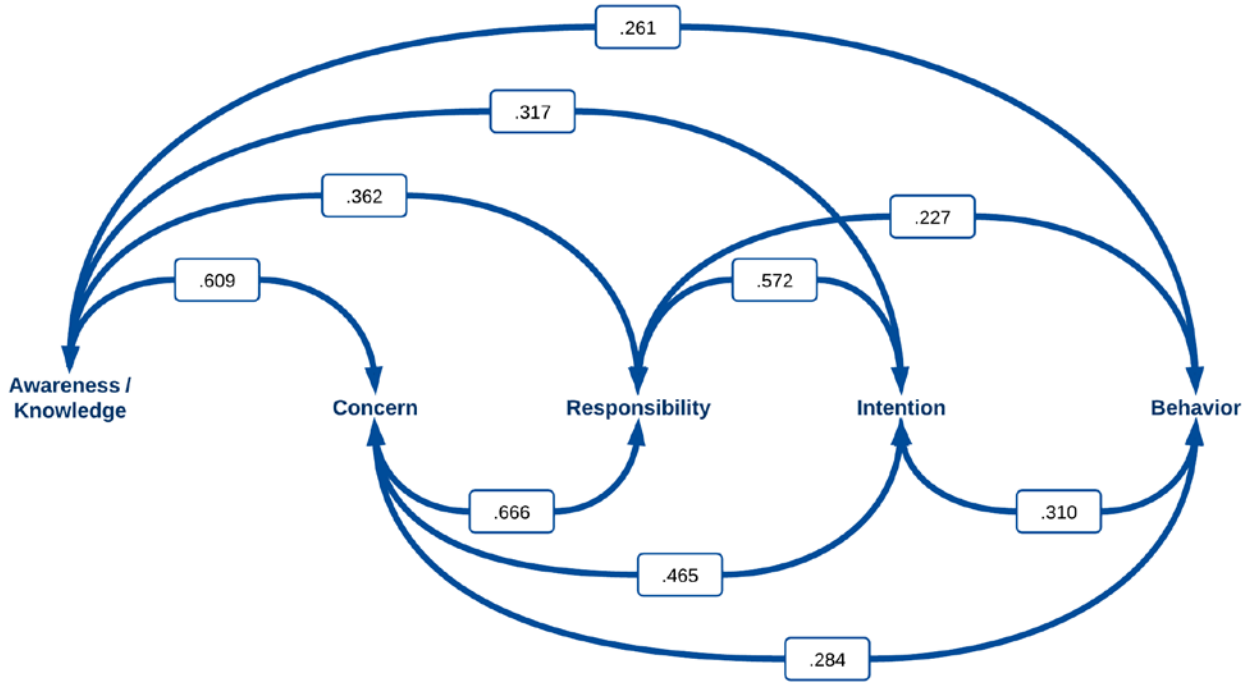
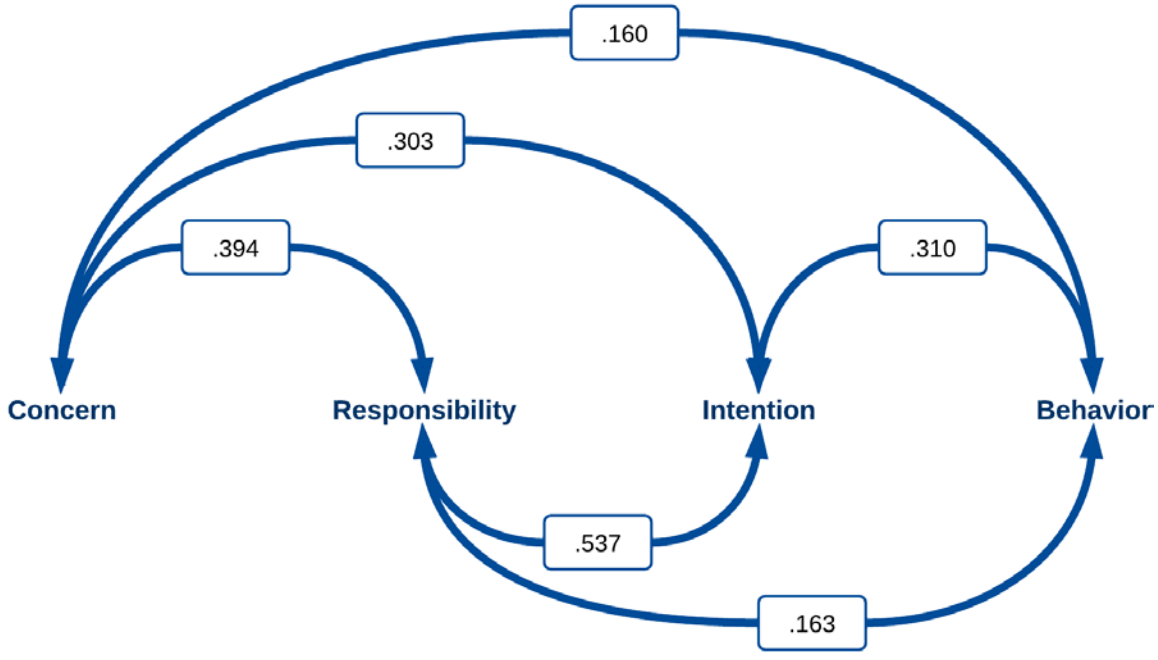


Figure 41: akAB Financial Model Correlations for all General Population Study Respondents



B GPS WEIGHTING METHODS

We applied post-stratification weights to the GPS survey sample to ensure that it appropriately represented the population of California. Post-stratification weighting is a technique to mathematically correct for biases that result from under- or over-sampling of key demographic groups.

When we compared the distribution of demographic characteristics in the sample to the 2010 U.S. Census for California, we observed the following: minorities, renters, younger respondents, and higher-income households were slightly under-represented in the GPS sample (Table 24). We corrected almost all of these deviations by calculating the weights based on age and applying them to the sample. The following equation describes our calculation of the post-stratification weights based on age:

Age Weight *= Census % for an age group ÷ Sample % for an age group*

In Table 24, we display both unweighted and weighted proportions of key demographic variables.

Table 24: Comparison of Sample and Census (in %)

California	2010 ACS[1] or Census	GPS Sample Unweighted	GPS Sample Weighted By Age
Household Population			
PG&E Territory	63%	63%	63%
SCE Territory	37%	37%	37%
Homeownership			
Homeowners	59%	64%	60%
Renters	41%	36%	40%
Age of Householder			
18-34 yrs old	19%	15%	19%
35-44 yrs old	20%	17%	20%
45-54 yrs old	22%	20%	22%
55-64 yrs old	18%	20%	18%
65 yrs or over	21%	28%	21%
Household Income			
Less than $50,000	44%	53%	53%
$50,000 to $100,000	30%	26%	26%
More than $100,000	26%	21%	21%

CALIFORNIA	2010 ACS[1] OR CENSUS	GPS SAMPLE UNWEIGHTED	GPS SAMPLE WEIGHTED BY AGE
	RACE		
White	58%	62%	58%
African American	6%	5%	5%
Other	36%	33%	36%
Hispanic Households	27%	24%	26%

1 ACS = American Community Survey

Further analysis revealed that those with more education also were over-represented in the GPS sample (Table 25). We attempted to correct for this deviation by applying weights based on age and education[61] to the sample. However, when we used weights based on age and education, the income distribution in the sample changed; the lower income households were notably over-represented (Table 25). This was problematic because income was more correlated with energy-efficient behaviors than education (1 ACS = American Community Survey

Table 26). Thereby, we decided to use our original weights based on age only when we weighted the sample.

Table 25: Weights Based on Age and Education Affect Income Distribution in the Sample (in %)

CALIFORNIA	2010 ACS[1] OR CENSUS	GPS SAMPLE UNWEIGHTED	GPS SAMPLE WEIGHTED BY AGE	GPS SAMPLE WEIGHTED BY AGE & EDU
	EDUCATION OF HOUSEHOLDER			
High School or Less	34%	27%	28%	34%
Some College	33%	23%	22%	33%
4-yr College Degree	34%	51%	50%	33%
	HOUSEHOLD INCOME			
Less than $50,000	44%	53%	53%	60%
$50,000 to $100,000	30%	26%	26%	23%
More than $100,000	26%	21%	21%	17%

1 ACS = American Community Survey

61 We already established that age weights corrected for age, homeownership, and race deviations. We multiplied age weights by education-specific weights to correct for education in addition to age, homeownership, and race deviations. Education-specific weights were estimated by dividing the 2010 Census proportion for an education group with the sample proportion for that education group.

Table 26: Correlations between Education, Income, and Behavior

GPS Sample - Correlations	Education	Income	Behavior[1]
Education	1.00	-	-
Income	0.50**	1.00	-
Behavior	0.19**	0.29**	1.00

1 The behavior variable was the sum of all energy efficiency or energy conservation actions that respondents reported doing.

**Significant at p<0.01

C GPS SURVEY INSTRUMENT

Note:

( ) indicates choose one option

[ ] indicates multiple responses allowed

SURVEY INTRODUCTION

Hello, my name is ________with Opinion Dynamics Corporation, a national research organization. We are conducting a study in California on behalf of _______ to understand customer attitudes about energy and your recent experiences buying new energy-using equipment. This is not a sales call and all responses will be kept confidential. Is this a convenient time for you to talk or is there a better time to reach you?

_ _

[ASK ONLY IF CALLING A CELL PHONE]

I know I'm calling you on your cell phone, but we are conducting an important survey. Are you in a safe place to talk right now?

(a) Yes, safe place to talk

(b) No, call me later [SCHEDULE CALLBACK]

(c) No, call back on land-line [RECORD NUMBER AND SCHEDULE A CALLBACK]

(d) Cell phone for business only [THANK AND END- BUSINESS#]

(e) Refused [THANK AND TERMINATE]

_ _

I'd like to speak with the person, or one of the persons, responsible for making energy-related decisions in your household – such as paying your electric or gas bill or buying new appliances. Is that you?

(a) Yes [CONTINUE TO Q1]

(b) No [FIND OUT WHO IT IS AND SCHEDULE A CALLBACK]

(c) Refused [THANK AND TERMINATE]

SCREENING QUESTIONS

We are interested in talking with PG&E or Southern California Edison customers.

1. Do you get your electric service from PG&E, Southern California Edison, or another provider? [DO NOT READ]

   (a) Pacific Gas & Electric (PG&E) [CONTINUE TO Q2]

   (b) Southern California Edison (SCE) [SKIP TO Q3]

   (c) Other [CONTINUE TO Q2]

   (d) Don't Know [CONTINUE TO Q2]

   (e) Refused [CONTINUE TO Q2]

2. Do you get your gas service from PG&E or some other utility or have no gas service? [DO NOT READ]

   (a) Pacific Gas & Electric (PG&E) [CONTINUE TO Q3]

   (b) Other [TERMINATE ONLY if electric service is NOT from PG&E]

   (c) Don't Know [TERMINATE ONLY if electric service is NOT from PG&E]

   (d) Refused [TERMINATE ONLY if electric service is NOT from PG&E]

   (e) No gas service [TERMINATE ONLY if electric service is NOT from PG&E]

I have a few questions about yourself and your household to see if you qualify for our survey.

3. What is your home zip code? [ASK ONLY IF CALLING A CELL PHONE]

   [ENTER 5 digits] _____

4. Do you or members of your household own your home, or do you rent it?

   (a) Own/Buying [monitor quota for the final survey] [59% homeowners]

   (b) Rent / Lease

   (c) Occupy rent-free

(d) Don't Know [THANK & TERMINATE]

(e) Refused [THANK & TERMINATE]

5. In what year were you born? [ENTER LAST TWO DIGITS]

(a) 19 _____ _ [monitor quota for the final survey] [1956]

(b) Refused

6. I am going to read a list of products. For each one, please tell me whether you have purchased the product since January 2010. [RANDOMIZE]

a.	TV	(Yes) (No) (DK)
b.	Desk top Computer	(Yes) (No) (DK)
c.	[ASK only if SCE customers]Refrigerator	(Yes) (No) (DK)
d.	[ASK only if PG&E customers]Clothes Washer	(Yes) (No) (DK)
e.	Room Air conditioner	
f.	Water heater	(Yes) (No) (DK)
g.	Device to watch streaming content on a TV, like TV shows or Movies from Netflix, Hulu Plus, ITunes or others	(Yes) (No) (DK)

Quota check for full-scale implementation

Q1/Q2: Utility- PG&E (63%, Q1=a or Q2=a) and SCE (37%, Q1=b)

Q4: Homeownership - 59% homeowners, 41% renters

Q5: Age - maximum 39% "55 yrs old or over"

Q6: Product Purchases –see sampling plan

Q46: Ethnicity –get 7% African Americans, use zip codes to reach this group

BCE RELATED QUESTIONS

7. [ASK ONLY if Q6g(Streaming Device)= YES] You said you bought a device to watch streaming content on a TV. What kind of device did you buy? [DO NOT READ; MULTIPLE RESPONSES allowed] [If respondent says "Netflix, ITunes, or Hulu," ASK "can you tell me the device you use to watch Netflix, ITunes, or Hulu"]

   [a] Roku

   [b] Blue Ray DVD

   [c] Wii

   [d] Xbox

   [e] Computer

   [f] Other, specify: _____

   [g] Nothing- does not watch streaming content on a TV

8. [ASK ONLY if Q6g(Streaming Device)= NO or DK] Do you plan to buy a streaming media device in the next 12 months?

   (a) Yes

   (b) No

   (c) Don't Know

   (d) Refused

9. [ASK ONLY if Q8(plan to buy)=YES] What kind of device do you plan to buy? [DO NOT READ; MULTIPLE RESPONSES allowed] [If respondent says "Netflix, ITunes, or Hulu," ASK "can you tell me the device you plan to buy to watch Netflix, ITunes, or Hulu"]

   [a] Roku

   [b] Blue Ray DVD

   [c] Wii

   [d] Xbox

[e] Computer

[f] Other, specify: _____

[g] Nothing- does not watch streaming content on a TV

10. [ASK ONLY if Q6a(TV)=YES] When you were buying the TV, did you plan to buy an Energy Star TV?

(e) Yes

(f) No

(g) Don't Know

(h) Refused

11. [ASK ONLY if Q6b(Computer)=YES] When you were buying the computer, did you plan to buy an Energy Star computer?

(i) Yes

(j) No

(k) Don't Know

(l) Refused

12. [ASK ONLY if Q6a(TV)=YES] Did you buy this TV… [READ CHOICES "a" through "d"]

(a) …new from an online retailer

(b) …new directly from manufacturer

(c) …new at retail store like Best Buy, Walmart, or some other store, or

(d) …used from a website, garage sale, an ad, or some other place.

(e) Other, specify: _____

(f) Don't Know

(g) Refused

13. [ASK ONLY if Q6b(Computer)=YES] Did you buy this computer… [READ CHOICES "a" through "d"]

(h) …new from an online retailer

(i) …new directly from manufacturer

(j) …new at retail store like Best Buy, Walmart, or some other store, or

(k) …used from a website, garage sale, an ad, or some other place.

(l) Other, specify: _____

(m) Don't Know

(n) Refused

HEER RELATED QUESTIONS

14. [ASK ONLY those that reported buying Clothes Washer, Water Heater, Room AC, or Refrigerator in Q6] When you were buying this <APPLIANCE TYPE>, did you plan to buy an Energy Star <APPLIANCE TYPE >? [Instructions: If respondents bought multiple appliances, ask this question for each appliance]

(a) Yes

(b) No

(c) Don't Know

(d) Refused

15. [ASK ONLY those that reported buying Clothes Washer, Water Heater, Room AC, or Refrigerator in Q6] When you were purchasing the <APPLIANCE TYPE > from where did you get information about what to buy? Any other sources of information? [ALLOW MULTIPLE RESPONSES] [Instructions: If respondents bought multiple appliances, ask this question for each appliance]

[a] Retailers/ salesperson

[b] Installation contractor

[c] Internet

[d] Consumer Reports or other product-oriented magazines

[e] Other, specify:_____ [Note to ODC: If this option is selected, it is required for an interviewer to "specify"]

[f] Don't know/Not sure/Can't remember

[g] Refused

16. [ASK ONLY those that reported buying Clothes Washer, Water Heater, Room AC, or Refrigerator in Q6] Why did you select this model or type of < APPLIANCE TYPE >? [DO NOT READ; ALLOW MULTIPLE RESPONSES.] [Instructions: If respondents bought multiple appliances, ask this question for each appliance]

[a] It was a good value/ in my price range

[b] It costs less to operate/energy savings

[c] It was the right size, color

[d] It had an Energy Star label

[e] Other, specify:_____ [Note: If this option is selected, it is required for an interviewer to "specify"]

[f] Don't know/ Not sure/ Can't remember

[g] Refused

17. [ASK ONLY if respondent is SCE customer and has reported buying Water Heater, Room AC, or Refrigerator in Q6] Were there any rebates available for the <APPLIANCE TYPE> at the time that you were purchasing the <APPLIANCE TYPE>? [Instructions: If SCE respondents bought multiple appliances, ask this question for each appliance]

(a) Yes

(b) No

(c) Don't Know

(d) Refused

18. [ASK ONLY if Q17(rebate available at time of purchase)=YES] Who was offering the rebate for the <APPLIANCE TYPE>? [DO NOT READ; ALLOW MULTIPLE RESPONSES]?

(a) Southern California Edison

(b) Other, specify:_____

(c) Don't Know

(d) Refused

19. [ASK ONLY if respondent is SCE customer, has reported buying Water heaters in Q6, and has NOT said SCE in Q18] Have you heard that Edison offers rebates for energy-efficient electric water heaters?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

20. [ASK ONLY if respondent is PG&E customer and has reported buying Water heaters in Q6] Have you heard that PG&E offers rebates for energy-efficient water heaters?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

21. [ASK ONLY if respondent is SCE customer, has reported buying Refrigerator in Q6, and has NOT said SCE in Q18] Have you heard that Edison offers rebates for energy-efficient refrigerators?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

22. [ASK ONLY if respondent is PG&E customer and has reported buying Clothes Washer in Q6] Have you heard that PG&E offers rebates for energy-efficient clothes washers?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

23. [ASK ONLY if respondent is SCE customer, has reported buying Room Air Conditioners in Q6, and has NOT said SCE in Q18] Have you heard that Edison offers rebates for energy-efficient room air-conditioners?

(e) Yes

(f) No

(g) Don't Know

(h) Refused

24. [ASK ONLY if respondent is PG&E customer and has reported buying Room Air Conditioners in Q6] Have you heard that PG&E offers rebates for energy-efficient room air-conditioners?

(i) Yes

(j) No

(k) Don't Know

(l) Refused

25. [ASK ONLY if any of Q19-Q24(heard of rebate)=YES or if respondent said SCE in Q18] At your present address, have you gotten a rebate check from your utility for purchasing this <APPLIANCE TYPE>?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

26. Do you think if this statement is TRUE or FALSE.

Some clothes dryers are more energy-efficient than others. True False

AKA/SEGMENTATION QUESTIONS

{we indicate ODC/ME&O segmentation questions in grey}

{we indicate AKA questions in red}

Next, I am going to ask you a few questions about energy-related issues and about energy-saving actions you may have done in your home.

27. I'm going to list several energy-efficient product labels or energy efficiency programs. For each, please tell me if you have heard of it. [RANDOMIZE LABELS/NAMES OF PROGRAMS EXCEPT "ENERGY STAR Most Efficient" SHOULD ALWAYS IMMEDIATELY FOLLOW "ENERGY STAR"]

(a)	ENERGY STAR	(Yes)	(No)	(DK)	(Refused)
(b)	ENERGY STAR Most Efficient	(Yes)	(No)	(DK)	(Refused)
(c)	Flex Your Power	(Yes)	(No)	(DK)	(Refused)
(d)	Top Ten	(Yes)	(No)	(DK)	(Refused)
(e)	Energy Upgrade California	(Yes)	(No)	(DK)	(Refused)

28. How worried are you about global warming? [READ CHOICES except DK or REF] (AKA)

(f) Not at all worried

(g) A little worried

(h) Somewhat worried

(i) Very worried, or

(j) Extremely worried

(k) Don't Know

(l) Refused

29. Have you heard of a carbon footprint? [IF NECESSARY: A carbon footprint is a measure of the energy you use throughout your life, either directly or indirectly. This includes but is not limited to the energy consumption from your home, your transportation, your diet, and your purchases]. (segmentation)

(m) Yes

(n) No

(o) Don't Know

(p) Refused

30. Now, I'm going to read a few statements. Using a scale of 0 to 10 where 0 means Not at all agree, and 10 means Completely agree, please tell me how much you agree with each statement. [RANDOMIZE "a" - "n"] (AKA)

		Not at all Agree										Completely Agree		
a.	I sometimes worry whether there is enough money to pay my energy bill.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
b.	I often worry that the cost of energy for my home will increase.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
c.	I am very concerned about how energy use affects the environment.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
d.	It is my responsibility to use as little energy as possible to help the environment.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
e.	I feel guilty if I use too much energy.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
f.	I intend to conserve on gas or electricity consumption in my home this winter.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
g.	I intend to conserve on electricity consumption in my home this summer.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
h.	If my utility bill goes up, I feel like I must do something to reduce it.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
i.	I have to take the lead in my household if we're going to keep our utility bills down.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref
j.	If others in my household can't or won't change their behavior to lower our utility bills, I feel I should do even more to control our energy costs.	0	1	2	3	4	5	6	7	8	9	10	DK	Ref

k. Household electricity use has an impact on the environment. 0 1 2 3 4 5 6 7 8 9 10 DK Ref

l. I believe that household energy use has an impact on global warming and climate change. 0 1 2 3 4 5 6 7 8 9 10 DK Ref

m. Conserving electricity will help reduce global warming. 0 1 2 3 4 5 6 7 8 9 10 DK Ref

31. Next, I'm going to read a list of energy-saving actions. For each action, please tell me if your household has already taken the action. [RANDOMIZE ACTIONS; READ EACH ACTION]

Infrequent Actions Did you…		
(a)…install an attic vent to keep the attic cooler (segmentation)	(Yes) (No) (DK) (NA) (Came with the house)	(Ref)
(b)…install programmable thermostats (segmentation)	(Yes) (No) (DK) (NA) (Came with the house)	(Ref)
(c)…Install ceiling fans (segmentation)	(Yes) (No) (DK) (NA) (Came with the house)	(Ref)
(d)…Install motion detectors for lights (segmentation)	(Yes) (No) (DK) (NA) (Came with the house)	(Ref)
(e)…Buy ENERGY STAR electronics	(Yes) (No) (DK)	(Ref)
(f)…Lower your water heater temperature	(Yes) (No) (DK) (NA)	(Ref)
(g)…Enable "sleep" features on your computer or laptop	(Yes) (No) (DK) (NA)	(Ref)

Frequent Actions Do you…		
(l)…UNPLUG electronic equipment when no one is using them	(Yes) (Sometimes) (No) (DK)	(Ref)
(l)…UNPLUG cell phone chargers when no one is using them	(Yes) (Sometimes) (No) (DK) (NA)	(Ref)

32. What percent of laundry loads do you wash with cold water? ___[ENTER %] (DK)

33. What percent of clothes do you dry on line or drying rack? ___[ENTER %] (DK)

WHOLE HOUSE QUESTIONS

34. Since January 2010, have you done a comprehensive energy upgrade of your home, including all of the following: sealing areas around windows and doors, insulating walls and attic, and if replacing appliances, installing high-efficiency appliances? In other words, did you complete a whole package of upgrades of this kind?

    (a) Yes

    (b) No

    (c) Don't Know

    (d) Refused

    (e) Done prior to January 2010

35. [ASK if YES or "done prior to Jan. 2010" in Q34] Did you do this to reduce energy use, make your home healthier, or make your home more comfortable? [MULTIPLE RESPONSES ALLOWED]

    (a) To reduce energy use

    (b) To make home healthier

    (c) To make home more comfortable

(d) Other, specify: _____

(e) Don't Know

(f) Refused

36. [ASK if NO OR DK in Q34] In the next 12 months, do you plan to do a comprehensive energy upgrade like we just described?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

(e) NA- we are renters

We are three-quarters done with the survey. I have a few more questions.

REFRIGERATOR RECYCLING QUESTIONS

37. At your present address, have you recycled an old refrigerator or freezer and gotten a check from your utility since January 2010?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

38. [If Q37(fridge recycling)=NO or DK] Do you plan to recycle an old refrigerator or freezer in the next 12 months?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

(e) NA- does not have an old refrigerator or freezer

(f) Already recycled an old refrigerator or freezer but did not get a rebate

39. Using a scale of 0 to 10 where 0 means Not at all confident, and 10 means Completely Confident, please tell me how much confidence do you have that recycled appliances are environmentally decomposed to original raw materials rather than the landfill?

0 1 2 3 4 5 6 7 8 9 10 DK Ref

SEGMENTATION ITEMS

40. On a scale of 1 to 7 where 1 is Strongly Disagree and 7 is Strongly Agree, please tell me how much you agree or disagree with the following 2 statements. (segmentation)

a. I compare prices of at least a few brands before I choose one. 1 2 3 4 5 6 7 DK Ref

b. I do NOT feel responsible for conserving energy because my personal contribution is very small. 1 2 3 4 5 6 7 DK Ref

41. I'm going to read you a list of 6 reasons why people might change their daily actions to save energy. Please tell me which of these would motivate you the MOST to save energy? [READ CHOICES] [IF DK PROBE "if you had to choose from the following reasons which one would motivate you the most"] (for segmentation) [RANDOMIZE]

(a) Saving money

(b) Maintaining Health

(c) Protecting the environment

(d) For the benefit of future generations

(e) Reducing our dependence on foreign oil

(f) Helping California lead the way on saving energy

(g) Don't Know

(h) Refused

DEMOGRAPHIC CHARACTERISTICS

Thanks for sharing all of that information. We're almost done with the survey. I just have a few final questions about your home and the members of your household.

42. Which of the following types of housing units would you say best describes your home? Is it a . . .[READ CHOICES]

(a) Single-family detached house

(b) Single-family attached house (townhouse, row house, excluding duplex)

(c) Duplex

(d) Building with 2-4 units

(e) Building with 5 or more units

(f) Mobile home or house trailer

(g) Other (specify) _____

43. Including yourself, how many people currently live in your home year-round?

(a) _____ [RECORD NUMBER]

(b) Don't Know

(c) Refused

44. [ASK IF NUMBER OF PEOPLE living in the home is > 1] Including yourself, how many of the people currently living in your home year-round are in the following age groups? [TOTAL SHOULD EQUAL the # in Q 37]

a. Less than 18 years old _____ [RECORD NUMBER]

b. 18 to 24 _____ [RECORD NUMBER]

c. 25 to 34 _____ [RECORD NUMBER]

d. 35 to 44 _____ [RECORD NUMBER]

e. 45 to 54 _____ [RECORD NUMBER]

f. 55 to 64 _____ [RECORD NUMBER]

g. 65 or older _____ [RECORD NUMBER]

h. Don't Know

i. Refused

45. What is the highest level of education you have completed? [DO NOT READ]

(a) No schooling

(b) Less than high school

(c) Some high school

(d) High school graduate or equivalent (e.g., GED)

(e) Some college

(f) College degree

(g) Some graduate school

(h) Graduate or professional degree

(i) Post Graduate

(j) Refused

(k) Don't know

46. How would you describe your race? [DO NOT READ; UP TO 5 RESPONSES ALLOWED]

[a] White

[b] Black or African American

[c] American Indian or Alaska Native

[d] Asian

[e] Pacific Islander

[f] Other, Specify _____

47. Are you Spanish, Hispanic, or Latino?

(a) Yes

(b) No

(c) Don't Know

(d) Refused

48. How many bedrooms do you have in your home? [IF A ONE-ROOM EFFICIENCY OR STUDIO APARTMENT, BEDROOMS=0]

_____[ENTER NUMBER]

49. About, when was this home/building first built? [RECORD RESPONSE, READ LIST IF NEEDED]

(a) Before the 1970s

(b) 1970s

(c) 1980s

(d) 1990-1994

(e) 1994-1999

(f) 2000s

(g) Don't Know

(h) Refused

50. What was your annual household income from all sources in 2010, before taxes? Please stop me when I reach the category that best describes your household's income. [READ LIST]

[IF NECESSARY: This information is confidential and will only be used for the purpose of characterizing study respondents.]

(a) Less than $20,000 per year

(b) 20 to less than $30,000

(c) 30 to less than $40,000

(d) 40 to less than $50,000

(e) 50 to less than $60,000

(f) 60 to less than $75,000

(g) 75 to less than $100,000

(h) 100 to less than $150,000

(i) 150 to less than $200,000

(j) More than $200,000

(k) Don't know

(l) Refused

51. What is the primary language spoken in your home? [DO NOT READ CHOICES]

(a) English

(b) Spanish

(c) Mandarin

(d) Cantonese

(e) Tagalog

(f) Korean

(g) Vietnamese

(h) Russian

(i) Japanese

(j) Other (please specify) _____

52. Finally, we'd like to know about your household's phone status. Does your household use . . . [READ] [ASK ALL]

(a) Landline phone only (not including internet phone)

(b) Landline and cell phone

(c) Cell phone only

(d) DK

(e) REF

53. GENDER [RECORD, DO NOT ASK]

(f) Female

(g) Male

Thank you so much for completing our survey. Is there anything you'd like to add at this point? [OPEN ENDED] _____