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Final Report

Program & Technology Review of Two Residential Product Programs: Home Energy Efficiency Rebate (HEER) / Business & Consumer Electronics (BCE)

Study # SCE0306

Funded By:



Prepared By:



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Jane S. Peters, Ph.D.
Marti Frank, Ph.D.
April Armstrong, M.S.
Alexandra Dunn, PhD.



Rob Bordner, M.S.
A.J. Howard
Zach Baron
Stephen Parry

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RESEARCH INTO ACTION, INC.
PO BOX 12312
PORTLAND OR, 97212
WWW.RESEARCHINTOACTION.COM

DELIVERY:
3934 NE MARTIN LUTHER KING JR. BLVD.,
SUITE 300
PORTLAND, OR 97212 (DELIVERY)

TELEPHONE: 503.287.9136
FAX: 503.281.7375

CONTACT:
JANE S. PETERS, PRESIDENT
JANEP@RESEARCHINTOACTION.COM



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE



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EXECUTIVE SUMMARY

This document presents the results of three evaluation activities conducted in 2011-2012 for Pacific Gas and Electric (PG&E) and Southern California Edison (SCE):

1. A process evaluation of the 2010-2012 Home Energy Efficiency Rebate (HEER) Program
2. A HEER product market characterization for refrigerators, water heaters, pool pumps, and clothes dryers
3. An experience review of the 2010-2012 Business and Consumer Electronics (BCE) Program, and a high-level technology and market review for consumer electronics products

The HEER Program is a core program of the PG&E and SCE Residential Energy Efficiency portfolio. The program is a continuation of existing statewide energy efficiency programs targeting residential measures. The HEER Program seeks to encourage customers to purchase energy efficient appliances by providing rebates and information. HEER seeks to help customers overcome first-cost barriers and to support ENERGY STAR[®] awareness. The program influences consumer purchasing decisions and informs customers about the benefits of efficient appliances. The utilities designed HEER to ensure maximum energy savings, flexibility, and cost effectiveness.

The BCE Program is a residential energy efficiency program targeting three consumer electronics products: televisions, desktop computers, and monitors. The program is implemented separately by PG&E and SCE, although they share a similar program theory, design, and goals. The PG&E program is part of a wider BCE Alliance and is implemented in partnership with other program sponsors.

FINDINGS

HEER Process Evaluation

The HEER process evaluation incorporates information surveys with retailers, pool pump contractors, participants, and nonparticipants; it covers 11 products included in the PG&E and SCE HEER programs. The following is a high-level summary of the findings:

- ➔ **The HEER program is on track to meet program goals for both utilities.** Satisfaction levels are high across all product offerings and surveyed groups. Satisfaction levels have remained consistent between the current and previous evaluations.



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- ➔ **Contractors and retailers, the market actors involved in facilitating HEER rebates, demonstrate a high level of awareness of the rebates.** Contractors and retailers use the rebates to promote the sale of efficient products.
- ➔ **Satisfaction with contractor training is very high.** Contractors indicate an interest in continued training.
- ➔ **The demographics and behaviors of HEER participants have remained consistent for the past four years.**
- ➔ **Most people redeeming HEER rebates are from the targeted segment known as “Leading Achievers,”** people who are highly concerned with saving energy.
- ➔ **HEER participants obtained information about the program from several sources.** Information sources varied depending on the product purchased and whether the place of purchase was online or in a retail store.
- ➔ **HEER participants differed from nonparticipants, who said they were likely to purchase energy efficient products without the program and rebates.**

HEER Product Market Characterization

The products studied are very different from one another, but a few important findings speak to all or most of them:

- ➔ **There are similarities in market characteristics and potential program strategies among the two “high touch” products** (refrigerators and clothes dryers), with which users interact regularly; **there are also similarities between the two “low touch” products** (water heaters and pool pumps), with which users do not interact regularly. This categorization may be applicable to other appliances and plug load products, and useful in identifying appropriate program strategies and tactics.
- ➔ **Several key market characteristics vary by product and make a one-size-fits-all program strategy difficult, if not impossible, to design.** They include the barriers to efficiency, penetration of efficient products, and the schedule of future standard and specification revisions.
- ➔ **Experts think each of the products studied will be available with “smart” or demand response capability by 2015.** However, the number of models and incremental cost are uncertain. High-end models are likely to be the first to employ this feature.
- ➔ **Manufacturing of all product types is consolidated,** with three companies holding 80% or more market share in each category.
- ➔ **Retail distribution is also consolidated.** The same three companies account for 40% to 65% of market share in the retail distribution channel for refrigerators, water heaters, and



clothes dryers: Sears, Lowe's, and Home Depot. This is in accord with the national trend in appliance sales toward national chains. A shift also taking place in electronics.

- **Among water heaters and pool pumps there is a similar 50-50 split between the percent of products installed by a contractor or service provider versus the end-user.**

BCE Experience Review and Technology and Market Review

The BCE Program made important strides in engaging and understanding sales channels for consumer electronics and established valuable retailer relationships. However, the program and program model encountered many challenges including:

- **A large amount of evaluation risk** due to a difficulty in showing local influence when targeting national markets
- **Potential difficulty in program attribution** in markets with many external forces driving energy efficiency
- **A regulatory framework that creates barriers** to the development of adaptable programs that are able to address rapidly changing markets

RECOMMENDATIONS

This study resulted in five high-level recommendations that apply to both the HEER and BCE Programs, and are based on all three research activities. The individual research activities also yielded their own, program-specific recommendations.

High-Level HEER and BCE Program Recommendations

The high-level recommendations for both the HEER and BCE Programs are to:

- 1. Create a holistic, flexible program with the goal of market transformation.** Address residential plug loads as a category and develop programs that target an overall reduction in plug loads. This means a program that can change its intervention strategy or measures quickly to respond to changing market conditions. It may also require an evaluation framework that assesses the overall reduction in plug loads due to multiple measures, instead of focusing on a per-product/per-measure evaluation framework.
- 2. When designing programs, keep two key points in mind:**
 - a. Target incentives to address specific barriers.** Incentives can accomplish many purposes, depending on how they are deployed. Programs should design incentives based on a systematic study of barriers. Targeted incentives may also decrease free ridership, which has been documented in this evaluation as well as previous evaluations.



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- b. Maintain retailer relationships.** Retailers are a key player in the supply chain for most plug load products. Thus, programs should seek to build long-term relationships with retailers and design program elements with the retailer's business case in mind.
- 3. Design intervention strategies on a product-by-product basis.** The approach to each product should be based on a careful assessment of the unique market barriers and an up-to-date supply chain characterization. Intervention strategies developed in this manner will likely lead to interventions at multiple points in the overall plug-load products supply chain.
- 4. Use experimental design to test new strategies and implementation approaches.** Small-scale pilots should be used to evaluate intervention strategies for effectiveness. Effective models can be expanded, ineffective models can be terminated. This may be particularly useful when existing market data do not strongly indicate a single approach.
- 5. Create a program "roadmap" to guide ongoing adjustment of program activities.** At the outset of each program cycle, develop a program "roadmap" that specifies when the program will check in with market conditions and sets criteria for adjusting program activities. This should include the timing, approach, and criteria for: altering measure specifications; changing intervention strategies based on shifts in barriers; adding new measures; and exiting old measures.

HEER Process Evaluation Recommendations

The recommendations from the HEER process evaluation are to:

- 1. Increase education and training for retail contacts.** PG&E and SCE offer different levels of outreach to participating retailers, but retail contacts uniformly showed a lack of awareness of available outreach and welcomed additional education for store staff. Retailers also expressed a willingness to consider implementing short term or tiered rebates.
- 2. Maintain participant interaction levels and procedures.** Participants reported high levels of satisfaction with program processes, including the ease of participation and time to receive a rebate. Participants did not request additional contact from program staff. Satisfaction with some program processes, such as the handling of mail-in applications, increased since the previous evaluation.
- 3. Maintain a mail-in option for rebates, but expand online rebate submission.** Participant satisfaction remained consistent across all methods of rebate submission. While a mail-in option is necessary for less tech-savvy customers and stores, the majority of customers may prefer an online option, which may reduce the internal administrative burden.



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4. **Increased tracking of rebates is necessary to gain a better understanding of the reach and effectiveness of the HEER program.** In order to effectively evaluate the HEER program moving forward, the evaluation team recommends that PG&E and SCE track each rebate, along with the customer name, price of the purchased item, and model number. With this additional information, the program can leverage rebates most effectively and track incremental costs of qualifying units.
5. **Increase outreach and marketing to the Latino community.** A high number the HEER nonparticipants who are not actively seeking ENERGY STAR appliances, but are purchasing appliances, are Latino and are unaware of the HEER program.

HEER Product Market Characterization Recommendations

The HEER product market characterization resulted in seven program strategy recommendations. Each recommendation applies to some, but not all, of the products studied and should be implemented differently depending on the specific market conditions of each product type.

1. **Use carefully targeted incentives to overcome the product's unique market barriers.**
 - a. **Refrigerators:** Use incentives to reduce incremental cost and increase availability of efficient products. Conduct a systematic study of measure availability by price point, configuration, and brand, and incent only those products where there is limited availability and/or a high incremental cost. Consider a limited-time, end-user incentive implemented either through retailers or brands. Consider also a brand incentive to increase the number of efficient models at any price point or for configurations with low availability. All piloted efforts should be designed such that their results can be measured and the findings applied to full-scale program designs.
 - b. **Water heaters:** Increase the end-user incentive on ENERGY STAR gas storage products to further reduce the incremental cost. Provide a per-unit incentive to the retailer/installer to increase product availability. Continue to offer the incentive year-round (i.e., do not use a limited-time incentive).
2. **Investigate a new incentive approach if process findings indicated potential for attribution risk.**
 - a. **Refrigerators:** The participant survey conducted as part of the process evaluation indicated the program and its incentives may not be influencing refrigerator purchases. Consider more narrowly targeting the incentive (for example, only products under \$500 MSRP [manufacturer's suggested retail price]) to reduce potential free-ridership.
 - b. **Pool pumps:** The participant and retailer survey conducted as part of the process evaluation and the manufacturer interviews conducted as part of the market characterization all indicated the program and its incentives may not be influencing



pool pump purchases. Consider testing various alterations to the current program design to gauge effectiveness, including eliminating all incentives, or eliminating only the end-user incentive or the midstream incentive.

3. Conduct retailer and installer training.

- a. **Refrigerators:** Consider a formalized training program for store managers and sales associates, focused on identifying qualifying products and selling energy efficiency benefits to the end-user. This will be particularly useful in influencing purchases in which there is no incremental cost or in which the product MSRP is large enough that a utility incentive is not a significant purchase consideration.
- b. **Water heaters and clothes dryers:** Consider retailer and installer trainings focused on selling the benefits of efficient products with low market penetration, identifying suitable applications for these products, and training to install and maintain the products. The most efficient technologies are new to market and thus unfamiliar to most retailers, installers, and end-users. They function differently than typical storage water heaters and have specific installation requirements.

4. Fund retailer co-op marketing.

- a. **Refrigerators:** Low end-user awareness is an important barrier to adoption and could be increased if retailers are incentivized to market efficient products.
- b. **Water heaters and clothes dryers:** The most efficient products are also technically innovative and thus unfamiliar to end-users. Increased marketing by retailers will increase awareness of these products and confidence in their functionality.

5. Conduct pilots to test implementation approaches.

- a. **Refrigerators:** The recommendation to implement a limited-time incentive is untested among U.S. energy efficiency programs and could be employed in many ways: by retailers or brands, for varying time periods, and at various times during the year. Pilots conducted with an experimental design approach (i.e., where the pilots are designed to facilitate data collection and comparison) will help program administrators evaluate the most effective, lowest cost approach.
- b. **Pool pumps:** Pilots conducted with an experimental design approach would allow program administrators to compare the effectiveness and implementation cost of the recommendations to alter the incentive structure.

6. Investigate new energy savings opportunities.

- a. **Pool pumps:** Pumps under 1 horsepower and motor replacement may yield savings and should be considered as additions to the HEER program.
- b. **Clothes dryers:** Heat pump clothes dryers are expected to become available in the U.S. in 2012 or 2013, have considerable savings over standard clothes dryers, and should be considered as additions to the HEER program.



7. Engage in policy/codes/standards development.

- a. Clothes dryers:** The current DOE test procedure for clothes dryers obscures differences in product performance. PG&E and SCE can assist efficiency organizations in lobbying for amendments to the test procedure that will enable the establishment of an ENERGY STAR specification for clothes dryers and lay a foundation for its inclusion in future efficiency programs.

BCE Experience Review Recommendations

The experience review of the California Statewide BCE Program resulted in seven key findings:

- 1. To date, plug-load programs have focused on televisions.**
- 2. The rapidly changing baseline of television energy consumption creates a significant evaluation risk and difficulty in assessing attribution.**
- 3. These programs target a national market of large retailers, which makes it difficult to have a local influence.**
- 4. The current regulatory framework is built around a per-measure cost-effectiveness program model.**
- 5. The BCE Program has effectively used ENERGY STAR as a program resource.**
- 6. The BCE Program has established valuable retailer relationships.**
- 7. Consumers tend not to understand plug-load-management products.**





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1

INTRODUCTION

This report presents the findings of a multi-task process evaluation and market characterization study of two 2010-2012 energy efficiency programs administered by Southern California Edison (SCE) and Pacific Gas & Electric (PG&E): the Home Energy Efficiency Rebate (HEER) Program and the Business and Consumer Electronics (BCE) Program.

The HEER programs are statewide, residential energy efficiency programs that offer rebates to end-users for the purchase and installation of qualified major home appliances, pool equipment, and cooling equipment. The programs implemented by SCE and PG&E (and also San Diego Gas & Electric [SDG&E]) share similar program theory, design, and goals, although each utility implements its program differently. For example, the products and measure qualifications differ across programs.

Previous evaluations of the HEER programs include process evaluations of PG&E's and SCE's 2006-2008 programs (by KEMA), a state-wide impact evaluation for 12 "high impact measure" groups for the 2006-2008 program years (by Cadmus), and an impact evaluation of the statewide 2004-2005 program (by Itron).¹

The Business and Consumer Electronics Program is a residential energy efficiency program targeting consumer electronics, such as televisions, monitors, and desktop computers. The program is implemented by SCE and PG&E (and also SDG&E, which did not participate in this evaluation). They share similar program theory, design, and goals, although each utility implements its program independently. The PG&E program is part of the wider BCE Alliance and is implemented in partnership with other out-of-state entities and Sacramento Municipal Utility District (SMUD), while the SCE program is implemented locally.

The BCE Program was introduced during the 2010-2012 program cycle (after a pilot in 2008-2009) and so has not been evaluated previously. Supporting research for the California BCE

¹ KEMA. 2009. *Process Evaluation of Southern California Edison's 2006-2008 Home Energy Efficiency Rebate (HEER) Program: Final Report*. Report ID SCE0278. Rosemead, Calif.: Southern California Edison.

The Cadmus Group, Inc. 2010. *Residential Retrofit High Impact Measure Evaluation Report*. San Francisco, Calif.: Public Utilities Commission, Energy Division.

ITRON. 2007. *2004/2005 Statewide Residential Retrofit Single-Family Energy Efficiency Rebate Evaluation: Final Report*. CPUC ID#1115-04. San Francisco, Calif.: California Public Utilities Commission



Program includes a 2009 statewide baseline study (by Opinion Dynamics Corporation) and a 2010 SCE plug load characterization study (by Research Into Action). In addition, EMI conducted a market progress evaluation report in 2011 of the television initiative offered by the Northwest Energy Efficiency Alliance, which is a BCE Alliance partner.

This process evaluation and market characterization was conducted in coordination with a general population survey (GPS) of nearly 1,000 ratepayers in the SCE and PG&E service territories. Select results from the GPS are incorporated in this report.²

ORGANIZATION OF THE REPORT

This report documents findings from three distinct research projects conducted by two consultants, Research Into Action, Inc. and EMI (Energy Market Innovations, Inc.). Although there are numerous areas of overlap among the three projects, each was conducted separately and thus the detailed findings are presented in three different sections of this report. The fourth section, covering forward-looking program design suggestions, brings these lines of inquiry together into a single set of “big picture” recommendations, as well as recommendations unique to the HEER and BCE Programs. Table 1.1 shows the organization of the report.

Table 1.1: Organization of the Report, Relevant Appendix, and Author

SECTION	RELEVANT APPENDIX	AUTHOR
Section I: HEER Process Evaluation	Appendix A	Research Into Action
Section II: HEER Market Characterization	Appendix B	Research Into Action
Section III: BCE Program Experience Review and Technology/Market Review	Appendix C	EMI
Section IV: HEER and BCE Program Design Recommendations	None	Research Into Action and EMI

Section I: HEER Process Evaluation

The HEER process evaluation documents the accomplishments and challenges for the 2010-2012 HEER Program for both PG&E and SCE. Research activities included:

- ➔ Interviews with HEER Program staff from PG&E and SCE

² The complete findings are published as a separate report volume: *2012 California General Household Population Study* (at the time of this report, the study was in draft and had not been assigned a study ID).



- ➔ A survey of pool pump contractors in PG&E and SCE service territories
- ➔ A survey of SCE and PG&E customers who did not participate in the HEER program
- ➔ A survey of SCE and PG&E customers who participated in the HEER program
- ➔ Review of primary data from PG&E and SCE
 - Lists of participating pool pump contractors
 - List of point-of-sale retailers
 - Program participant data
 - Program documentation including program websites and prior evaluations

A detailed statement of the process methodology and sources is provided Appendix A.

Section II: HEER Market Characterization

The market characterization covers four residential products of interest to HEER program managers, three of which are currently included in at least one of the utilities' programs: refrigerators, water heaters, and pool pumps. A fourth product, clothes dryers, was included because it is of interest to utilities for future inclusion in the HEER Program.

The market characterization component of the study had three objectives:

- ➔ Assess U.S. appliance programs to identify common (and uncommon) implementation approaches, notable successes, and new ideas
- ➔ Characterize the markets for the four products of interest, including sales and efficiency trends, and key players in the supply chain
- ➔ Recommend program design strategies to address the projects to be considered by program managers for program cycles starting in 2013-2014

Research activities included:

- ➔ In-depth interviews with product manufacturers, industry experts, researchers, and efficiency program administrators
- ➔ An extensive literature review, including documentation from the Department of Energy, ENERGY STAR[®], appliance industry publications, energy efficiency studies, and the popular press

A detailed statement of the project methodology and sources is provided Appendix B.



Section III: BCE Program Experience Review and Technology/Market Review

The BCE component of the project had three phases completed in succession, each with its own goals:

- ➔ **Program experience review.** The first phase of the project focused on understanding stakeholder experiences with the BCE Program and programs from other utilities attempting to address miscellaneous plug loads. The purpose of this review was for the evaluators to understand what worked well and what did not in this first generation of programs focused on miscellaneous plug loads.
- ➔ **Technology and market review.** The second phase of this project focused on two specific areas: 1) research into current technologies and trends in miscellaneous plug load products; and 2) research into current markets where these products are acquired by consumers, as well as trends in these markets. This research primarily focused on consumer electronics and the retail markets where customers most often purchase consumer electronics products.
- ➔ **Recommended program concepts.** The third phase of research was to develop recommendations to provide input for future program designs to address the energy use of miscellaneous plug loads. These recommendations were based on the detailed research from the first two tasks.

BCE research activities included:

- ➔ Stakeholder interviews with:
 - Utility program staff
 - Other utility staff involved in relevant issues, such as retailer engagement or codes and standards
 - Implementation contractor staff
 - Staff from other utilities with programs targeting plug loads
 - Staff from other organizations that promote plug-load efficiency, such as the EPA ENERGY STAR program and the Consortium for Energy Efficiency (CEE)
- ➔ Review of primary data from PG&E and SCE, including:
 - BCE Program data
 - BCE Program documentation
 - Other consumer electronics reports sponsored by PG&E and SCE
- ➔ Review of secondary data from other research reports for consumer electronics
- ➔ Review of current news sources to identify trends in the market



A detailed statement of the project methodology and sources is provided Appendix C.

Section IV: Program Design Recommendations

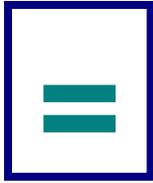
The specific program design recommendations that resulted from the HEER process evaluation and market characterization, and the BCE component of the study, are summarized in the final section of this report.



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SECTION I: HEER PROCESS EVALUATION

CHAPTER 2: OVERVIEW

CHAPTER 3: FINDINGS



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

SECTION I: HEER PROCESS EVALUATION



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

2 OVERVIEW

Research Into Action conducted a process evaluation of the HEER Program. This evaluation documented the accomplishments and challenges for the 2010-2012 HEER Program for both PG&E and SCE.

This chapter describes the 2010-2012 HEER program structure, overall program progress, and inspection process.

PROGRAM STRUCTURE

The HEER Program offers participants rebates for energy efficient measures such as refrigerators, whole house fans, and pool pumps. Retailers or contractors provide the rebates to participants in three separate ways – immediate point-of-sale (POS), mail, or online. Program staff from both utilities reported that the program has been successful at meeting its 2010-2012 program goals. They further anticipated that they had met the 2012 goals. The program has targeted different measures and population segments over time.

Table 2.1 shows the measures incented by the 2010-2012 HEER Program. For this study, the evaluator collected data on four measures for each utility; these are marked with asterisks. The utilities selected these products based on their relevance to current and future offerings, and the potential for the most new knowledge.

Table 2.1: Incented Measures by Utility

MEASURE	PG&E	SCE
Water heaters	\$30*	None
Insulation	\$0.15/sq ft	\$0.15/sq ft
Refrigerators	\$50	\$50*
Dishwashers	None	None
Clothes washers	None	None
Furnaces	None	None
Room air conditioners	\$50*	\$50*
Pool pumps/motors	\$100*	\$200*
Whole house fans	\$100*	\$50
Ducted evaporative coolers	None	\$300-\$600*
Cool roof	None	\$0.10-\$0.20/sq ft

* Utility-selected measure for this study.



Each utility offers a different combination of rebates and methods for rebate delivery. Retailers deliver rebates instantly via POS, or customers can apply for rebates by mail or online. Table 2.2 and Table 2.3 show the different mix of rebate types and rebated products for each utility.

Table 2.2: Measures Rebated through the PG&E HEER Program (2009-2012)

PRODUCTS	PG&E REBATE METHOD		
	Mail	Online	POS
Clothes washers	X	X	
Dishwashers	X	X	X
Room air conditioners	X	X	
Whole house fans	X	X	
Water heaters	X	X	
Pool pumps/motors	X	X	

Table 2.3: Measures Rebated through the SCE HEER Program (2009-2012)

PRODUCTS	SCE REBATE METHOD		
	Mail	Online	POS
Evaporative coolers	X	X	
Insulation	X		
Room air conditioners	X	X	X
Whole house fans	X	X	X
Water heaters	X	X	
Pool pumps/motors	X	X	
Refrigerators	X	X	X

OVERALL PROGRESS

Contacts from both utilities reported that the HEER Program is on track to meet goals as of fall 2011. PG&E has rebated clothes washers more frequently than other appliances for the past three years. SCE has rebated more refrigerators than other appliances. Table 2.4 and Table 2.5 show the composition of both utilities' rebate programs by percent. Totals include mail, online and POS rebates processed by year.



Table 2.4: PG&E HEER Measure Rebates Processed by Year

MEASURE	2009		2010		2011	
	Count	Percent	Count	Percent	Count	Percent
Clothes washers	232	97%	95,213	66%	63,531	61%
Dishwashers	6	3%	40,504	28%	34,195	33%
Water heaters	1	0%	4,175	3%	1,841	2%
Pool pumps	0	0%	1,142	1%	2,765	3%
Room air conditioners	0	0%	1,924	1%	402	0%
Whole house fans	0	0%	1,894	1%	1,616	2%
Total*	239	100%	144,852	100%	104,350	101%

* Totals may not equal 100% due to rounding.

Table 2.5: SCE HEER Measure Rebates Processed by Year

MEASURE	2009		2010		2011	
	Count	Percent	Count	Percent	Count	Percent
ENERGY STAR refrigerators	1,467	87%	54,109	89%	23,298	88%
ENERGY STAR room ACs	17	1%	1,695	3%	188	1%
Water heaters	1	0%	31	0%	18	0%
Pool pumps	144	9%	3,297	5%	1,992	8%
Evaporative coolers	38	2%	699	1%	317	1%
Whole house fans	15	1%	819	1%	625	2%
Total*	1,682	100%	60,650	99%	26,438	100%

* Totals may not equal 100% due to rounding.

Staff from both utilities noted that the HEER Program has been able to increase retailer involvement over the past two years. In the future, PG&E plans to revamp their offerings and review the amount and type of incentives available in order to better address changing goals in the overall energy efficiency portfolio. Staff contacts indicated that PG&E is considering more upstream and midstream incentives, such as contractor incentives for water heaters, and is conducting market research around these approaches. SCE contacts reported that POS rebates are the future of their rebate program, since both customers and big box retailers favor them. In addition, SCE staff noted that they plan to continue and expand the successful collaboration with retailers, which has resulted in increased marketing through in-store material and mailers in addition to the program provided materials.



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INSPECTIONS

Both utilities inspect a certain number of measures claimed by online and mail-in rebates to verify that the correct appliance has been installed and is operational. PG&E contacts reported that between 2% and 10% of HEER installations receive random inspections. Inspection reports alert program management to any issues regarding a particular appliance or program practice. For PG&E, if less than 95% of any particular type of installation is passing inspection, the inspection team conducts an investigation into the issue.

PG&E inspection contacts report that there is no indication of more failures for any particular measure. Staff reject 2% to 5% of rebate applications, although as many as 15% may have an initial issue that must be resolved before the application can be approved. Program staff send a rejection letter to the applicant, describing any issues. It can take several weeks for program staff to generate this letter and receive comments and any additional information from the customer. In some cases, customers may fax the information, which can expedite the process.

An SCE contact reported that the percentage of installations inspected varies by product type. Refrigerators have the highest volume of applications and fewer inspections, while around 70% of pool pump installations are inspected because of the lower volume of applications. Contacts indicated that a sufficient amount of installations of each measure type are inspected to ensure a high level of confidence in quality installations. The SCE inspection team randomly selects installations for inspection across each type of incentive delivery and the incentive delivery method has no influence on selection.

Most SCE customers are receptive to inspections, although a utility contact reported that about 20% require additional persuasion beyond the initial contact. Nearly all customers are willing to complete the inspection to receive their rebate. The SCE inspection department does not fail any installations; instead, findings are recorded and passed on to HEER program staff for pass-or-fail determination. If a measure fails, SCE staff informs the customer via a letter. The customer may reapply for rebates once they address the cause of a failed inspection.



3 FINDINGS

Research Into Action conducted surveys with pool pump contractors, appliance retailers, participating HEER customers, and non-participating customers. This chapter is organized by population, with separate sections for retailers, pool pump contractors, and participants. Each section presents a summary of the findings from the surveys of the population. Additional findings can be found in Appendix A.

Table 3.1 displays the total surveyed contacts from the available samples.

Table 3.1: HEER Evaluation Surveys

GROUP	AVAILABLE SAMPLE		SURVEYED	
	PG&E	SCE	PG&E	SCE
Retailers	1,299	424	74	79
Pool pump contractors	195	264	24	31
Participants	15,759	77,721	205	302
Total	17,253	78,409	303	412

RETAILERS

Characteristics of Retailers

The evaluator managed telephone surveys with retailers who participated in the PG&E or SCE HEER program from 2009-2010. Total retailers surveyed included 153 retailers from PG&E (74) and SCE (79) territories. SCE provided a list of 424 individual retailer contacts (see Methodology Appendix A for details). Contacts were not linked with HEER rebates, so we were unable to target retailers by measure. PG&E rebate data included the name of the retailer, but did not include associated phone numbers. We searched for phone numbers associated with the retailer name and city, finishing with a list of 1,299 retailers in PG&E territory. About 20% of the list had incorrect phone numbers (245 out of a total of 1,299).

At each location, the survey administrators requested to speak to the person most knowledgeable about the HEER Program and the associated rebates. This chapter summarizes findings from



retailer surveys across both utilities. Wherever possible, we have paired our findings with those from the 2006-2008 process evaluation,³ which presented results from surveys with SCE⁴ only.

Both utilities strive to form strong relationships with retailers in their territories. Some participating big box stores have assigned staff to work with the utility to effectively promote the HEER rebates. PG&E and SCE both have outreach teams that visit retail stores in their respective territories to distribute program materials and ensure that qualified merchandise is identified through stickers and displays.

Representatives of both utilities indicated that their firms conduct outreach to participating retailers at least twice annually. PG&E has five field representatives who promote the program, conduct outreach, and distribute training materials. PG&E representatives visit retailers approximately every eight weeks and document the results of these visits in a detailed report. PG&E staff indicated that detailed tracking of program outreach allows staff to ensure successful outreach to retailers because the tracking records details about the information provided to retailers and any issues the retailers encounter. This increased tracking is a notable program success.

SCE employs an outside contractor, Organizational Support Services (OSS), as the “boots on the ground” of the program. In addition to providing general program promotion and marketing services, OSS staff respond to communications from stores when stores report running low on marketing materials or rebate applications. A list of participating SCE retailers can be found in Appendix A. An OSS representative reported that stores are receptive to receiving program materials and program outreach. Neither OSS representatives nor SCE staff were able to provide a specific schedule for marketing outreach.

Research Into Action attempted to survey representative amounts of each size of retailer establishment. Table 3.2 displays the available population for each category of stores and the total contacts surveyed.⁵ This is a stratified random sample by store size. The 2006-2008 process evaluation sampled primarily large retailers (89%).

³ KEMA. 2009. *Process Evaluation of Southern California Edison's 2006-2008 Home Energy Efficiency Rebate (HEER) Program: Final Report*. Report ID SCE0278. Rosemead, Calif.: Southern California Edison.

⁴ Report also includes PG&E pool pump contractor survey data from 2006-2008.

⁵ PG&E had no available list of retailers. A list was compiled from the names of retailers; however, the list proved unreliable. Due to this inaccurate list, these population numbers should be considered estimates.



Table 3.2: Available Population for Each Category of Retailer

CATEGORY		POPULATION		
		PG&E	SCE	Total
Large stores	Surveyed	33	34	67
	Population	257	295	552
Medium stores	Surveyed	27	25	46
	Population	196	81	277
Small stores	Surveyed	20	20	40
	Population	846	48	894

Surveyed retailers offered a variety of qualifying merchandise. Retailers sold refrigerators and clothes washers more than any other qualifying items. Table 3.3 shows the qualifying products offered by surveyed retailers.

Table 3.3: Qualifying Products Sold by Surveyed Retailers

PRODUCT	RETAILERS OFFERING			PERCENT OFFERING			
	Total	PG&E	SCE	Total	PG&E	SCE	SCE 2006-2008
Refrigerators	134	55	79	88%	74%	100%	99%
Clothes washers	133	54	79	88%	73%	100%	—
Dishwashers	129	53	76	85%	72%	96%	—
Room air conditioners	110	56	54	72%	76%	68%	54%
Water heaters	103	65	38	68%	88%	48%	—
Whole house fans	59	32	27	39%	43%	34%	30%
Ducted evaporative coolers	39	24	15	26%	32%	19%	20%

Program Awareness and Knowledge

Staff from both utilities reported a perception that retailers awareness of the HEER program is increasing. All surveyed contacts reported familiarity with the Home Energy Efficiency Rebates (HEER) Program. Nearly all (95%) of surveyed retailers reported that they had heard of the



program.⁶ Retailers most commonly reported that they had heard of the program through a visit to their store from a utility representative (35%), word-of-mouth/an industry colleague (26%), or a utility brochure/ mailing/ email (16%). Table 3.4 shows the reported source of awareness for all surveyed retailers.

**Table 3.4: Source of Program Awareness
(Multiple Responses Allowed)**

SOURCE OF AWARENESS	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)		2006-2008 EVALUATION (N=79)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Utility representative came to store	26	35%	38	48%	64	42%	5	6%
Word-of-mouth/ industry colleague	29	39%	18	23%	47	31%	17	21%
Utility mailing / brochures	13	18%	14	18%	27	18%	34	43%
Utility website	6	8%	6	8%	12	8%	11	14%
Company training	3	4%	3	4%	6	4%	—	—
Utility email	2	3%	3	4%	5	3%	2	3%
Equipment manufacturer/ retailer	2	3%	2	3%	4	3%	15	19%
Utility phone call	—	—	3	4%	3	2%	—	—
Advertisement	3	4%	—	—	3	2%	—	—
Corporate	1	1%	1	1%	2	1%	—	—
Trade conference/ trade association	1	1%	—	—	1	1%	1	1%
Customers wanted ENERGY STAR	1	1%	—	—	1	1%	—	—
Other	—	—	—	—	—	—	7	9%
Don't know	3	4%	3	4%	6	4%	2	3%

⁶ We calculated this percent from the population of retailers, including retailers who decline participation in the survey and incorrect phone numbers, in addition to the 153 contacts that completed the retailer survey.



Training

We asked surveyed retailers how knowledgeable the sales staff at their location is about ENERGY STAR and selling energy efficient models of qualifying equipment (Table 3.5). The majority of contacts (over 80%) indicated that staff at their location are “knowledgeable” or “very knowledgeable.”

Table 3.5: Appliance Sales Staff Awareness of ENERGY STAR

RATING	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)	
	Count	Percent	Count	Percent	Count	Percent
1 – Not at all knowledgeable	1	1%	0	0%	1	1%
2	1	1%	2	3%	3	2%
3	10	14%	9	11%	19	12%
4	25	34%	21	27%	46	30%
5 – Very knowledgeable	37	50%	47	59%	84	55%

In addition to general knowledge about ENERGY STAR, we asked retailers if they were aware that ENERGY STAR has higher levels of classification. Roughly half of respondents reported being aware of the higher tiers (Table 3.6).

Table 3.6: Awareness of ENERGY STAR Classifications

AWARE	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)	
	Count	Percent	Count	Percent	Count	Percent
Yes	35	47%	41	52%	76	50%
No	39	53%	38	48%	77	50%

We also asked contacts if more training would be beneficial to their co-workers or employees. SCE contracts reported that more training would be “helpful” or “very helpful” more often (64%) than PG&E contacts (47%). Respondents offered a variety of responses, including some (14% SCE, 20% PG&E) who indicated that additional training would not be at all helpful (Table 3.7).



Table 3.7: Helpfulness of Additional Training

RATING	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)	
	Count	Percent	Count	Percent	Count	Percent
1 – Not at all helpful	15	20%	11	14%	26	17%
2	7	9%	5	6%	12	8%
3	17	23%	12	15%	29	19%
4	9	12%	13	16%	22	14%
5 – Very helpful	26	35%	38	48%	64	42%

Familiarity and Issues with Rebate Processes

Rebate Familiarity

The 2006-2008 process evaluation noted that most retailers were familiar with the POS option (70%), while being less familiar with the mail-in (48%) or online rebate options (39%). Research Into Action asked retailers about their experiences with the various types of rebates they had experience working with. Three-quarters (76%) of the retailers who had worked with the POS rebates reported having no problems with this method of providing rebates to customers (Table 3.8). These results are similar to previous evaluation findings indicating that most retailers experienced no difficulties with the POS process (84% gave a “4” or “5” on a five-point scale).

Table 3.8: Retailers Reporting Problems with POS Rebates

PROBLEMS	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)	
	Count	Percent	Count	Percent	Count	Percent
Yes	2	3%	5	6%	7	5%
No	58	78%	58	73%	116	76%
Don't know	12	16%	15	19%	27	18%
Refused	2	3%	1	1%	3	2%

Overall Retailer Satisfaction

We asked retailers how satisfied they are with the existing HEER program and rebates. Overall, retailers reported high satisfaction with the HEER program. Over three-quarters of contacts who recalled a visit from the market materials delivery team reported being “very satisfied” or “satisfied” with the teams who supply the HEER marketing materials to their stores. Table 3.9 shows the satisfaction scores regarding marketing materials delivery. Around 20% of contacts did not recall anyone coming in to deliver marketing materials. This may be a result of staff turnover, as outreach staff deliver materials as needed. Because marketing materials are the



primary contact between retailers and the HEER program, this high percentage of unaware respondents suggests an opportunity to improve communication.

Table 3.9: Satisfaction with Market Materials Delivery Team

RATING	PG&E (N=55)		SCE (N=65)		TOTAL (N=120)	
	Count	Percent	Count	Percent	Count	Percent
1 – Not at all satisfied	2	4%	1	2%	3	3%
2	4	7%	5	8%	9	8%
3	2	4%	12	18%	14	12%
4	11	20%	11	17%	22	18%
5 – Very satisfied	36	65%	36	55%	72	60%

The majority of respondents reported that utility-provided marketing materials are “effective” or “very effective” (Table 3.10). Very few contacts (3% SCE, 12% PG&E) indicated that their store does not use the utility-provided marketing materials.

Table 3.10: Effectiveness of Utility Marketing Materials

RATING	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)	
	Count	Percent	Count	Percent	Count	Percent
1 – Not at all effective	4	5%	1	1%	5	3%
2	4	5%	1	1%	5	3%
3	6	8%	14	18%	20	13%
4	13	18%	20	25%	33	22%
5 – Very effective	37	50%	40	51%	77	50%
Store does not use utility provided materials	9	12%	2	3%	11	7%
Don't know	1	1%	1	1%	2	1%

Around 80% of respondents reported having some contact with HEER outreach staff when the staff visit retail locations to distribute materials and provide resources. As noted earlier, PG&E outreach staff visit retailers every eight weeks. SCE outreach teams, composed of OSS staff, visit retailer stores twice annually and provide a toll-free number for information and materials requests in between scheduled visits. We asked retailer contacts to rate their satisfaction with staff contacts. Of these, around 60% in each utility territory reported being “satisfied” or “very satisfied” (Table 3.11).



Table 3.11: Retailer Satisfaction with HEER Staff

RATING	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)		2006-2008 EVALUATION (N=79)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1 – Not at all satisfied	8	11%	4	5%	12	8%	0	0%
2	2	3%	8	10%	10	7%	1	1%
3	6	8%	6	8%	12	8%	5	6%
4	3	4%	16	20%	19	12%	16	20%
5 – Very satisfied	42	57%	32	41%	74	48%	42	53%
Don't know	13	18%	13	16%	26	17%	16	20%

The majority of retailers are satisfied with the program overall (82% gave “4” or “5” on a five-point scale; Table 3.12). While there appears to be a difference in satisfaction levels between SCE and PG&E, these differences may be due to differing sampling strategies. Satisfaction ratings for SCE remained consistent between the 2006-2008 process evaluation and the 2010-2012 evaluation. The PG&E sample contained stores who were not targeted in PG&E’s POS marketing campaign, whereas the SCE sample was entirely derived from SCE’s list of retailers contacted for POS information.

Table 3.12: Retailer Overall Satisfaction with the HEER Program

RATING	PG&E (N=74)		SCE (N=79)		TOTAL (N=153)		2006-2008 EVALUATION (N=79)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1 – Not at all satisfied	7	9%	1	1%	8	5%	0	0%
2	4	5%	0	0%	4	3%	0	0%
3	7	9%	6	8%	13	8%	5	6%
4	18	24%	21	27%	39	25%	22	28%
5 – Very satisfied	36	49%	51	65%	87	57%	52	66%
Don't know	2	3%	0	0%	2	1%	0	0%

Smaller stores in PG&E territory rated satisfaction with the program much lower than SCE (25% have a “1” on a five-point scale in PG&E versus 0% in SCE). The lower satisfaction rating among smaller retailers may be due to difficulties with the POS rebates. Contacts from both utilities indicated that small retailers have trouble with the POS rebates because the retailer must pay the customer the instant rebate and wait for the utility to reimburse them. Small retailers often cannot afford to wait for repayment. For SCE, OSS staff and program staff disagreed about the reimbursement period; OSS staff reported it was about 90 days, while program staff believed



it was 30 to 60 days. OSS staff indicated that 15 to 30 days would be more acceptable for the retail stores. OSS staff and program staff also indicated that the program paperwork can overwhelm smaller retailers.

Findings by Appliance Type

Research Into Action asked participating retailers similar questions about selected appliance types. If a retailer did not sell a specific appliance, we omitted those questions. Therefore, the total number of responses for each appliance differs. We present the following results by appliance type.

Refrigerators

Only SCE selected refrigerators as an appliance of interest for this evaluation. The following findings apply only to retailers in SCE territory. Research Into Action surveyed 79 SCE retailers regarding their awareness, promotion, and comments on the HEER refrigerator rebates. The SCE refrigerator rebates account for 90% of the total SCE HEER rebates.⁷ SCE has offered these rebates for several years and thus the market penetration is high. Participating retailers indicated that an average of 79% of the refrigerators they sell are ENERGY STAR-qualified.

Awareness and Promotion

Nearly all (96%) of surveyed SCE retailers reporting being aware of the HEER refrigerator rebates. Similarly, nearly all (99%) surveyed retailers reported promoting the rebates. The majority (79%) of surveyed retailers who sell HEER-qualified refrigerators indicated that the rebates are high enough to motivate consumers to consider the higher efficiency refrigerators. These results are consistent with the 2006-2008 process evaluation which found that nearly all (99%) surveyed retailers sell refrigerators and reported being aware of the HEER rebates (94%). We asked participating retailers if it would be viable for their stores to offer a tiered rebate, with a larger incentive for more efficient refrigerators. Nearly all (90%) of the contacts who were able to answer for their stores (70) reported that their store could offer tiered rebates. Tiered rebates, or rebates varying over time, allow for alternative rebate structures that may increase options for evaluation, for more information see the *Marketing Characterization* section of this report.

Participating retailers reported using various strategies to promote the HEER-qualifying refrigerators. Contacts chose multiple promotion strategies employed in their stores. Retailers

⁷ Percentage calculated from counts of evaluated products only – refrigerator, room AC, evaporative cooler, and pool pump.



identified using signage or materials from the utility as the most common method, followed by using signage or materials provided by manufacturers. Table 3.13 shows the promotion strategies retailers reported using.

**Table 3.13: SCE Retailer HEER Refrigerators Promotion Strategies
(Multiple Responses Allowed)**

PROMOTION STRATEGY	COUNT (N=79)	PERCENT
Use signage/promotional materials from utility	40	51%
Use signage/promotional materials from manufacturer	29	37%
Inform customers of ENERGY STAR benefits	21	27%
Use our own signage/promotional materials	10	13%
Products are physically positioned more prominently	4	5%
Discounts/coupons	3	4%
Same as all other refrigerators	3	4%
Extra training for sales staff	3	4%
Don't know	3	4%
Other (not clear)	2	3%

Retailers use these methods to reach the customer with various messages. We asked retailers which marketing messages are the most effective. Retailers indicated that saving money/lower operating costs (43%) and qualification for rebates (42%) are the most effective marketing messages (Table 3.14). SCE program staff reported that customers increasingly are focusing on sustainability and conservation, and that energy efficient features have a new “brag value,” similar to that attached to stainless steel finishes or other features.

**Table 3.14: Most Effective Refrigerator Marketing Message for SCE Retailers
(Multiple Responses Allowed)**

MOST EFFECTIVE MESSAGE	COUNT (N=79)	PERCENT
Saves money via lower operating costs	34	43%
Qualifies for a rebate	33	42%
Provide energy savings	15	19%
External marketing materials	3	4%
Internal marketing materials	3	4%
Helps protect our environment	1	1%
Cost	1	1%
Refrigerator recycling program	1	1%



MOST EFFECTIVE MESSAGE	COUNT (N=79)	PERCENT
Fast delivery	1	1%
Don't know	9	11%

In addition to identifying successful marketing strategies, retailers also identified some barriers to sales of ENERGY STAR refrigerators. Of the retailers who reported any barriers, most (71%) reported cost as the largest barrier. We asked refrigerator retailers if the existing rebate is sufficient. Most (79%) reported that the rebate is sufficient. This is consistent with the 2006-2008 process evaluation, which found that three-quarters of participating refrigerator retailers considered the \$50 rebate to be sufficient. Those retailers who expressed dissatisfaction with the current incentives recommended an incentive of \$100.

Retailers identified cost as the most common barrier to sales of efficient refrigerators (43%). However, nearly as many retailers (39%) reported that there are no barriers limiting the sales of ENERGY STAR refrigerators. This disagreement over barriers may be because the prices of efficient refrigerators are only significantly different in the lowest price brackets, meaning that cost is a prohibiting factor in choosing a more efficient model if the overall price must remain as low as possible for the customer to purchase the unit. Other barriers given included the lack of qualifying units (10%), availability of features (10%), and the lack of customer knowledge (2%). Table 3.15 shows the retailer-identified factors that limit the sales of ENERGY STAR refrigerators.

**Table 3.15: Factors that Limit Sales of ENERGY STAR Refrigerators
(Multiple Responses Allowed)**

FACTORS	COUNT (N=79)	PERCENT
Cost	34	43%
Nothing	31	39%
Availability of qualifying units	5	6%
Availability of features	4	5%
Lack of customer knowledge	1	1%
Customer unwilling to update	1	1%
Don't know	5	6%

Refrigerator Recycling

In addition to rebates, SCE also offers refrigerator recycling services. The recycling program has a similarly high penetration rate, with 95% of retailers reporting awareness of the program. Slightly fewer (88%) reported that their stores promote the refrigerator recycling program. This



is similar to the percentage of retailers promoting the refrigerator recycling option in 2006-2008,⁸ which was 90%. Of those six retailers in this evaluation who did not report promoting the program, four indicated that their stores have their own recycling program, one reported that the rebate is too much of a hassle, and the last did not specify. These reasons for not participating show progress from the previous evaluation, in which 19% of retailers reported that they did not promote rebates because the rebates do not affect sales or because there is not enough information about the recycling program (15%).

Cooling Products

Room Air Conditioners (AC)

Both utilities offer \$50 rebates for qualifying room air conditioners (AC). We surveyed retailers who sell qualifying room air conditioners about their program awareness, experience, and any factors limiting the success of room AC rebates.

Awareness and Promotion

Overall, 69% of surveyed retailers reported being aware of the HEER rebates for ENERGY STAR room AC units. Of those surveyed retailers who were aware of the rebates (76), 71% reported promoting the available rebates, as shown in Table 3.16 and Table 3.17.

Table 3.16: Awareness of HEER Rebates among Surveyed Retailers

AWARENESS OF REBATES	PG&E (N=56)		SCE (N=54)		TOTAL (N=110)	
	Count	Percent	Count	Percent	Count	Percent
Yes	41	73%	35	65%	76	69%
No	14	25%	17	31%	31	28%
Don't know	1	2%	2	4%	3	3%

⁸ The 2006-2008 evaluation used a 1-to-5 scale, where "1" was *Not very active* and "5" was *Very active*. To compare, we added up all respondents in the 2006-2008 evaluation who gave a "2", "3", "4", or "5" rating on this scale.



Table 3.17: Retailers Promoting HEER AC Rebates

PROMOTING REBATES	PG&E (N=41)		SCE (N=35)		TOTAL (N=76)	
	Count	Percent	Count	Percent	Count	Percent
Yes	21	51%	33	94%	54	71%
No	15	37%	2	6%	17	22%
Don't know	5	12%	0	0%	5	7%

Those retailers from both utilities who did not report promoting the rebates (17) gave a variety of reasons for the lack of promotion. Of these, the most common reasons were that the market for energy efficient appliances is small (four mentions) and a lack of sufficient information about the rebates or program (two mentions).

The majority (71%) of surveyed retailers reported that they do promote the rebates or the rebated efficient appliances. These participating retailers reported using the signage or materials from the manufacturers (36%) or materials provided by the utilities (34%) as the most common promotion strategies (Table 3.18). Fourteen percent of promoting retailers indicated that the energy efficient room ACs are promoted in the same way as all other ACs their stores carry. Additionally, more than 10% (13%) of participating retailers indicated that they did not know how their companies promoted these rebates. Table 3.18 shows the promotion strategies for retailers from each utility territory.

Table 3.18: Retailers' HEER ENERGY STAR AC Promotion Strategies (Multiple Responses Allowed)

PROMOTION STRATEGIES	PG&E (N=41)		SCE (N=35)		TOTAL (N=76)	
	Count	Percent	Count	Percent	Count	Percent
Use signage/promotional materials from manufacturer	10	24%	17	49%	27	36%
Use signage/promotional materials from the utility	10	24%	16	46%	26	34%
Same as all other room AC	8	20%	3	9%	11	14%
Company marketing materials/pamphlets	6	15%	4	11%	10	13%
Inform customers of energy efficient benefits	6	15%	5	14%	11	13%
Discounts/coupons	—	—	3	9%	3	4%
Products are physically positioned more prominently	2	5%	2	6%	4	4%
Store generated program	1	2%	—	—	1	1%



PROMOTION STRATEGIES	PG&E (N=41)		SCE (N=35)		TOTAL (N=76)	
	Count	Percent	Count	Percent	Count	Percent
Refused	1	2%	—	—	1	1%
Don't know	10	24%	—	—	10	13%

The HEER rebates are intended to motivate customers to purchase more efficient room ACs. Of the combined surveyed retailers (110), over half (66%) reported that the rebates are enough to motivate customers to purchase more efficient room ACs. Nine retailers indicated that a larger rebate would be necessary to motivate customers. PG&E retailer contacts estimated the average difference in price between ENERGY STAR and standard ACs is \$78. SCE retailers reported a higher estimate of \$111.

Surveyed retailers reported that nearly three-quarters (72%) of the room air conditioners they sold in the past year were ENERGY STAR-qualifying. Although many retailers consider the rebates to be sufficient, 60% reported that at least one factor limits the sales of ENERGY STAR air conditioners. The most commonly reported limiting factor was cost (39%), followed by the availability of qualifying units (6%). Table 3.19 shows the reported limiting factors by utility. Nearly a quarter (24%) of surveyed retailers indicated that there are no barriers to selling more efficient units.

**Table 3.19: Factors Limiting Sales of ENERGY STAR Air Conditioners
(Multiple Responses Allowed)**

LIMITING FACTORS	PG&E (N=41)		SCE (N=35)		TOTAL (N=76)	
	Count	Percent	Count	Percent	Count	Percent
Cost	24	59%	18	51%	43	39%
Nothing	12	29%	14	40%	26	24%
Availability of qualifying units	5	12%	3	9%	7	6%
Availability of features	1	2%	4	11%	6	5%
Lack of knowledge	2	5%	2	6%	4	4%
Climate – AC not needed	2	5%	—	—	2	2%
Not powerful enough (not enough BTUs)	—	—	2	6%	2	2%
Needs of customer	1	2%	—	—	1	1%
Not enough rebates	—	—	1	3%	1	1%
Portable ACs not ENERGY STAR	—	—	1	3%	1	1%
Seasonal item	—	—	1	3%	1	1%
Value	1	2%	—	—	1	1%



Evaporative Coolers

SCE selected evaporative coolers for the evaluation. Evaporative coolers make up 1% of all SCE HEER appliance rebates.⁹ SCE currently offers a \$300 rebate on efficient evaporative coolers. Research Into Action surveyed 15 retailer contacts representing stores that sell HEER-qualifying evaporative coolers.

Awareness and Promotion

Just over half (8 of 15) of the contacts reported being aware of the HEER rebates for evaporative coolers. Of the eight contacts who reported awareness of the rebates, six reported that their company actively promotes the evaporative cooler rebates.

Those six participating retailers reported similar marketing strategies to those used by retailers promoting other HEER-qualifying products. The most common approaches were using signage/promotional materials provided by the utility (5 of 5) and by the manufacturer (4 of 6).

We asked retailers who sold any evaporative coolers (15 retailers) what the price difference between an energy efficient evaporative cooler and a standard evaporative cooler typically is. Most retailers did not know; the first that did answer reported that the difference can range from \$50 to \$1,000 (Table 3.20).

Table 3.20: Price Difference between Energy Efficient Evaporative Cooler and Standard Model

PRICE DIFFERENCE	COUNT (N=15)
\$50	2
\$200	2
\$1,000	1
Don't know	10

All except two retailers reported that there are no existing barriers to evaporative cooler sales. Retailers (11) noted that customers are more interested in window evaporative cooler units than ducted evaporative coolers. This confirmed a program staff suspicion that ducted units may be losing popularity to window units.

⁹ Percentage calculated from counts of all SCE-rebated appliances, including refrigerator, room AC, evaporative cooler, water heater, whole house fan, and pool pump.



Whole House Fans

Research Into Action surveyed PG&E retailers about their experiences with whole house fans. PG&E offers a \$100 rebate for qualifying whole house fans. Of the surveyed retailers, 32 reported that their stores sell whole house fans.

Awareness and Promotion

Almost half of whole house fan retailers (13 of 32, 41%) reported being aware of the HEER rebates. Seven of the 13 retailers who reported being aware of the rebates indicated that their store actively promotes the rebates. Six surveyed contacts reported that their stores do not promote the HEER rebates. Surveyed retailers who reported not promoting the rebates indicated that there is no market demand for the rebates or that the rebates do not generate sales.

We asked all contacts who reported selling efficient whole house fans about their marketing strategies. Contacts reported multiple strategies, of which company and manufacturer marketing materials were the most common. Table 3.21 shows the marketing strategies reported by whole house fan retailers.

**Table 3.21: Whole House Fan Promotion Strategies
(Multiple Responses Allowed)**

PROMOTION STRATEGY	COUNT (N=32)	PERCENT
Same as all other whole house fans	6	19%
Company marketing materials/pamphlets	6	19%
Use signage/promotional materials from manufacturer	4	13%
Use signage/promotional materials from the utility	3	9%
Inform customers about energy benefits	3	9%
Products are physically positioned more prominently	2	6%
Store specific program	1	3%
Sold online only	1	3%

Of the 13 retailers who did promote the HEER rebates, 5 reported that the rebates are enough to motivate customers to consider the more efficient whole house fans. Two suggested that a rebate of more than \$100 would be more appropriate. About half (14 of 32) of retailers who sold whole house fans reported that there are no factors limiting sales of energy efficient whole house fans.

Water Heaters

Research Into Action surveyed PG&E retailers who sold water heaters about their experiences selling efficient water heaters and working with the HEER rebates. Retailers offered various types of water heaters, as shown in Table 3.22.



Table 3.22: Water Heater Types Sold by Surveyed Retailers

TYPE	COUNT (N=65)	PERCENT
Both gas and electric	58	89%
Only gas	4	6%
Don't know	3	5%

Water heaters may be installed by a contractor or by the homeowner. Surveyed retail locations serve both professional installers and homeowners who intend to install the units themselves. Table 3.23 shows the average amount of each type of customer as reported by PG&E retailers.

Table 3.23: Installation Method by Water Heater Customers

INSTALLATION METHOD	AVERAGE PERCENT
Will install the unit themselves (n=49)	29%
Purchase a unit, but will not install it themselves (n=41)	24%
Are professional installers (n=49)	38%
Use retail store staff to install (n=50)	28%

Awareness and Promotion

Surveyed retailers reported high levels of awareness (92% aware) of HEER rebates. Of the aware retailers, most (67%) reported that their store promotes the HEER rebates. Retailers who were aware of the rebates report using a mixture of strategies to sell energy efficient water heaters. We asked retailers how they sell water heaters and permitted open-ended responses. Table 3.24 shows their responses.

**Table 3.24: Energy Efficient Water Heater Promotion Strategies
(Multiple Responses Allowed)**

PROMOTION STRATEGY	COUNT (N=62)	PERCENT
Inform customers of energy efficiency benefits	17	27%
Use signage/promotional materials from manufacturer	14	23%
Same as all other water heater	10	16%
Use signage/promotional materials from the utility	8	13%
Company marketing materials/pamphlets	8	13%
Discounts/coupons	2	3%
Customer demand	2	3%
Products are physically positioned more prominently	1	2%



PROMOTION STRATEGY	COUNT (N=62)	PERCENT
Store specific program	1	2%
Customer has to request	1	2%
Vendor shows	1	2%

Sixteen retailers reported that their store does not promote the HEER rebates for water heaters. The most common reason (7 of 13) was that the models stocked by their store do not qualify for the rebates. Table 3.25 shows reported reasons for not promoting HEER water heater rebates.

Table 3.25: Reasons Given for Not Promoting HEER Water Heater Rebates

REASON GIVEN	COUNT (N=16)	PERCENT
We don't promote ENERGY STAR water heaters	5	38%
The water heaters we stock do not qualify	2	15%
The rebates are too small to bother with	1	8%
We don't market water heaters at all	1	8%
Most use propane	1	8%
Program is inconsistent	1	8%
Ran out of marketing supplies and forgot	1	8%
Small market base	1	8%

Slightly less than half (47%) of surveyed water heater retailers reported that the rebate is enough to motivate customers to consider more efficient water heaters. Retailers reported that the mean estimated price difference between standard and efficiency water heaters is \$338. Additionally, retailers indicated that only just over half (54%) of the water heater they sold in the past year were energy efficient. Most (75%) retailers who sold both gas and electric water heaters indicated that there is no difference in the promotion of the two types.

Retailers reported several factors that limit the sales of energy efficient water heaters, foremost being cost. Table 3.26 shows limiting factors as reported by PG&E water heater retailers.



Table 3.26: Limiting Factors in Sales of Energy Efficient Water Heaters

LIMITING FACTOR	COUNT (N=62)	PERCENT
Cost	38	78%
Availability of qualifying units	5	10%
Cost of installation	1	2%
Complexity of installation (re: tankless and heat pump)	1	2%
Lack of demand	1	2%
Utility doesn't know about water heater technology	1	2%
Size of unit	1	2%
Store does not focus on energy efficiency	1	2%

POOL PUMP CONTRACTORS

We structured our evaluation of pool pump contractors based on previous evaluations completed in 2009 for both PG&E and SCE. Whenever possible, we asked the same questions in order to allow for comparison across the years. Throughout this section we will present the results of the 2010-2012 HEER evaluation, along with the comparable results from the 2006-2008 studies.¹⁰

Characteristics of the Pool Contractors

All of the pool pump contractors reported that their companies are actively promoting the HEER pool pump rebates. All except four firms installed 80% or more of their pool pumps in residential applications. All of the surveyed firms offered pool pump sales and installations. Firms ranged in size from one to 30 employees (Table 3.27). These proportions matched the 2006-2008 process evaluation results. Overall, the average number of part-time employees was less than one. Over half (63%) of the firms had no part-time employees.

¹⁰ KEMA. 2009. *Process Evaluation of 2006-2008 PG&E Mass Markets Program Portfolio and CFL, Swimming Pool Market Characterizations*. San Francisco, Calif.: Pacific Gas and Electric Company.

KEMA. 2009. *Process Evaluation of Southern California Edison's 2006-2008 Home Energy Efficiency Rebate (HEER) Program: Final Report*. Report ID SCE0278. Rosemead, Calif.: Southern California Edison.



Table 3.27: Company Size, by Full-Time Employees (FTE)

COMPANY SIZE (BY FTE)	PGE		SCE	
	2006-2008 (n=29)	2010-2012 (n=24)	2006-2008 (n=30)	2010-2012 (n=31)
Small (1)	28%	29%	17%	28%
Medium (2-9)	41%	54%	63%	56%
Large (10+)	31%	17%	17%	16%
Refused / Missing	0%	0%	3%	0%

Surveyed pool pump contractors reported installing an average of between 5 and 550 pool pump motors a year. For the 2006-2008 evaluation, surveys asked pool contractors how many pools they serviced in the previous year. For the 2010-2012 evaluation, Research Into Action asked pool pump contractors how many pool pump motors they installed. Table 3.28 shows the amount pools serviced or pool pumps installed.

Table 3.28: Pool Pumps Installed or Serviced by Utility

NUMBER OF POOLS	PGE		SCE	
	2006-2008 (n=29)	2010-2012 (n=24)	2006-2008 (n=30)	2010-2012 (n=31)
1 to 99	24%	83%	10%	78%
100 to 499	38%	17%	47%	19%
500 or more	21%	0%	40%	3%
Refused / Don't know	17%	0%	3%	0%

Program Experience

Program Awareness

All of the surveyed contractors reported awareness of the HEER pool pump rebates. Pool pump contractors heard about the HEER rebates from a variety of sources. We allowed contractors to select more than one source of awareness. As shown in Table 3.29, contractors most commonly selected manufacturer/retailer (24 total) or word-of-mouth/a colleague (11 total). Contractors also reported utility contacts as a source of information, including: utility mailings, utility meetings, and utility phone contact. SCE contractors reported more word-of-mouth or a colleague contact as a source, potentially because the SCE sample included chains with established relationships with HEER.



**Table 3.29: Awareness of Rebate Program 2010-2012
(Multiple Responses Allowed)**

SOURCE OF AWARENESS	PGE (N=24)	SCE (N=31)
Manufacturer / Retailer Information	63%	29%
Word-of-mouth / Colleague	13%	26%
Utility	21%	16%
Conference / Trade Show	8%	3%
Other	0%	3%
Don't know	8%	16%

Rebates

All of the surveyed pool contractors from both utilities reported that they are actively promoting the HEER pool pump rebates. Pool pump contractors have the ability to provide customers with an “instant rebate” if the customer signs the rebate over to them directly. Nineteen percent of contractors overall (5, 21% PG&E; 5, 16% SCE) reported doing this.

Audits

Less than half (39%) of the total surveyed pool pump contractors indicated that their companies conduct efficiency audits of pool pump systems as part of their general maintenance offerings or when assessing replacement of pool pump equipment. More PG&E pool pump contractors reported doing audits (13 of 24, 54%) than did SCE contractors (8 of 31, 26%). Three PG&E contractors identified audits as a valuable sales tool, as they allow for demonstration of potential energy savings. Two SCE contractors also identified conducting audits as an effective strategy for promoting energy efficient pool pumps.

Sales and Marketing

Sales

We asked participating pool pump contractors what types of pool pumps they sell. More than half of contractors in both utility territories reported that they are actively selling single-speed pumps. Title 20 bans single-speed pumps over 1 horsepower. Table 3.30 shows the count of contractors who have installed at least one pool pump motor of each type.



**Table 3.30: Pool Pump Motor Types Sold by Participating Contractors
(Multiple Responses Allowed)**

MOTOR TYPE	PG&E (N=24)		SCE (N=31)		TOTAL (N=55)	
	Count	Percent	Count	Percent	Count	Percent
Single speed	14	58%	19	61%	33	60%
Dual speed	9	38%	3	10%	12	22%
Variable speed	24	100%	31	100%	55	100%

A third of pool pump contractors (33% of PG&E, 35% of SCE) reported that every pool pump they have installed in the past year has been variable speed. Some pool pump contractors spontaneously commented that single-speed pool pumps are still installed outside the program, often by unqualified technicians. One contractor suggested that the utilities should have a list of qualified installers to help customers avoid this issue. Another suggested that the use of certified contractors should be mandated for rebate qualification.

General Promotion of Energy Efficient Pool Pumps

We asked contractors about their energy efficient pool pump promotional practices. First we asked if there are any specific barriers to selling energy efficient pool pumps. Four pool pump contractors from the PG&E territory and three from the SCE territory identified specific barriers, including issues with the variable-speed pool pump technology, lack of customer understanding of the technology, upfront costs, and unregulated Internet sales of pool pumps, which are cheap and below code.¹¹

Marketing

All surveyed contractors, with the exception of one PG&E contractor, reported that more than half of their customers are concerned about their electricity bills in terms of the energy required to run their pool pumps. All of the surveyed contractors reported that they discuss how to manage pool pump energy use with their customers.

Pool pump contractors identified the strategies they use to promote energy efficient pool pumps. Overall, contractors identified promoting the energy savings as the most effective strategy (30 mentions overall) and cost savings (12 mentions overall) as the second most effective. Contractors frequently mentioned these two strategies together. The 2006-2008 process

¹¹ California's Title 20 requires multi-speeds for pump motors over one horsepower.



evaluation also identified energy and cost savings as the most influential factors in customer decision-making. Table 3.31 shows the count of mentions of each marketing strategy by utility.

Table 3.31: Contractor Strategies for Marketing Energy Efficient Pool Pumps (Multiple Responses Allowed)

UTILITY	ENERGY SAVINGS/ EFFICIENCY	COST SAVINGS	CUSTOMER OUTREACH	AUDIT	QUIETNESS	REBATES	PENTAIR WEBSITE
PG&E (n=24)	12	3	4	3	2	0	1
SCE (n=31)	18	9	3	2	1	3	1

Contractors mentioned the Pentair website only once per utility regarding marketing, but it was a commonly mentioned tool for educating customers about the potential energy savings of efficient pool pumps. This website provides a calculator for residential customers to estimate their potential energy savings based on pool size and equipment.¹² Customers can fill out details about their pool, cost of energy, and operating hours. The calculator provides estimated operating costs annually and compares their existing pool pump with a dual or variable-speed option.

Education

Pool pump contractors identified education as a major component of generating customers' interest in energy efficient pool pumps. All except one PG&E pool pump contractor reported that part of their customer education is explaining to customers how variable-speed pool pumps work differently than single-speed pool pumps. We asked contractors if any relevant concepts are particularly difficult to explain to customers. Responses were mixed – almost half (44%) of contractors overall reported that it is not difficult to explain concepts. Of those who did report that some concepts are difficult (12, 50% PG&E; 11, 35% SCE), the most common concept identified as problematic was the variable-speed pool pump programming. The programming is complex, since variable-speed pool pumps are essentially computers. Contractors described the pumps as “technically challenging” to customers.

Beyond the initial programming, four contractors (2 PG&E, 2 SCE) reported that the concept of running the pump for a longer period of time is counter-intuitive to customers who have had other pool pumps previously. Because many customers are concerned about their bills, the

¹² See: <http://www.pentairpool.com/pool-owner/resources/calculators/pool-pump-calc/index.htm>, accessed December 14, 2011.



concept of running the pump for more hours is unappealing. Due to the complexity of the initial programming, some contractors (7 from each utility) reported that they take actions to encourage the customers to leave the programming as they have set it. Overall, 39% of contractors reported that they explain to homeowners not to change the settings. Nearly a quarter (24%) provides return visits to maintain optimal settings. A majority (89% overall, 96% PG&E, 90% SCE) of contractors indicated that they discuss with customers how to manage the energy use of their pool pumps. Further research could determine if pool pump customers maintain optimal settings or alter their pool pump settings over time.

Training Opportunities

We asked contractors about their awareness of available training opportunities around energy efficient pool pumps, the extent to which they had participated in these trainings, and how useful they found the trainings to be. We also documented barriers to participation in training and interest in future trainings.

More than half of overall contractors (59%) reported being aware of utility-offered training regarding energy efficient pool pumps. Contractors commonly mentioned that these trainings were offered in conjunction with Pentair. A majority (69%) of surveyed contractors reported that they had participated in a utility-provided training or educational event. Another 44% indicated that someone else at their company had attended. Only 6% of contractors indicated that no person at their company had attended a utility-offered training. Table 3.32 shows the percentage of contractors or firms that had attended training, by utility.

**Table 3.32: Attendance of Utility-Offered Pool Pump Trainings
(Multiple Responses Allowed)**

PERSON ATTENDING	PGE		SCE	
	2011	2009	2011	2009
Self	63%	—	23%	—
Other	38%	—	16%	—
No	8%	—	0%	—
Total	88%	79%	39%	10%

Note: Totals do not sum 100% because contractors may have attended with or without colleagues.

The 2006-2008 process evaluation did not separate responses about who attended the training. In both years, more PG&E pool pump contractors reported attending training. In 2010-2012, more SCE contractors had attended training. Nearly all of the contractors (90%) who had attended training indicated that it was helpful in their efforts to promote energy efficient pool pumps. Both of the two contractors who reported that the training did not help them were PG&E contractors. A majority of contractors (71% PG&E, 77% SCE) expressed an interest in attending future trainings. Several contractors spontaneously offered comments about being interested in more



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training for themselves or wanting to send more members of their staff to trainings. Overall, nearly all surveyed contractors reported interest in additional training opportunities and positive experiences with past training experiences.

Rebate Applications

Research Into Action asked pool pump contractors about their experiences with the various types of rebates and their satisfaction. First, we asked pool pump contractors if they had filled out each of the three types of rebate paperwork with their customers.

Overall, 32 contractors had filled out some paperwork for their customers (Table 3.33). Of these, the majority (84%) reported that they found the forms to be reasonable in terms of length and level of detail. Only four (13%) had any complaints. Three reported that the forms are too long and one reported that they are too detailed for customers. Similarly, 92% of contractors reported that the forms were reasonable in the 2006-2008 process evaluation.

Table 3.33: Forms Filled Out by Pool Pumps Contractors

UTILITY	MAIL	ONLINE	BOTH	DON'T KNOW	TOTAL (N=32)
PG&E	94%	6%	0%	0%	100%
SCE	43%	22%	22%	13%	100%

Satisfaction with Program Processes

We asked pool pump contractors about their satisfaction with several elements of the program process, including: rebate applications, forms, incentive levels, program websites, and interactions with program staff. Contractors provided satisfaction ratings and suggestions for improvements to the program.

Previous evaluations reported satisfaction from appliance retailers overall. The 2010-2012 evaluation separated pool pump retailers from general retailers. Satisfaction levels remained generally consistent between all three evaluations, although overall satisfaction was higher in the 2006-2008 process evaluation (Table 3.34).



**Table 3.34: Percent Satisfied by Evaluation Years
(Multiple Responses Allowed)**

PROGRAM COMPONENT (N=32)	2004-2005	2006-2008	2010-2012
	STATEWIDE HEER	STATEWIDE HEER	STATEWIDE HEER
Program as a whole	84%	94%	83%
Interactions with program staff	64%	73%	70%*
Way utility markets program	60%	80%	60%
Program promotion on utility websites	54%	49%	64%

* N=24, 44% of surveyed pool pump contractors answered "Don't know."

Participating contractors from both utilities rated the program high in terms of overall satisfaction. Table 3.35 shows overall satisfaction by utility.

Table 3.35: Overall Pool Pump Contractor Satisfaction by Utility

RATING	PG&E (N=24)		SCE (N=30)	
	Count	Percent	Count	Percent
1 – Very dissatisfied	0	0%	2	7%
2	0	0%	2	7%
3	2	8%	2	7%
4	7	29%	18	60%
5 - Very satisfied	15	63%	6	20%

Only four total contractors, all from SCE territory, reported that they were not satisfied with the rebate program offered by their utility. These four utilities attributed their dissatisfaction to slow rebates, not being able to track the progress of rebates, two-speed pool pumps not being qualified for the program, and the fact that the rebate was insufficient and/or split between the contractor and customer.

Suggestions for Program Improvement

Surveyed pool pump contractors offered suggestions for improving the pool pump programs. The most common suggestion was to raise the rebate amount (9 mentions). The second most common suggestion was to increase awareness of the program through additional utility marketing, such as bill stuffers (6 mentions). Other suggestions included adding LED pool lights to the program (4 mentions), simplifying the rebate form (4 mentions), and enforcing code requirements (4 mentions). Contractors suggested that code compliance could be improved by requiring the use of a certified contractor in order to qualify for rebates.



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PARTICIPANTS AND NONPARTICIPANTS

Characteristics of HEER Participants

In January 2012, Research Into Action surveyed participants who had received a rebate for a HEER-qualifying appliance. We surveyed 200 or more participants for each utility. Wherever possible, we have paired our findings with findings from the 2006-2008 process evaluation, which presented results from surveys with SCE customers only. Responding participants represented six qualifying products and all three rebate methods (Table 3.36 and Table 3.37).

kWh Savings by Utility

PG&E provided kWh savings for selected products. Pool pump rebates accounted for 25% of all PG&E-rebated products,¹³ but accounted for 83% of claimed kWh savings (Table 3.38). Additionally, while PG&E mail rebates accounted for 70% of the total rebates given, they accounted for 96% of the kWh savings claimed (Table 3.39).

The higher proportion of mail-rebated pool pumps over online-rebated pool pumps exaggerates the proportion of mail rebate savings over online rebate savings. Water heaters (mostly gas) accounted for the largest number of rebates for PG&E-evaluated products (38%); they also accounted for the greatest combined kWh and therm savings (58% of savings).

¹³ This analysis is restricted to the products the evaluation team studied for this project. PG&E also rebates refrigerators, clothes washers, and dishwashers, but these are not included in these data.



Table 3.36: Participants for each Product, by Utility and Overall

PRODUCT BY UTILITY	PG&E			SCE			TOTAL (CURRENT EVALUATION)			2006-2008 EVALUATION		
	Available	Percent	Completes	Available	Percent	Completes	Available	Percent	Completes	Available	Percent	Completes
Water heater	5,873	38%	53	0	0%	0	5,873	3%	53	31	0%	5
Evaporative cooler	0	0%	0	1,978	1%	41	1,978	1%	41	698	2%	40
Pool pump	3,907	25%	41	10,148	7%	71	14,055	8%	112	1,714	4%	40
Refrigerator	0	0%	0	138,597	90%	130	138,597	82%	130	38,402	86%	100
Room AC	2,326	15%	56	3,536	2%	60	5,862	3%	116	2,125	5%	40
Whole house fan	3,510	22%	55	0	0%	0	3,510	2%	55	1,764	4%	40
Total	15,616	100%	205	154,259	100%	302	169,875	100%	507	44,734	100%	265

* The term "Available" refers to the available sample with viable contact information.

Table 3.37: Participants by Rebate Method

REBATE METHOD	PG&E			SCE			TOTAL (CURRENT EVALUATION)			2006-2008 EVALUATION		
	Available	Percent	Completes	Available	Percent	Completes	Available	Percent	Completes	Available	Percent	Completes
Mail	10,922	70%	102	63,053	41%	102	74,045	44%	204	35,624	79%	65
Online	4,624	30%	103	13,485	9%	99	18,109	11%	202	7,685	17%	100
POS	0	0%	0	77,721	50%	101	77,721	46%	101	1,615	4%	100
Total	15,616	100%	205	154,259	100%	302	169,875	100%	507	44,924	100%	265

* PG&E did not select any products with POS rebates.

** The term "Available" refers to the available sample with viable contact information.

Table 3.38: Percent of kWh Savings by Product

PG&E REBATED PRODUCTS*	KWH SAVINGS		THERM SAVINGS		COMBINED SAVINGS**	
	Sum	Percent	Sum	Percent	Sum	Percent
Water heater	48,827	2%	66,504	107%	1,997,879	43%
Pool pump	2,565,301	91%	0	0%	2,565,301	55%
Room AC	31,101	1%	1	0%	31,133	1%
Whole house fan	185,304	7%	-4,116	-7%	64,667	1%
Total	2,830,533	100%	62,389	100%	4,658,980	100%

* The evaluation team did not have access to SCE savings data.

** The evaluation team converted kWhs to therms for combined savings.

Table 3.39: Percent of kWh Savings by Rebate Method*

REBATE METHOD	KWH SAVINGS		THERM SAVINGS		COMBINED SAVINGS**	
	Sum	Percent	Sum	Percent	Sum	Percent
Mail	2,724,597	96%	38,205	61%	3,844,284	83%
Online	105,936	4%	24,184	39%	814,696	17%
Total	2,830,533	100%	62,389	100%	4,658,980	100%

* The evaluation team did not have access to SCE savings data.

** The evaluation team converted kWhs to therms for combined savings.

Awareness of Utility Programs and Messaging

As shown in Table 3.40, over two-fifths (41%) of program participants reported that they visited their utility website for more information about how to reduce their bill; a little less than a third (28%) said they visited “other,” unspecified websites for this information.



**Table 3.40: Participants' Source of Information on How to Reduce their Bill
(Multiple Responses Allowed)**

SOURCE	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)	
	Count	Percent	Count	Percent	Count	Percent
Utility website	84	41%	125	41%	209	41%
Other website (not specified)	65	32%	76	25%	141	28%
Utility phone call	20	10%	23	8%	43	8%
Friend or relative	18	9%	24	8%	42	8%
Utility (other contact method)	11	5%	19	6%	30	6%
Consumer Reports or other product-oriented magazines	8	4%	10	3%	18	4%
Retailers / Stores	7	3%	11	4%	18	4%
Product manufacturer	2	1%	10	3%	12	2%
Tradesperson (contractor, electrician, builder)	5	2%	6	2%	11	2%
Other	27	13%	51	17%	78	15%
Don't know	13	6%	23	8%	36	7%
Refused	1	0%	3	1%	4	1%

As shown in Table 3.41, more than one-third of participants (36%) did not recall knowing about any other utility residential energy efficiency rebate programs. This appears to conflict with the 38% of participants who said they recalled “other” utility programs, but often could not name a specific one. Typical “other” responses were: “CARE,” “weatherization,” “ENERGY STAR,” “low income,” and “solar.”

Sixteen percent of participant respondents said they knew of utility rebate programs, most typically insulation, windows, appliances, lighting, and solar. Ten percent of participants recalled the California Solar Initiative program (see Table 3.41). The 2006-2008 evaluation found similar levels of awareness for SCE programs.



**Table 3.41: Utility Programs Recalled by Participating Customers
(Multiple Responses Allowed)**

PROGRAM	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)	
	Count	Percent	Count	Percent	Count	Percent
None	70	34%	110	36%	180	36%
Rebated program	35	17%	46	15%	81	16%
California Solar Initiative	25	12%	24	8%	49	10%
Home energy audits	15	7%	16	5%	31	6%
Summer discount plan	3	1%	17	6%	20	4%
Energy Management Assistance	8	4%	9	3%	17	3%
AC quality	4	2%	7	2%	11	2%
Energy Upgrade California	6	3%	5	2%	11	2%
Recycling used refrigerators or freezers	4	2%	6	2%	10	2%
Other	84	41%	110	36%	194	38%
Don't know	26	13%	34	11%	60	12%
Refused	1	0%	2	1%	3	1%

As shown in Table 3.42, program participants said they heard of the “other” programs from a variety of sources, including: bill inserts (23%), a retailer or contractor (22%), their utility’s website (17%) and TV (14%). Compared to the findings in the 2006-2008 evaluation, fewer current participants learned of their utility’s program from a utility bill insert (23% vs. 36%) or utility website (17% vs. 23%). On the other hand, more participants said they heard of these “other” programs from a retailer or contractor (22% vs. 16%). Some participants (8%) recalled hearing about utility programs online, but did not specifically cite their utility’s website. Just over one-third of participants (34%) did not remember where they had heard of the recalled programs. This suggests that, while some participants are aware of other utility programs, they cannot pinpoint the source of their awareness.



**Table 3.42: Where Participants Learned of Other Utility Programs
(Multiple Responses Allowed)**

SOURCE	PG&E (N=145)		SCE (N=198)		TOTAL (N=343)		2006-2008 EVALUATION (N=276)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Utility bill insert	33	23%	47	24%	80	23%	99	36%
Retailer or contractor	23	16%	52	26%	75	22%	44	16%
Utility website	28	19%	29	15%	57	17%	63	23%
TV	21	14%	27	14%	48	14%	36	13%
Word-of-mouth	12	8%	23	12%	35	10%	39	14%
Other utility contact	16	11%	18	9%	34	10%	17	6%
Newspaper article/ ad	7	5%	20	10%	27	8%	39	14%
Online (generic)	11	8%	15	8%	26	8%	—	—
Radio	5	3%	14	7%	19	6%	6	2%
Phone call	6	4%	4	2%	10	3%	—	—
Work in industry	5	3%	5	3%	10	3%	—	—
Participation in utility program	5	3%	4	2%	9	3%	0	0%
Email	0	0%	8	4%	8	2%	3	1%
Stickers on product	4	3%	2	1%	6	2%	—	—
Trade show	2	1%	3	2%	5	1%	3	1%
Other	3	2%	9	5%	12	3%	6	2%
Don't know	38	26%	79	40%	117	34%	14	5%

We asked participants if they would like more information about appliance rebates. Participants' responses were split evenly: 51% wanted more information, while 49% did not (Table 3.43).

Table 3.43: Participants Who Want Additional Appliance Rebate Information

WANT ADDITIONAL INFORMATION	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)		2006-2008 EVALUATION (N=296)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	97	47%	162	54%	259	51%	142	48%
No	108	53%	140	46%	248	49%	154	52%

Those who wanted more information said the best way to inform them was via email. Over one-third of responding participants (38%) mentioned utility bill inserts as a good way for them to get



appliance rebate information (Table 3.44). While the proportion of participants who would like to get access to additional rebate information remained the same between the 2006-2008 process evaluation and this evaluation, the preferred method of delivery changed. The percentage of participants who said they preferred receiving this information via email almost doubled, from 25% to 49%, while the percentage of participants who said they preferred to get that information in a bill insert dropped to 38% from 47%.

**Table 3.44: Best Method to Inform Customers of Programs and Services
(Multiple Responses Allowed)**

METHOD	PG&E (N=97)		SCE (N=162)		TOTAL (N=259)		2006-2008 EVALUATION (N=142)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Email	46	47%	80	49%	126	49%	36	25%
Utility bill insert	34	35%	64	40%	98	38%	67	47%
Other utility direct mail piece	17	18%	49	30%	66	25%	34	24%
Utility website	4	4%	2	1%	6	2%	6	4%
TV	4	4%	1	1%	5	2%	3	2%
Dealer, retailer, or contractor	2	2%	2	1%	4	2%	1	1%
Text message	3	3%	1	1%	4	2%	0	0%
Radio	0	0%	1	1%	1	0%	1	1%
Other	12	12%	16	10%	28	11%	6	4%
Don't know	1	1%	4	2%	5	2%	1	1%

Most program participants (86%) had seen or heard of the yellow *Energy Guide* labels on appliances; the other 14% of participants said they had not seen the labels or were not sure if they had.¹⁴ Awareness of the yellow *Energy Guide* label has not changed from the 2006-2008 evaluation findings (84% aware) and current awareness (86%).

As shown in Table 3.45, more PG&E participants (65%) recalled hearing energy efficiency messages from their utility than did those served by SCE (53%).¹⁵ Participants said they recalled

¹⁴ Results did not differ between utilities.

¹⁵ Chi-square: $\chi^2(2, N=507)=6.71, p=.01$.



the following typical energy efficiency messages: “reduce use,” “buy energy efficient equipment,” “lower their water heater temperature,” “lower thermostat settings,” “close drapes,” “reduce peak use,” “use compact fluorescent lights,” and “general Smart Meter information.”

Table 3.45: Participants Who Recalled Hearing an Energy Efficiency Message from Their Utility

RECALLED HEARING MESSAGE	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)		2006-2008 EVALUATION (N=296)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	133	65%	161	53%	294	58%	155	52%
No	72	35%	141	47%	213	42%	141	48%

Forty-four percent of participants who recalled hearing energy efficiency messages from their utility indicated that they saw those messages in bill inserts. Another 20% recalled seeing these messages on their TV, while 19% saw them on the Internet (Table 3.46). Typical “other” methods were email, mailers, or phone calls. The sources from which program participants recalled receiving utility energy efficiency messaging changed significantly between the 2006-2008 and current evaluations. For instance, those contacted for the 2010-2011 evaluation identified bill inserts (44% vs. 22%), the Internet (19% vs. 3%), and other utility mailings (17% vs. 9%); the percentage of those who recalled hearing energy efficiency messages from TV dropped more than 100% , from 51% in 2006-2008 to 20% in the current evaluation.

Table 3.46: Source of Utility Energy Efficiency Messages (Multiple Responses Allowed)

SOURCE	PG&E (N=133)		SCE (N=161)		TOTAL (N=294)		2006-2008 EVALUATION (N=155)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Utility bill insert	57	43%	71	44%	128	44%	34	22%
TV	32	24%	26	16%	58	20%	79	51%
Internet	23	17%	32	20%	55	19%	5	3%
Other utility mailing	17	13%	32	20%	49	17%	14	9%
Radio	11	8%	11	7%	22	7%	8	5%
Newspaper/ magazine ad	8	6%	6	4%	14	5%	12	8%
Label on appliances	3	2%	8	5%	11	4%	8	5%
Display in stores	3	2%	4	2%	7	2%	6	4%
Newspaper/ magazine article	3	2%	4	2%	7	2%	5	3%
Salesperson	1	1%	3	2%	4	1%	2	1%



SOURCE	PG&E (N=133)		SCE (N=161)		TOTAL (N=294)		2006-2008 EVALUATION (N=155)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Friend, neighbor, relative, or co-worker	0	0%	3	2%	3	1%	3	2%
Other	22	17%	30	19%	52	18%	3	2%
Don't know	4	3%	3	2%	7	2%	11	7%
Refused	1	1%	0	0%	1	0%	0	0%

HEER Participation

Over a third of both utilities' program participants (35%) sought appliance information on the Internet, about two-fifths (43%) received information from retailers¹⁶ or salespeople, and 10% got information from their contractor. In contrast, SCE HEER participants contacted for the 2006-2008 evaluation predominantly (61%) got information from retailers, while a quarter got information from the Internet and 1% received information from their installation contractor (Table 3.47). The increased use of the Internet as a medium to gather product information suggests that future potential program participants would be very open to receiving outreach via electronic means.

**Table 3.47: Where Participants Got Information about Which Appliance to Buy
(Multiple Responses Allowed)**

SOURCE	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)		2006-2008 EVALUATION (N=296)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Retailer/ salesperson	65	32%	154	51%	219	43%	181	61%
Internet	88	43%	91	30%	179	35%	71	24%
Installation contractor	32	16%	21	7%	53	10%	3	1%
Friend, neighbor, relative, or co-worker	19	9%	25	8%	44	9%	12	4%
Utility	14	7%	16	5%	30	6%	9	3%

¹⁶ About 3% of participants said they went to a retail location and looked at the stickers on the appliances.



SOURCE	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)		2006-2008 EVALUATION (N=296)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Consumer Reports or other product-oriented magazines	8	4%	19	6%	27	5%	30	10%
Did not look for any information about what to buy	5	2%	19	6%	24	5%	—	—
Newspaper	6	3%	9	3%	15	3%	—	—
Trade/ Home show	6	3%	0	0%	6	1%	—	—
Other	12	6%	19	6%	31	6%	30	10%
Don't know	1	0%	4	1%	5	1%	9	3%
Refused	0	0%	2	1%	2	0%	0	0%

Participants purchasing different appliances got information from different sources (χ^2 (10, N=507) = 40.93, $p < .001$).¹⁷ Participants who bought a refrigerator or a room air conditioner were more likely to have learned about what appliance to buy from a retailer or salesperson, while whole house fan purchasers were more likely to have gotten their information from the Internet, and all other purchasers were equally or more likely to have found information from the Internet than a retailer (Table 3.48).¹⁸

¹⁷ To calculate chi-square, we combined all sources of information with fewer than 70 responses into an “other” category. The evaluation team then compared Internet, retailer, and other sources.

¹⁸ The evaluation team used primary method learning (allowing one response per participant), so analysis did not include multiple responses.



Table 3.48: Primary Method of Gathering Product Information by Appliance (Retailer vs. Other Source)

PRIMARY METHOD	WATER HEATER (N=53)		EVAPORATIVE COOLER (N=41)		POOL PUMP (N=112)		REFRIGERATOR (N=130)		ROOM AC (N=116)		WHOLE HOUSE FAN (N=55)	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Retailer	15	28%	11	27%	40	36%	64	49%	50	43%	5	9%
Internet	17	32%	7	17%	29	26%	27	21%	31	27%	26	47%
Other Source	21	40%	23	56%	43	38%	39	30%	35	30%	24	44%

The evaluation team broke down the “other source” from Table 3.48 for more granularity (Table 3.49). Participants who bought water heaters, evaporative coolers, or pool pumps were more likely to have heard about product information from their installation contractors than participants who bought other products that required a more complicated installation process.

Table 3.49: Primary Method of Gathering Product Information by Appliance (All Sources Shown)

PRIMARY METHOD	WATER HEATER (N=53)	EVAPORATIVE COOLER (N=41)	POOL PUMP (N=112)	REFRIGERATOR (N=130)	ROOM AC (N=116)	WHOLE HOUSE FAN (N=55)	TOTAL (N=507)
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Retailer/ salesperson	28%	27%	36%	49%	43%	9%	36%
Internet	32%	17%	26%	21%	27%	47%	27%
Installation contractor	17%	12%	24%	0%	0%	5%	9%
Friend, neighbor, relative, or co-worker	6%	12%	6%	3%	3%	20%	7%
Utility	6%	7%	4%	0%	8%	2%	4%
Did not look	0%	12%	0%	5%	8%	2%	4%
Consumer Reports or other product-oriented magazines	4%	2%	1%	8%	2%	2%	3%
Trade shows	0%	0%	0%	0%	0%	9%	1%
Other	8%	7%	3%	12%	7%	4%	7%
Don't know	0%	0%	0%	2%	3%	0%	1%
Refused	0%	2%	0%	1%	0%	0%	0%

Participants bought their appliance from a variety of stores or locations (Table 3.50). While across appliance type, a quarter of all participants bought their appliance at a home improvement store such as Home Depot, some products were more likely to have been bought at a home improvement store, including water heaters (34%) and evaporative coolers (44%). Two-thirds of



participants (66%) bought their pool pump from a swimming pool contractor and 16% bought theirs over the Internet. Compared to the 2006-2008 evaluation,¹⁹ only evaporative cooler sales shifted more toward home improvement stores (44% vs. 21%), while fewer participants are buying evaporative coolers from contractors (15% vs. 32%) or at local hardware stores (15% vs. 24%). Participants bought fewer water heaters, refrigerators, room air conditioners, or whole-house fans at home improvement stores than in the 2006-2008 evaluation. More refrigerators were bought at appliance stores than during the 2006-2008 evaluation (49% vs. 11%). In addition, more participants bought room air conditioners at big box stores in 2010-2011 than did those contacted for the 2006-2008 evaluation (41% vs. 11%), and fewer participants purchased room air conditioners at Sears than previously (11% vs. 20%). More participants purchased whole-house fans via the Internet (15% vs. 10%) or an installation contractor (25% vs. 17%).

¹⁹ Comparisons are between SCE 2006-2008 evaluation counts and current evaluation counts (including both PG&E and SCE participants).



Table 3.50: Where Participants Bought their Appliance, by Appliance Type

STORE TYPE	WATER HEATER		EVAPORATIVE COOLER		POOL PUMP		REFRIGERATOR		ROOM AC		WHOLE-HOUSE FAN	
	2010-2012 Evaluation (n=53)	2006-2008 Evaluation (n=5)	2010-2012 Evaluation (n=41)	2006-2008 Evaluation (n=38)	2010-2012 Evaluation (n=112)	2006-2008 Evaluation (n=40)	2010-2012 Evaluation (n=130)	2006-2008 Evaluation (n=100)	2010-2012 Evaluation (n=116)	2006-2008 Evaluation (n=40)	2010-2012 Evaluation (n=55)	2006-2008 Evaluation (n=41)
	Home improvement store	34%	80%	44%	21%	1%	0%	31%	58%	31%	48%	25%
Appliance store	6%	0%	5%	3%	5%	5%	49%	11%	9%	8%	4%	5%
Swimming pool contractor	0%	0%	0%	3%	66%	45%	0%	0%	0%	0%	0%	0%
Big box store	4%	0%	5%	5%	0%	0%	5%	7%	41%	10%	0%	0%
Sears	9%	0%	0%	0%	0%	0%	8%	18%	11%	20%	0%	0%
Internet	6%	0%	0%	0%	16%	13%	0%	0%	2%	3%	15%	10%
Installation contractor	9%	0%	15%	32%	3%	3%	0%	0%	0%	0%	25%	17%
Plumbing supply store	19%	0%	2%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Local hardware store	2%	20%	15%	24%	0%	0%	2%	2%	1%	3%	5%	0%
Brand retailer	2%	0%	0%	0%	2%	3%	2%	1%	3%	0%	5%	0%
Roofing contractor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%
Other	0%	0%	2%	0%	2%	28%	2%	1%	0%	3%	15%	15%
Don't know	9%	0%	0%	0%	2%	5%	1%	2%	3%	8%	2%	10%

Participants spoke to salespeople about a variety of characteristics they were considering before their purchase. They most frequently mentioned: level of efficiency, size, and price (Table 3.51).

Table 3.51: Product Characteristics Spoken About with Salesperson, by Utility

CHARACTERISTIC	PG&E (N=205)		SCE (N=302)		TOTAL (N=507)	
	Count	Percent	Count	Percent	Count	Percent
Efficiency	107	52%	139	46%	246	49%
Size / Capacity	73	36%	114	38%	187	37%
Price	32	16%	56	19%	88	17%
Operating cost	19	9%	15	5%	34	7%
Rebates	6	3%	21	7%	27	5%
Design / Layout	0	0%	23	8%	23	5%
Life expectancy / Durability	12	6%	7	2%	19	4%
ENERGY STAR	7	3%	11	4%	18	4%
Warranty	10	5%	6	2%	16	3%
Specific motor	8	4%	7	2%	15	3%
Brand	5	2%	9	3%	14	3%
Ease of installation	5	2%	7	2%	12	2%
Color	0	0%	10	3%	10	2%
Other	20	10%	39	13%	59	12%
Didn't talk to anyone	27	13%	25	8%	52	10%
Don't know	3	1%	11	4%	14	3%

The utilities chose different product selection criteria, which are reflected in participants' responses to questions about preferred product characteristics. For instance, participants in PG&E territory mentioned "quiet running of their appliance" more often than did SCE participants (12% vs. 3%). This is largely because PG&E specified equipment operating noise levels, while SCE did not. Similarly, more SCE participants mentioned design and layout than did PG&E participants (8% vs. 0%), again due to the differing characteristics of selected equipment by the utility. Other than these two differences, participants served by both utilities generally spoke about the same characteristics with similar frequency.

Participants consistently asked about efficiency, size, and price across all product types (Table 3.52).



Table 3.52: Product Characteristics Discussed with Salesperson, by Product

CHARACTERISTIC	WATER HEATER		EVAPORATIVE COOLER		POOL PUMP		REFRIGERATOR		ROOM AC		WHOLE-HOUSE FAN	
	2010-2012 Evaluation (n=53)	2006-2008 Evaluation (n=5)	2010-2012 Evaluation (n=41)	2006-2008 Evaluation (n=38)	2010-2012 Evaluation (n=112)	2006-2008 Evaluation (n=40)	2010-2012 Evaluation (n=130)	2006-2008 Evaluation (n=100)	2010-2012 Evaluation (n=116)	2006-2008 Evaluation (n=40)	2010-2012 Evaluation (n=55)	2006-2008 Evaluation (n=41)
	Efficiency	62%	80%	44%	50%	73%	55%	35%	51%	37%	38%	45%
Size / Capacity	45%	40%	32%	37%	8%	18%	51%	49%	47%	55%	38%	37%
Price	30%	40%	17%	5%	14%	28%	19%	22%	18%	23%	7%	10%
Operating cost	6%	40%	10%	5%	4%	3%	7%	6%	4%	8%	2%	5%
Quiet	4%	—	0%	—	4%	—	4%	—	5%	—	2%	—
Rebates	4%	20%	0%	0%	4%	13%	4%	7%	5%	5%	2%	2%
Design/ layout	4%	—	7%	—	2%	—	3%	—	1%	—	4%	—
Life expectancy / Durability	0%	—	0%	—	0%	—	8%	—	0%	—	0%	—
ENERGY STAR	0%	0%	0%	0%	0%	6%	8%	11%	0%	3%	0%	2%
Warranty	4%	20%	7%	0%	2%	19%	2%	4%	1%	3%	2%	0%
Specific motor	9%	—	0%	—	7%	—	1%	—	1%	—	7%	—
Brand	9%	20%	0%	5%	7%	0%	1%	10%	1%	5%	7%	0%
Ease of installation	0%	20%	0%	8%	12%	0%	1%	1%	3%	5%	29%	2%
Color	0%	0%	0%	0%	11%	6%	0%	8%	0%	3%	5%	2%
Other	13%	0%	20%	13%	6%	19%	15%	16%	9%	3%	11%	32%
None / Didn't talk to anyone	6%	0%	5%	0%	6%	0%	5%	0%	24%	0%	11%	0%
Don't know	2%	0%	2%	11%	1%	16%	5%	10%	4%	13%	0%	10%

Many participants spoke about efficiency with a salesperson; this ranged from a low of 35% for refrigerators to 73% for pool pumps. Fewer of the refrigerator buyers contacted for this evaluation spoke about efficiency than did those surveyed for the 2006-2008 evaluation (35% vs. 51%). More pool pump (73% vs. 55%) and whole-house fan (45% vs. 27%) purchasers spoke about efficiency than in the 2006-2008 evaluation. More than a third of participants, except those buying pool pumps, spoke about the size and capacity of the appliance with a salesperson. More evaporative cooler purchasers (17% vs. 5%) and fewer pool pump purchasers (8% vs. 18%) spoke about price with a salesperson than in the previous evaluation. Differences for water heaters between the current evaluation and the 2006-2008 evaluation are exaggerated due to the small sample size in the earlier evaluation, so it is not appropriate to draw any conclusions from those differences.

The evaluation team asked appliance purchasers about some characteristics that were not mentioned in the 2006-2008 evaluation: quietness of the appliance, layout of the appliance (which was particularly important to those who bought refrigerators and evaporative coolers), life expectancy or durability, and specific motors (which was particularly important for those who bought a pool pump, water heater, or whole house fan).

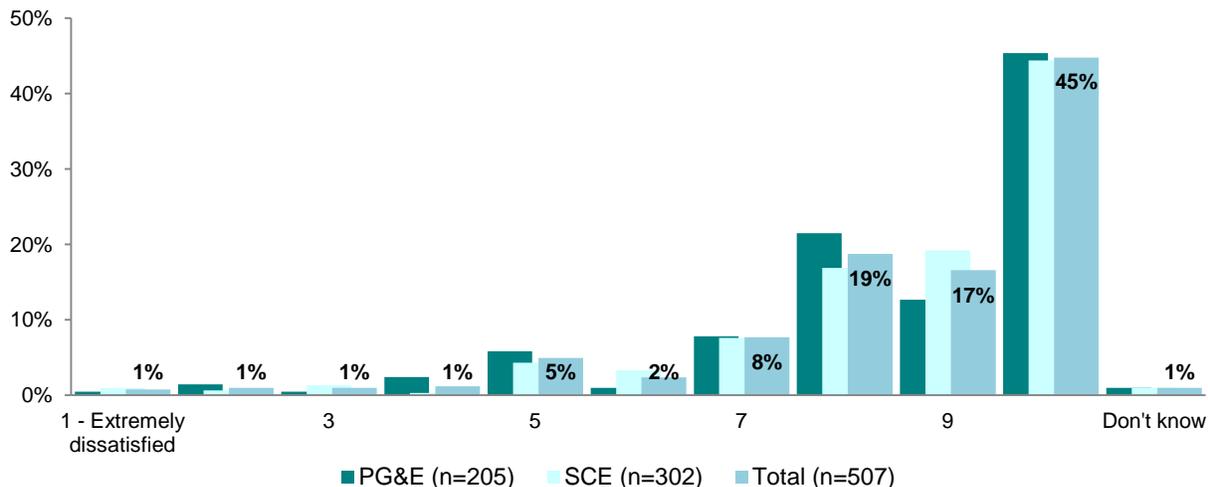
Satisfaction

Overview of Satisfaction Ratings

The evaluation team used the same participant satisfaction categories as those used in the 2006-2008 evaluation to facilitate comparison of the two evaluations. Most participants surveyed for the current evaluation reported high levels of satisfaction with the program; 88% gave a ranking of “7,” “8,” “9,” or “10” on a ten-point scale, where “1” is “not at all satisfied” and “10” is *extremely satisfied*. Almost half of participants served by each utility said they were “extremely satisfied” with the program overall (Figure 3.1).

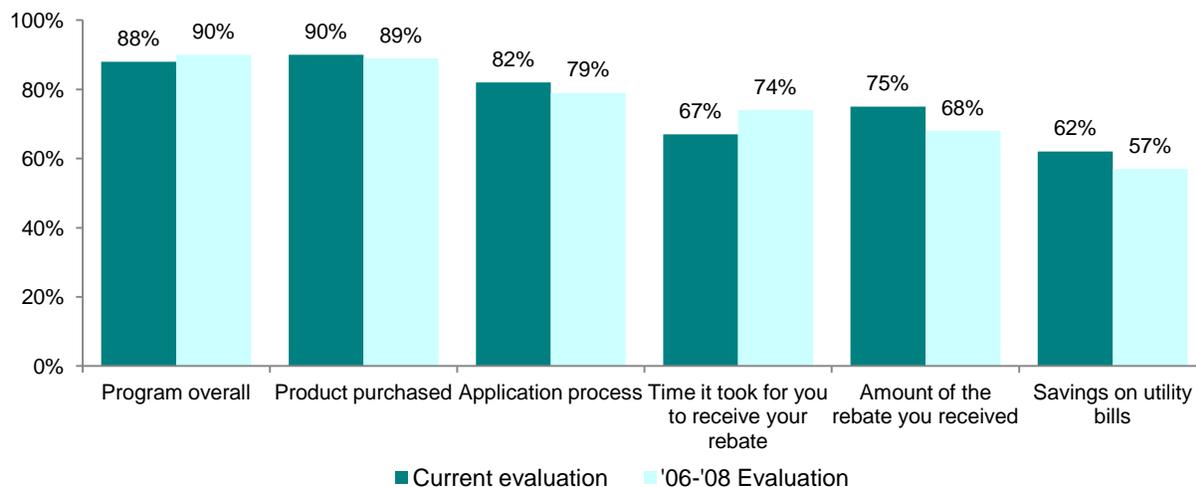


Figure 3.1: Participant Overall Satisfaction with the Program (10-point scale)



In addition to high overall program satisfaction, participants were quite satisfied with their purchased product; 90% gave the product a rating of “7” to “10.” Participants were less satisfied with specific aspects of the program, but their responses were comparable to responses from the 2006-2008 evaluation (Figure 3.2).

Figure 3.2: Participant Satisfaction with their Purchased Product (Current vs. 2006-2008)



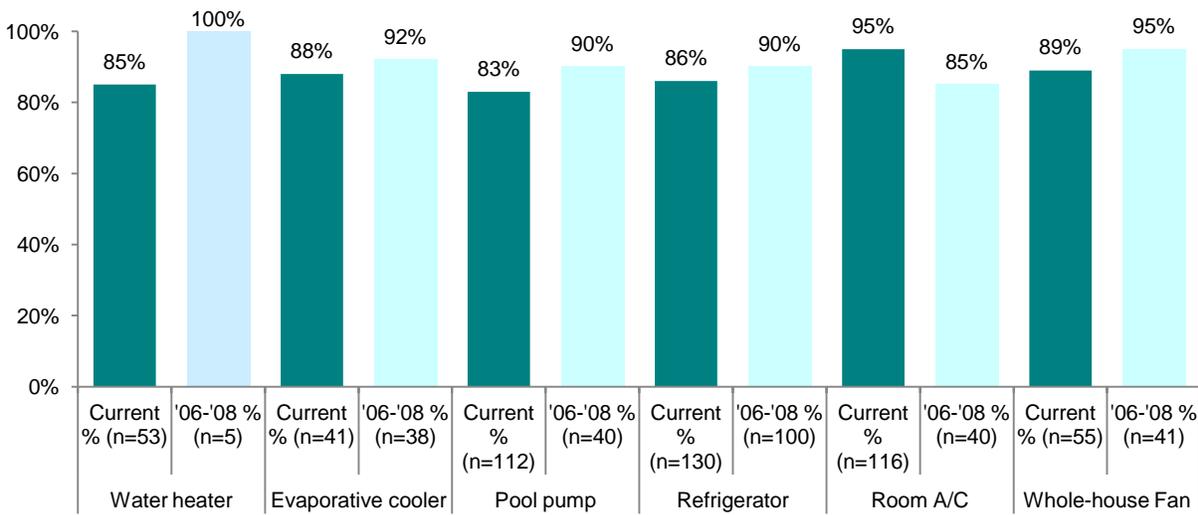
Note: Current satisfaction ratings include participants in both PG&E and SCE territory. 2006-2008 evaluation figures include SCE participants only. Ratings of *Satisfied* indicate a “7” to “10” on a ten-point scale.

Participants showed high overall program satisfaction (“7” to “10” on a 10-point scale) with all product types (Figure 3.3).



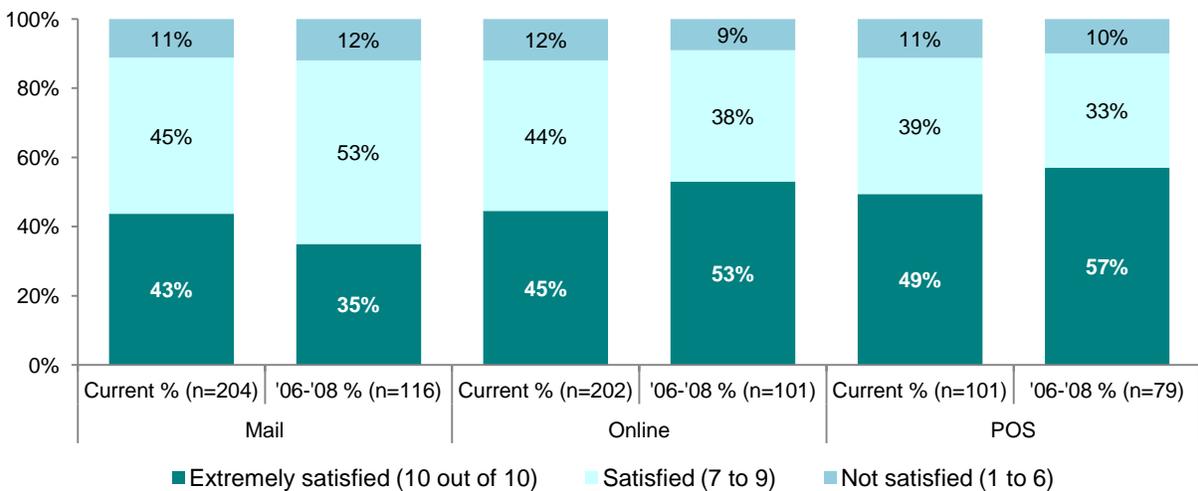
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Figure 3.3: Participant Satisfaction with the Program Overall by Product (Current vs. 2006-2008)



Overall program satisfaction does not vary by delivery type, or between the current and 2006-2008s surveys (Figure 3.4).

Figure 3.4: Participant Satisfaction with Program Overall by Delivery Type (Current vs. 2006-2008)



Purchased Product

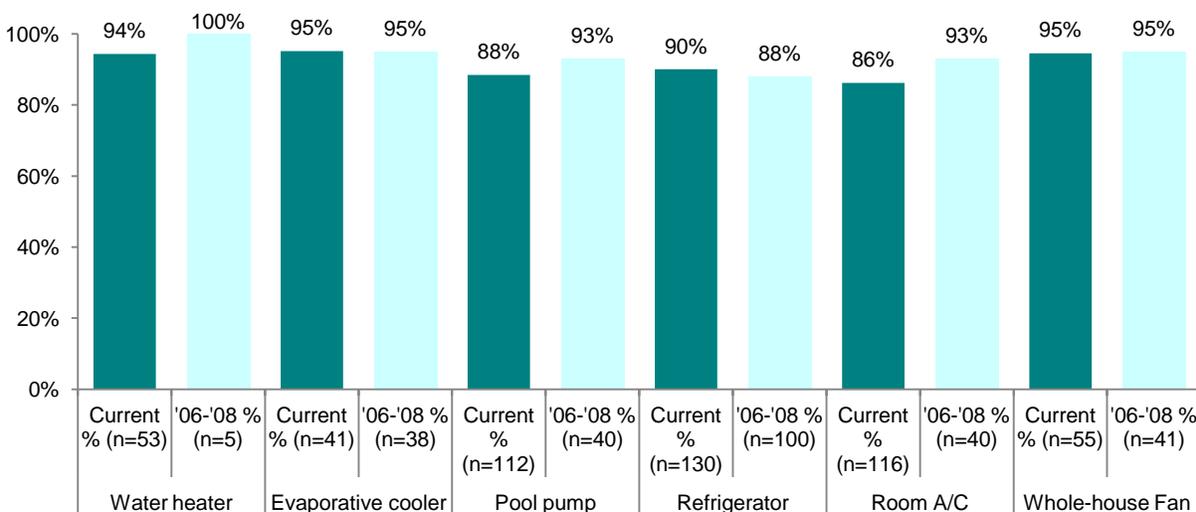
Participants generally were very satisfied with the product they bought; 90% rated satisfaction from “7” to “10” on a ten-point scale, where “10” is *extremely satisfied* (Figure 3.5).



Differences in Satisfaction Ratings by Product Type

As found in the 2006-2008 evaluation, respondents were quite satisfied with the products they bought. Participants who bought a room air conditioner (86% satisfied) or refrigerator (88% satisfied) were the least satisfied with their product (Figure 3.5). Those who were most satisfied had bought evaporative coolers and whole-house fans (95%).

Figure 3.5: Participant Satisfaction with their Product, by Product Type (Current vs. 2006-2008)



Note: Ratings of *Satisfied* indicate a “7” to “10 on a ten-point scale.

Application Process

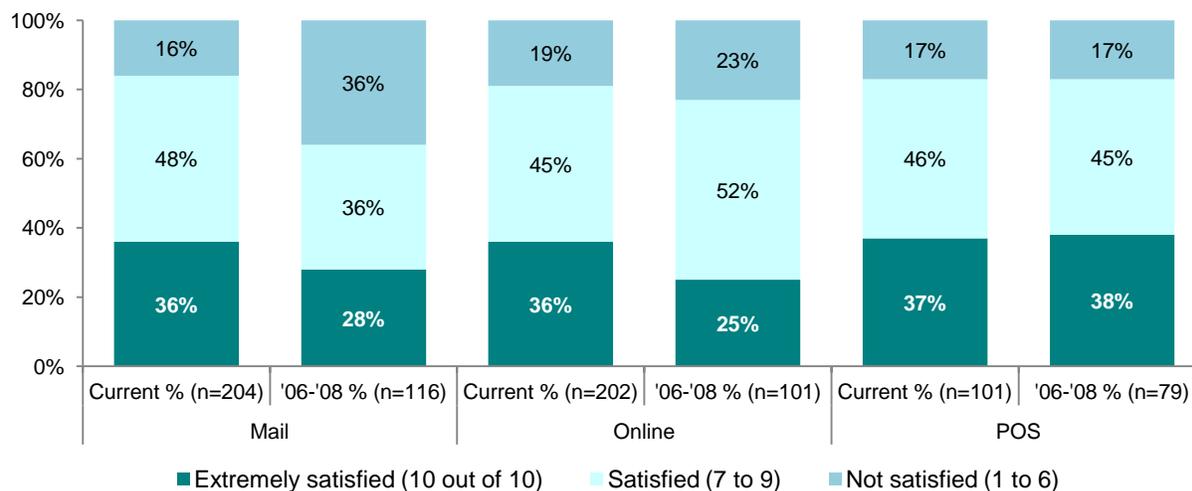
Differences in Satisfaction Ratings by Program Delivery Type

As shown in Figure 3.6, over 80% of participants were satisfied with the application process across all three program delivery types: mail, online, and POS. Participants who submitted a mail application in 2010-2011 were more satisfied with that process than participants surveyed in the 2006-2008 evaluation ($\chi^2(2, N=320)=16.54, p<0.001$). Participants who applied to the program online and at point-of-sale were equally satisfied (about 80%). These findings suggest no serious issues with any of the application processes.



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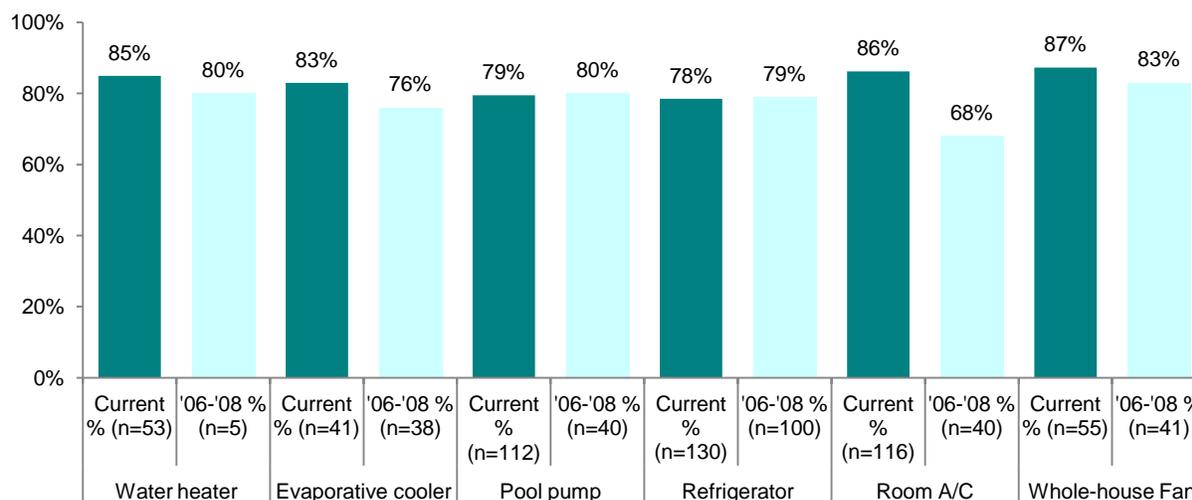
Figure 3.6: Participant Satisfaction with the Application Process by Delivery Type (Current vs. 2006-2008)



Differences in Satisfaction Ratings by Product Type

The percentage of participants satisfied (“7” to “10” on a ten-point scale) with their application process did not vary significantly by product type for this evaluation (Figure 3.7).

Figure 3.7: Participant Satisfaction with the Application Process by Product Type (Current vs. 2006-2008)



Note: Ratings of *Satisfied* indicate a “7” to “10 on a ten-point scale.



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Participants who bought a room air conditioner were more satisfied with the application process in the 2010-2011 evaluation (86%) than those surveyed for the 2006-2008 evaluation (68%) ($z=2.52, p=0.01$). The 2006-2008 evaluation included data only from SCE territory.

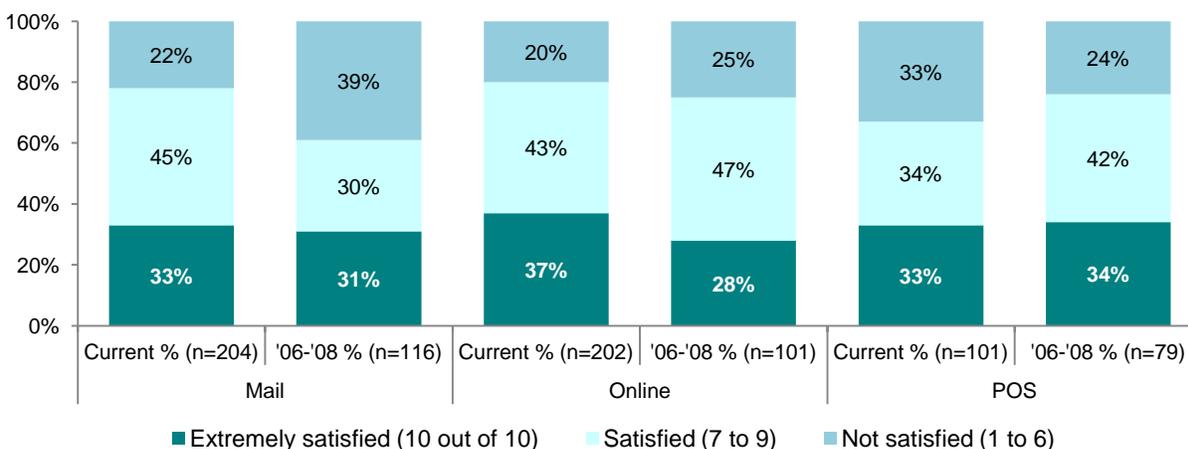
This evaluation found no significant difference – participants from both utilities were virtually equally satisfied with the application process. The difference in application satisfaction for room AC participants between the current data and the 2006-2008 evaluation cannot be attributed to differences between the utilities.

Time Taken to Receive Rebate

Differences in Satisfaction Ratings by Delivery Type

Sixty-seven percent of participants reported being satisfied (“7” to “10” on a ten-point scale) with the time it took to receive their rebate. Satisfaction ratings for the time it took to receive rebates across delivery type (mail, online, or POS) differed somewhat; 78% of mail-in rebate, 80% of online rebate, and 66% of POS participants gave a “7” to a “10” satisfaction rating (Figure 3.8).²⁰ These findings suggest that POS participants may not fully understand that they received an instant rebate.

Figure 3.8: Participant Satisfaction with the Time to Receive Rebate by Delivery Type (Current vs. 2006-2008)



²⁰ Note that all POS participants bought refrigerators in the SCE area. The product, refrigerator, and the delivery type are conflated, leaving some doubt as to whether the lower satisfaction ratings are due to the product or the delivery type.



According to program staff, the POS rebates lose their visibility in the transaction, which makes measuring POS rebate effectiveness more difficult. Utility staff identified the following issues with the POS rebates: 1) Retailers do not always explain to the customers that the rebates come from the utility; 2) Customers sometimes apply for the same rebate twice because it is unclear that PG&E sponsors the program; and 3) PG&E cannot track which customers have received incentives or where incented appliances have been installed. These issues may explain the satisfaction issues with the POS rebates, as customers may not be aware of the rebate or the source of the rebates.

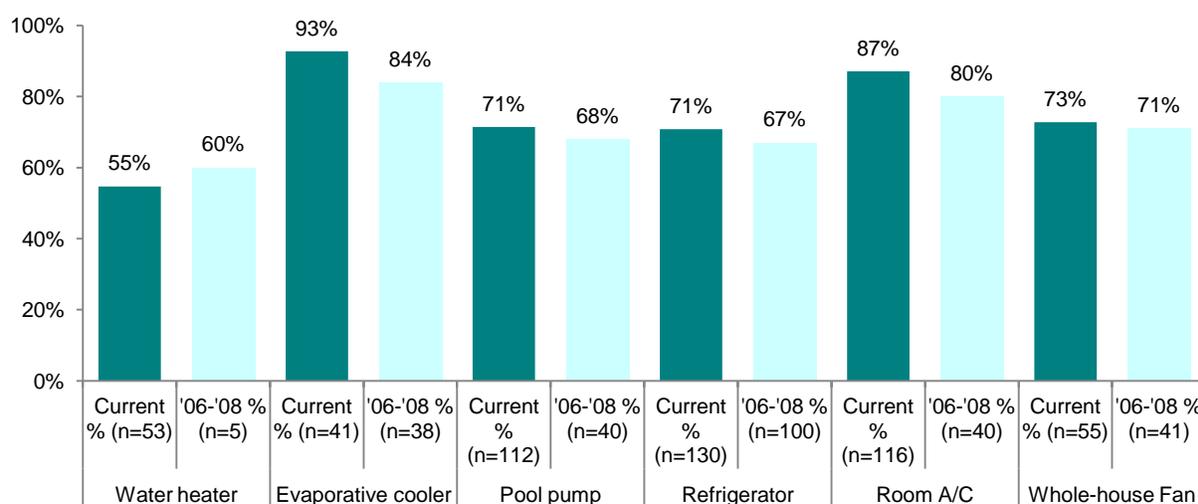
Despite these issues, utility staff said the POS rebates simplify the purchase and rebate process and substantially reduce processing costs for the utilities. In contrast, mail-in participants rated their satisfaction with the time it took to get their rebate 17% higher than did those surveyed for the previous evaluation. Online participants rated their satisfaction similarly high in both evaluations.

Amount of Rebate Received

Three-quarters of participants were satisfied with the amount of rebate they received. As shown in Figure 3.9, participants who bought an evaporative cooler were the most satisfied with the amount of the rebate they received (93%). Participants who bought water heaters were the least satisfied (55%).

Rebate level satisfaction ratings were the same or slightly higher in this evaluation than in the previous one. Satisfaction with water heaters was slightly lower, but the previous evaluation had only five participants who bought water heaters, which limits the ability to draw substantive conclusions.

Figure 3.9: Participant Satisfaction with the Amount of Rebate Received by Product Type (Current vs. 2006-2008)



Savings on Utility Bills

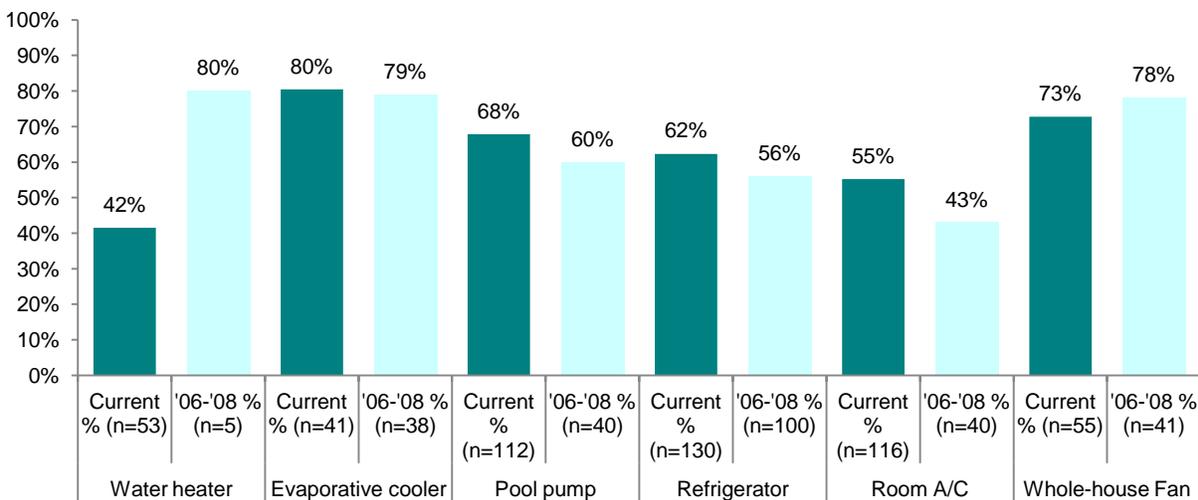
Almost two-thirds (62%) of participants reported being satisfied with the savings they saw on their utility bills.

Differences in Satisfaction Ratings by Product Type

Satisfaction ratings differed according to product type. Water heater purchasers reported the lowest satisfaction with their bill savings, while those who bought an evaporative cooler were the most satisfied (Figure 3.10).

Satisfaction levels were similar in both evaluations. While there is a striking difference between satisfaction levels for participants who bought a water heater, as noted in the discussion about satisfaction with the amount of the rebate, the small sample size used in the previous evaluation limits any claims we can make about the reason for that difference.²¹

Figure 3.10: Participant Satisfaction with the Amount of Utility Bill Savings by Product Type (Current vs. 2006-2008)



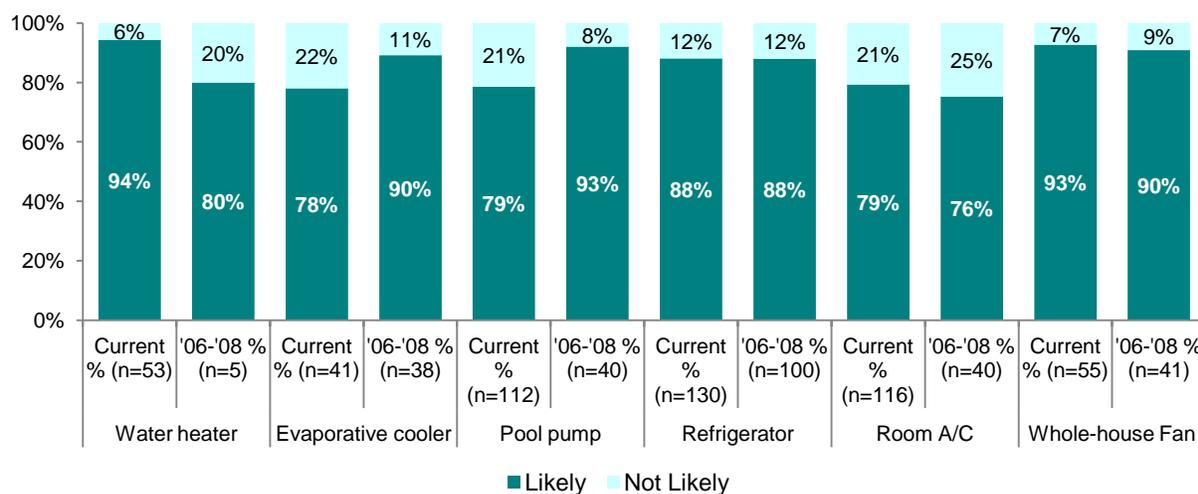
²¹ Chi-square for this difference is $X^2(1, N=58)=2.737, p=.098$.



Free-Ridership Indicators

Most participants (84%) indicated that they would have been “likely” or “very likely” to buy the same product had they not received the utility rebate. PG&E participants were more likely than SCE participants to give that response ($\chi^2(1, N=507)=6.155, p=.01$). Specifically, more whole-house fan (93%) and water heater participants (94%) said they would have bought the same model without the rebate (Figure 3.11). Participants purchasing evaporative coolers, pool pumps, and room air conditioners were least likely to buy the same model without the utility rebate.

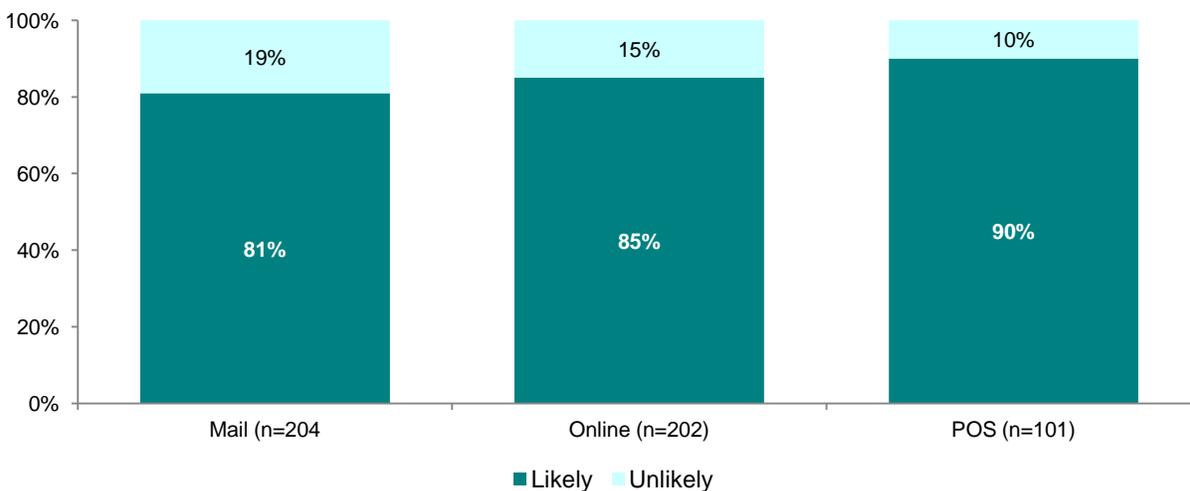
Figure 3.11: Participants Who Would Have Bought the Same Model Without the Utility Rebate, by Product Type (Current vs. 2006-2008)



Pool pump purchasers surveyed for the current evaluation were less likely to buy the same model without utility assistance than those surveyed for the previous evaluation ($z=2.01, p=.02$). As Figure 3.12 shows, delivery type does not alter free-ridership findings in the current evaluation. Participants who submitted their rebate forms via mail, online, or POS were equally likely to have reported buying the same model with or without a rebate ($\chi^2(2, N=507)=3.925, p=.14$).



Figure 3.12: Participants Who Would Have Bought the Same Model without the Utility Rebate, by Delivery Type



Future Equipment Purchases

About one-quarter (26%) of respondents surveyed for this and the previous evaluation said they were planning to buy a new energy-using appliance in the next year. Of these, about one-third (35%) planned to buy a refrigerator (Table 3.53), a 10% increase over the previous evaluation ($z=1.52$, $p=.06$).²²

Table 3.53: Participants Who Plan to Purchase Products in Next 12 Months, by Utility (Multiple Responses Allowed)

PRODUCT	PG&E (N=62)		SCE (N=97)		TOTAL (N=159)		2006-2008 EVALUATION (N=73)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Refrigerator	23	37%	32	33%	55	35%	18	25%
Whole-house fan	11	18%	21	22%	32	20%	14	19%
Water heater	8	13%	12	12%	20	13%	11	15%
Roof	8	13%	11	11%	19	12%	7	10%

²² This finding is marginally significant at the 0.05 level.



PRODUCT	PG&E (N=62)		SCE (N=97)		TOTAL (N=159)		2006-2008 EVALUATION (N=73)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Room air conditioner	4	6%	12	12%	16	10%	11	15%
Pool pump	4	6%	6	6%	10	6%	9	12%
Evaporative cooler	4	6%	3	3%	7	4%	3	4%

Of the 26% planning to buy an appliance in the next year, fewer than half (42%) already were shopping for that appliance (Table 3.54).

Table 3.54: Whether Participants Have Started Shopping for their Product, by Utility

HAVE SHOPPED	PG&E (N=60)		SCE (N=89)		TOTAL (N=131)	
	Count	Percent	Count	Percent	Count	Percent
Yes	23	38%	40	45%	63	42%
No	37	62%	49	55%	86	58%

Of the respondents who reported planning to buy a product in the next 12 months, about half (53%) said they were not planning to buy an energy efficient model because it would be too expensive. Conversely, about a quarter (24%) of participants said nothing was stopping them from buying an energy efficient model (Table 3.55).²³

Table 3.55: Participants' Reasons for Not Buying an Energy efficient Model, by Utility (Multiple Responses Allowed)

REASON	PG&E (N=60)		SCE (N=89)		TOTAL (N=131)	
	Count	Percent	Count	Percent	Count	Percent
Price too high	26	43%	43	48%	69	53%
No reason (plan to buy efficient model)	15	25%	17	19%	32	24%
Wrong size or color	2	3%	4	4%	6	5%

²³ Data coded from open-ended answers.



REASON	PG&E (N=60)		SCE (N=89)		TOTAL (N=131)	
	Count	Percent	Count	Percent	Count	Percent
Not available/in-stock	3	5%	3	3%	6	5%
Don't need product	2	3%	3	3%	5	4%
Installation	2	3%	1	1%	3	2%
Don't know where to go to purchase an energy efficient model	0	0%	2	2%	2	2%
Lacks other features wanted	1	2%	1	1%	2	2%
Lack of rebates	1	2%	1	1%	2	2%
Don't believe/care about energy efficiency claims	1	2%	1	1%	2	2%
Other	2	3%	2	2%	4	3%
Don't know	5	8%	13	15%	18	14%
Refused	1	2%	2	2%	3	2%

Participants versus Nonparticipants

The evaluation team conducted a general population survey (GPS) to assess characteristics of a representative sample of California's adult energy decision-making population. The survey included nonparticipants for this HEER evaluation, but not known HEER participants; except for POS rebate participants, who were unidentifiable and therefore could not be removed. Appendix A describes the methods taken to create a representative sample of California's population.

The final GPS sample consisted of 928 surveys, which provides greater than 5% precision at greater than a 95% confidence level. The evaluation team applied post-stratification weights to the final sample to ensure that it appropriately represented the population per key demographic characteristics (see 2011-2012 General Households Population report for more details about post-stratification weighting).



This section compares findings between HEER participants and the non-participating respondents from the GPS.²⁴ We defined non-participating respondents as those who bought an appliance after January 2010, but did not receive a HEER rebate (Table 3.56).

We subdivided non-participating respondents into those who said they looked or planned to look for ENERGY STAR appliances and those who did not. Nonparticipants seeking ENERGY STAR products typically were more energy-minded,²⁵ had higher incomes, were more educated, and were more likely to be homeowners than nonparticipants not seeking ENERGY STAR appliances.²⁶

Table 3.56: Types of Nonparticipants

NONPARTICIPANTS	COUNT
Not Seeking ENERGY STAR	47
Seeking ENERGY STAR	94

Use of the Internet to Gather Appliance Information

We asked both HEER participants and nonparticipants what types of research they conducted before purchasing an appliance. More HEER participants who purchased water heaters and room air conditioners 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 Internet than did HEER participants. Table 3.57

A greater number of higher-income HEER participants (44%) sought appliance information via the Internet than did HEER participants with a lower household income (33%, $z=2.16$, $p=.02$)²⁷.

²⁴ For a full report on all GPS respondents see the *2012 California General Population* report. The 2012 California General Population report covers all questions asked in the GPS survey, the current report focuses on questions pertinent to the HEER program.

²⁵ A greater percentage of nonparticipants seeking ENERGY STAR appliances were *Striving Believers* or *Leading Achievers* than nonparticipants not seeking ENERGY STAR. (See the *Segmentation* section for more information.)

²⁶ See the *Demographics* section below for more information on these differences.

²⁷ The evaluation team broke household income into two groups: "higher income" households, which made \$50,000 or more, lower income households made less than \$50,000 annually.



Internet outreach, therefore, is reaching potential participants who are concerned about energy and have higher incomes.



**Table 3.57: Methods of Gathering Appliance Information, by Population and Product Type
(Multiple Responses Allowed)**

METHOD	WATER HEATER			REFRIGERATOR			ROOM A/C		
	Non-participant Seeking ENERGY STAR (n=36)	Non-participant Not Seeking ENERGY STAR (n=18)	HEER Participant (n=53)	Non-participant Seeking ENERGY STAR (n=25)	Non-participant Not Seeking ENERGY STAR (n=10)	HEER Participant (n=130)	Non-participant Seeking ENERGY STAR (n=22)	Non-participant Not Seeking ENERGY STAR (n=12)	HEER Participant (n=116)
Retailers / Salesperson	50%	33%	34%	60%	60%	56%	45%	58%	45%
Installation contractor	22%	44%	19%	4%	0%	1%	0%	0%	1%
Friend, neighbor, relative or coworker	3%	11%	8%	0%	10%	6%	5%	17%	3%
Utility	0%	0%	6%	0%	0%	2%	0%	0%	10%
Other gas/electric utility	0%	0%	0%	0%	0%	0%	0%	0%	1%
Internet	22%	6%	43%	32%	10%	25%	23%	17%	37%
Consumer Reports	0%	0%	6%	12%	20%	12%	9%	0%	3%
Other magazines	0%	0%	2%	0%	0%	0%	0%	0%	0%
Newspaper	0%	0%	0%	0%	0%	5%	0%	0%	5%
Radio	0%	0%	0%	0%	0%	0%	0%	0%	2%
Television	0%	0%	0%	0%	0%	0%	5%	8%	3%
Didn't look	6%	11%	4%	0%	0%	8%	5%	0%	15%
Other	6%	0%	4%	4%	10%	6%	9%	8%	3%
Don't know	3%	6%	0%	0%	0%	2%	5%	0%	3%
Refused	0%	0%	0%	4%	0%	1%	0%	8%	0%

**Table 3.58: Reasons for Buying Specific Model, by Population and Product Type
(Multiple Responses Allowed)**

REASON FOR PURCHASE	WATER HEATER			REFRIGERATOR			ROOM A/C		
	Non-participant Seeking ENERGY STAR (n=36)	Non-participant Not Seeking ENERGY STAR (n=18)	HEER Participant (n=53)	Non-participant Seeking ENERGY STAR (n=25)	Non-participant Not Seeking ENERGY STAR (n=10)	HEER Participant (n=130)	Non-participant Seeking ENERGY STAR (n=22)	Non-participant Not Seeking ENERGY STAR (n=12)	HEER Participant (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%	0%	25%	20%	0%	18%	10%	0%	13%
It was the right size, color	22%	38%	9%	44%	27%	56%	25%	38%	33%
It had an ENERGY STAR Label	6%	0%	4%	8%	0%	1%	10%	0%	6%
The contractor/retailer recommended	17%	19%	19%	0%	0%	3%	0%	8%	3%
It was energy efficient	8%	0%	15%	4%	0%	5%	5%	0%	7%
There was a rebate for it	0%	0%	6%	0%	0%	5%	0%	0%	15%
It had good reviews / Recommended by others	3%	13%	17%	8%	9%	5%	15%	8%	9%
It had the features I wanted	8%	0%	25%	20%	9%	37%	5%	0%	29%
Same/similar to previous model	3%	6%	8%	0%	0%	4%	0%	0%	2%
Wanted that brand	3%	0%	6%	4%	0%	12%	5%	0%	6%
It was all that was available/only choice	6%	13%	9%	0%	9%	1%	5%	0%	3%
It was good for the environment	0%	0%	2%	0%	0%	0%	0%	0%	2%
Other	6%	6%	2%	8%	27%	2%	10%	23%	0%
Don't know	3%	6%	6%	0%	9%	2%	0%	8%	2%

Reasons for Purchase of Specific Appliance Model

We asked all surveyed groups what attributes they were looking for when they decided to purchase an appliance. Across all three appliances, 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. Rather, HEER participants purchased their water heater because it was of good value (30%), it cost less to operate (25%), and it had the features they wanted (25%, Table 3.58).

Segmentation Differences

The evaluation team examined HEER participants and nonparticipant respondents in both groups (those who sought ENERGY STAR products and those who did not) by the market segments using established segmentation questions.²⁸

- ➔ **Leading Achievers:** Highly likely to adopt energy efficiency measures and are highly concerned with saving energy
- ➔ **Practical Spenders:** Highly likely to adopt energy efficiency measures, but they are not very concerned with conserving energy
- ➔ **Striving Believers:** Practice energy conservation and are concerned about saving energy, but fail to install energy efficiency measures
- ➔ **Thrifty Conservers:** Practice energy conservation, but are not very concerned about conserving energy
- ➔ **Disconnected:** Do not take many energy conservation actions and have low interest in saving energy

Figure 3.13 shows the market segments these four groups fall into. Most notably:

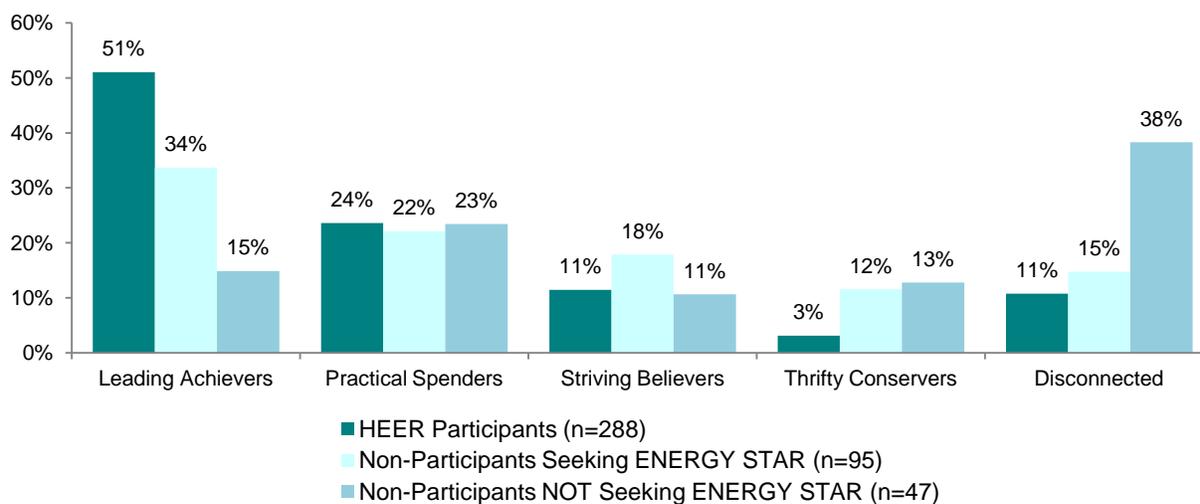
- ➔ HEER participants and nonparticipants seeking ENERGY STAR appliances were more likely to be *Leading Achievers*.

²⁸ See 2011-2012 General Households Population Study in California, Study #SCE0306, August 30, 2012.



➔ Nonparticipants not seeking ENERGY STAR appliances were more likely to be *Disconnected*.

Figure 3.13: HEER Participant and Nonparticipant Market Segment Differences



Demographic Differences

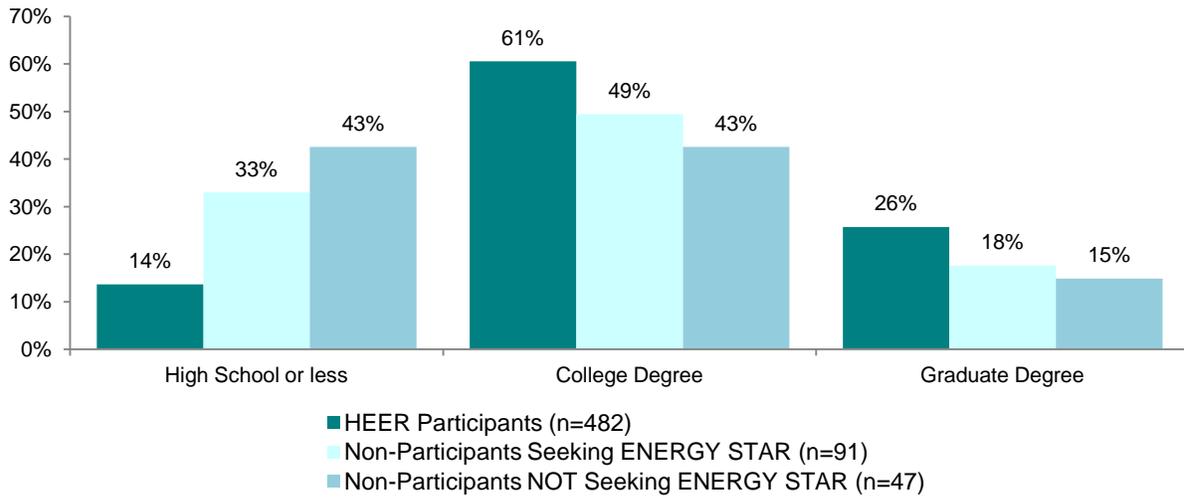
HEER participants are demographically different from both groups of nonparticipants. Specifically, almost all (93%) HEER participants were homeowners. In contrast, fewer (64%) nonparticipants seeking ENERGY STAR appliances and 55% of nonparticipants not seeking ENERGY STAR appliances were homeowners ($\chi^2(2, N=640)=90.99, p<.0001$). Additionally, men are more likely to seek out energy efficient appliances. Specifically, there are more male HEER participant respondents (60%) and nonparticipants seeking ENERGY STAR products (58%) than male nonparticipants not seeking ENERGY STAR (34%, $\chi^2(2, N=647)=12.04, p=.002$). This is notable, because the general California population is split evenly by gender.²⁹

HEER participants were more likely to have college and graduate degrees than both nonparticipants groups ($\chi^2(4, N=620)=38.1, p<.0001$, see Figure 3.14).

²⁹ Source U.S. Census Bureau: State and County QuickFacts; accessed March 20, 2012.

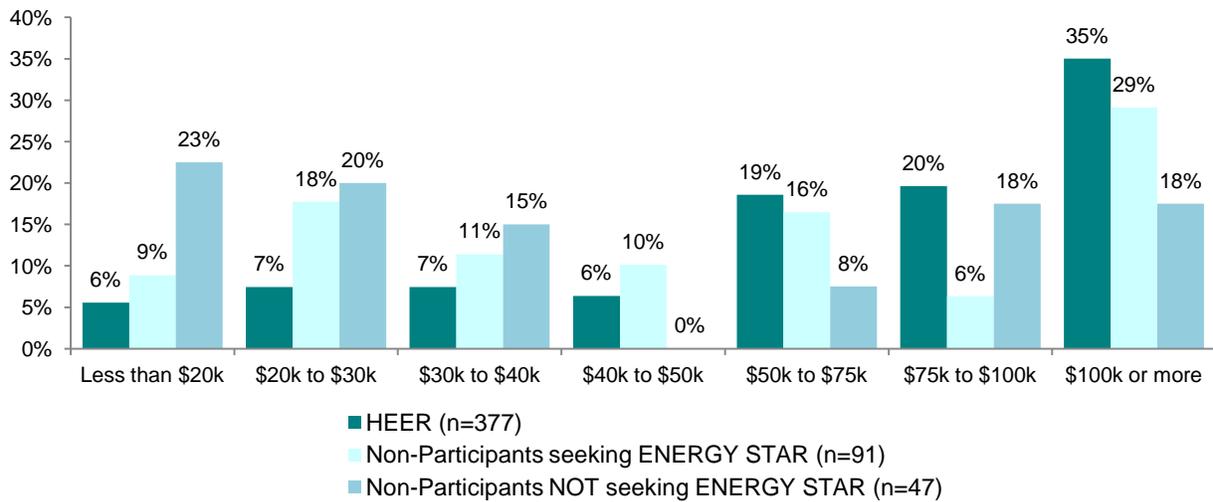


Figure 3.14: Differences in Level of Education between Nonparticipants and HEER Participants



HEER participants also tended to have a higher income than nonparticipants ($\chi^2(10, N=334)=35.81, p<.0001$, see Figure 3.15).

Figure 3.15: Differences in Income Level between Nonparticipants and HEER Participants



AKAB FINDINGS FOR HEER PARTICIPANTS VERSUS NONPARTICIPANTS

akAB Framework

The Randazzo and Peters white paper *Reconsidering What We Measure*³⁰ describes the akAB framework in detail. Briefly, the akAB model of behavior change focuses on the stages a person goes through before changing their behavior, including: *awareness and knowledge, concern, ascription to personal responsibility, and intention.*

- ➔ **Awareness:** A person must be aware of the possibility of change and the benefits of change before they can deliberately change their behavior. Awareness of new technologies or the possibility to change may be focused on environmental or financial issues.
- ➔ **Concern:** To change behavior deliberately, a person also may exhibit a higher level of concern; these concerns may be altruistic environmental concerns, but also may be financial concerns, such as worry about paying electricity bills.
- ➔ **Ascription to personal responsibility (responsibility):** A person 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.
- ➔ **General intention to conserve (intention):** Intention to change a behavior is the final step before a person changes their behavior – they recognize that they can make a change and intend to do so.

The evaluation team can measure behavior when a person buys a more energy efficient appliance, or when they make low-cost or no-cost changes within their home (e.g., by drying clothes on a line rather than in a clothes dryer, or lowering the temperature on their water heater).

akAB Methodology

The HEER participant survey included the same akAB questions as those used in the *California General Population* survey. For in-depth methodology, see 2011-2012 General Households Population Study in California (Study #SCE0306).

³⁰ Randazzo, V.K. and J.S. Peters. 2011. *Reconsidering What We Measure: A White Paper. Residential Decision-Making and Proposed Standard Questionnaire Items.* Study ID SCE0305. Rosemead, Calif.: Southern California Edison and Pacific Gas and Electric.



The evaluation team created scales for the following: awareness/knowledge of the environment, concern for the environment, concern for finances, responsibility for the environment, responsibility for finances, and intention.

akAB Model Correlations – HEER Participants

Adhering to the akAB model, there were stronger correlations for HEER participants between bordering scales than non-bordering scales. For example, the correlation between *awareness/knowledge* and *concern* is stronger than the correlation between *awareness/knowledge* and *responsibility*. This pattern holds true for the models using environmentally focused questions (Figure 3.16) and financially focused questions (Figure 3.17). Overall, there are strong correlations between the akAB scales for the HEER participants. All relationships below are significant (P-values for all correlations shown are less than .01.).

Figure 3.16: akAB Environmental Model Correlations for HEER Participants

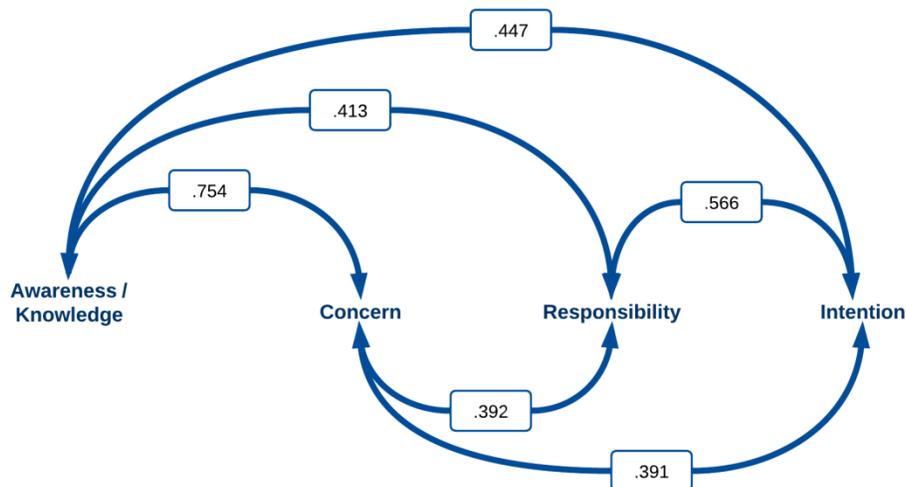
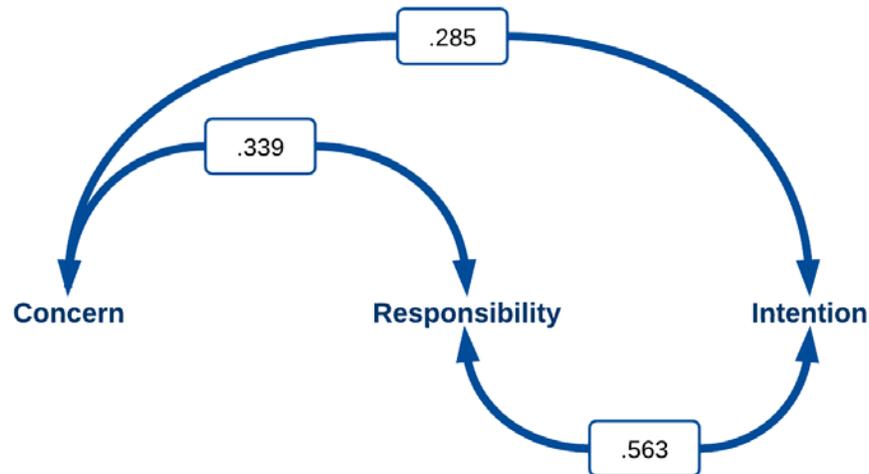


Figure 3.17: akAB Financial Model Correlations for HEER Participants



Differences Between Nonparticipants and HEER Participants

Differences Between HEER Participants and Nonparticipants Seeking ENERGY STAR

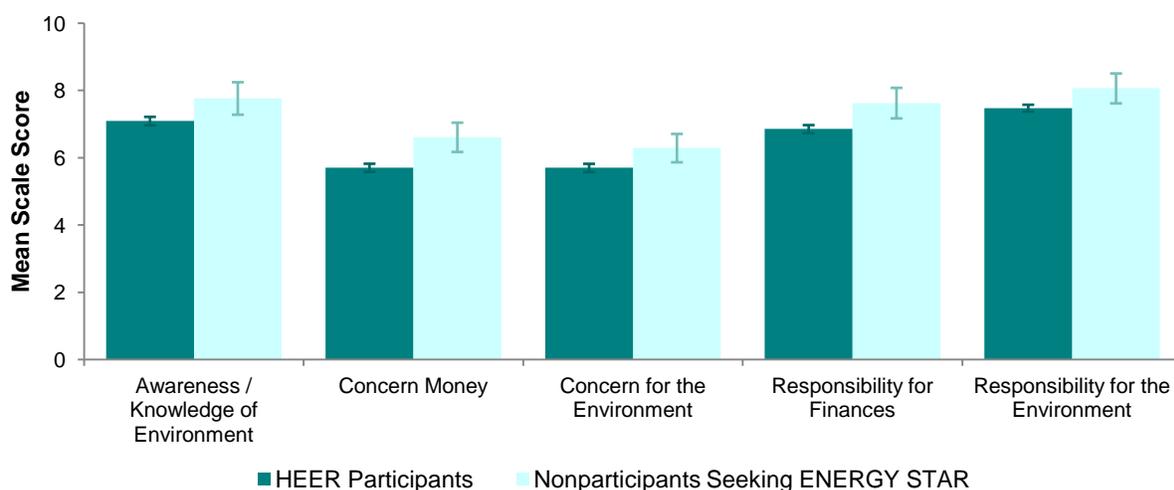
Nonparticipants seeking ENERGY STAR appliances were more aware of energy issues, ($t(112)=2.49$, $p=.01$), more concerned about the environment ($t(112)=2.21$, $p=.03$), more concerned about finances ($t(105)=2.86$, $p=.01$), and scored higher on the responsibility for protecting the environment scale ($t(111)=2.94$, $p=.004$) and for the responsibility for energy finances scale ($t(111)=2.60$, $p=.01$) than did HEER participants. (See Figure 3.18 for bar plots showing the group means and standard errors). Nonparticipants seeking ENERGY STAR and HEER participants scored similarly for intention.

These results suggest that HEER participants differed from nonparticipants who bought ENERGY STAR appliances but did not seek a utility rebate. For instance, HEER participants were less aware of/knowledgeable about the environment, less concerned about the environment and their energy-use finances, and felt less responsible for the environment and their energy-use finances.³¹

³¹ The responsibility for energy use finances consists of three questions regarding taking responsibility for keeping utility bills lower.



Figure 3.18: Differences between HEER Participants and Nonparticipants Seeking ENERGY STAR Appliances*



* Shows standard error bars. Only significant differences are shown.

Differences Between HEER Participants and Nonparticipants Not Seeking ENERGY STAR

HEER participants and nonparticipants not seeking ENERGY STAR appliances scored very similarly on all akAB scales. Both groups have similar scores for all environment scales – *awareness/knowledge*, *concern*, and *responsibility*.³² Similarly, both groups have similar scores for all financial scales (*concern* and *responsibility*).³³ The only notable difference is that HEER participants scored higher on the *intention* scale, $t(47)=-2.57$, $p=.01$. These results suggest that, per the akAB model, HEER participants were not significantly different from nonparticipants who did not seek ENERGY STAR appliances, suggesting that HEER participants would not have purchased an energy efficient appliance without the influence of the HEER program.

³² All t-tests for environment scales were not significant.

³³ All t-tests for financial scales were not significant.



Differences Between HEER Participants and Both Nonparticipant Groups

The results described below indicate that the HEER program effectively engaged its targeted participant group. Nonparticipants seeking ENERGY STAR appliances were more aware of, concerned about, and felt a greater responsibility for the environment than did HEER participants. These results suggest that purchasers motivated to buy ENERGY STAR products on their own were doing so, but were not going through the program. Additionally, nonparticipants not seeking ENERGY STAR appliances showed similar levels of awareness, concern, and responsibility about the environment as did HEER participants. This suggests that HEER participants were most similar to nonparticipants not seeking ENERGY STAR appliances.

When comparing all three groups, the groups differ marginally regarding awareness/knowledge of the environment ($F(2, 644)=2.64, p=.07$), and differ regarding perceptions of concern for finances ($F(2,642)=5.20, p=.01$), responsibility for the environment ($F(2,643)=3.30, p=.04$), responsibility for finances ($F(2, 638)=4.00, p=.02$), and intention ($F(2, 644)=8.44, p=.0001$).

Differences between groups³⁴ for awareness/knowledge of the environment show that nonparticipants seeking ENERGY STAR appliances were more aware/knowledgeable than nonparticipants not seeking ENERGY STAR and HEER participants combined ($t(131)=-2.33, p=.02$). There is no difference in awareness/knowledge scores between nonparticipants not seeking ENERGY STAR and HEER participants, $t(53)=-.53, p=.60$.

We asked all groups two questions about how concerned they are about the costs of energy and paying their utility bills. These questions constitute the concern for finances scale. There is no difference in concern for finance scores between nonparticipants seeking ENERGY STAR and grouped scores for nonparticipants not seeking ENERGY STAR and HEER participants ($t(53)=-1.49, p=.14$). Similarly, there is no difference between concern scores for nonparticipants not seeking ENERGY STAR and HEER participants ($t(53)=1.57, p=.12$). The planned comparisons used in these statistical tests combine mean scores for nonparticipants not seeking ENERGY STAR and HEER participants; however, HEER participants have a lower concern for finances

³⁴ The evaluation team used planned comparisons to test the hypothesis that nonparticipants seeking ENERGY STAR appliances differed from HEER participants and nonparticipants not seeking ENERGY STAR appliances (combined). Similarly, the researchers used planned comparisons to test whether HEER participants differed from nonparticipants not seeking ENERGY STAR appliances. The evaluation team designed the planned comparisons to provide the statistical power needed to determine any differences. (Note that contrasts are orthogonal.)



than both nonparticipating groups.³⁵ We suggest that the lower concern for finances found for HEER participants is partially due to the group's higher income as the concern for finances questions constituting the scale focus on a customer's concern about being able to pay energy utility bills.

Nonparticipants seeking ENERGY STAR appliances scored higher on the responsibility for finances scale than nonparticipants not seeking ENERGY STAR appliances and HEER participants combined ($t(121)=-2.76$, $p=.01$). There is no difference in responsibility scores between nonparticipants not seeking ENERGY STAR products and HEER participants alone ($t(53)=-1.11$, $p=.27$).

Nonparticipants seeking ENERGY STAR appliances scored higher on the responsibility for the environment scale than nonparticipants not seeking ENERGY STAR appliances and HEER participants combined ($t(134)=-2.00$, $p=.05$). There is no difference in responsibility scores between nonparticipants not seeking ENERGY STAR products and HEER participants ($t(53)=.46$, $p=.65$).

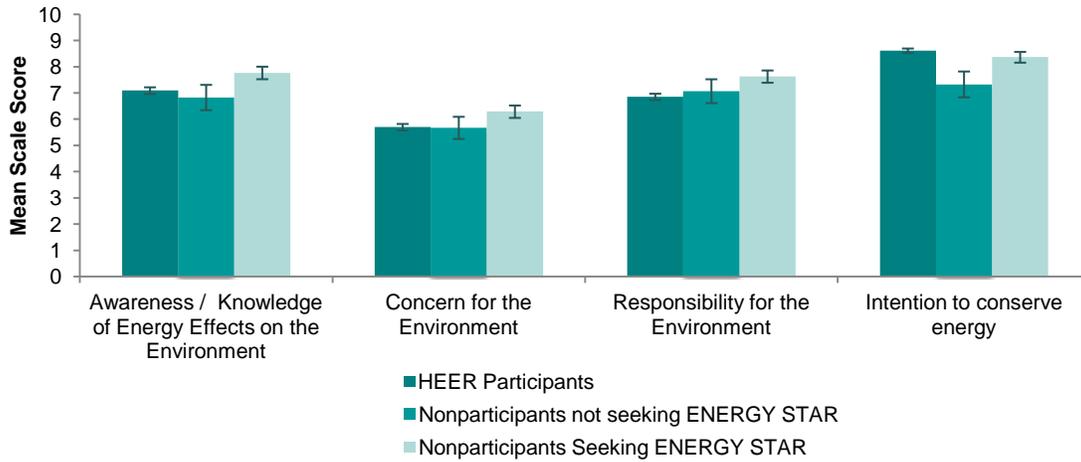
Nonparticipants seeking ENERGY STAR products have the same level of intention to act on behavior than did nonparticipants not seeking ENERGY STAR products and HEER participants combined ($t(111)=-1.22$, $p=.23$). Separately, HEER participants had a higher intention to act on behavior than nonparticipants not seeking ENERGY STAR appliances ($t(49)=-2.57$, $p=.01$).

There were no significant differences between nonparticipants and HEER participants regarding their concern or responsibility for the environment (Figure 3.19).

³⁵ Mean score of concern for finances for HEER participants is 5.71, while it is 6.61 for nonparticipants not seeking ENERGY STAR, and 6.41 for nonparticipants seeking ENERGY STAR appliances.



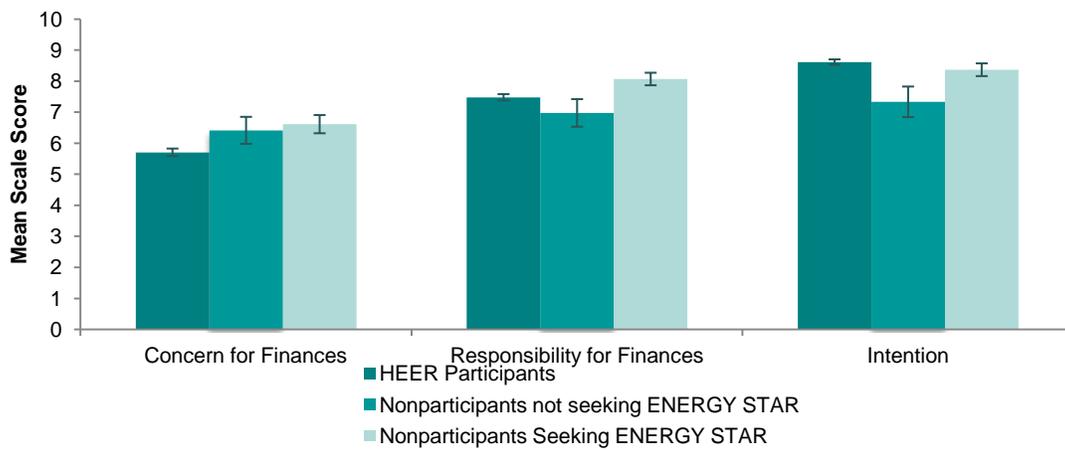
Figure 3.19: Mean Environment Scale Differences between HEER Participants and Both Nonparticipant Groups



Note: We include the intention scale in both Figure 3.19 and Figure 3.20 at the intention scale covers both the financial and environmental domains.

The evaluation team also noted no significant differences between nonparticipants and HEER participants regarding their concern and responsibility for finances (Figure 3.20).

Figure 3.20: Mean Financial Scale Differences between HEER Participants and Both Nonparticipant Groups



Note: We include the intention scale in both Figure 3.19 and Figure 3.20 at the intention scale covers both the financial and environmental domains.



Differences Between Groups by Appliance

We compared nonparticipants who did not report seeking ENERGY STAR to HEER participants purchasing specific appliances and found no meaningful differences. We believe that a potential reason for not finding meaningful differences is that we could not divide nonparticipants not seeking ENERGY STAR appliances into groups according to what appliance they purchased because the sample sizes were too small. HEER participants purchasing water heaters and pool pumps showed no difference in any akAB scale to nonparticipants not seeking ENERGY STAR appliances.

Differences Between Groups by Place of Purchase

HEER participants purchased their appliances from several different places: big box stores, home improvement stores, specialty plumbing or pool stores, online stores, or through a contractor. We divided HEER participants who purchased their appliance in a store from HEER participants whose contractor purchased their appliance for them to examine akAB score differences between these two purchasing groups when compared to nonparticipants seeking ENERGY STAR and nonparticipants not seeking ENERGY STAR.

Nonparticipants seeking ENERGY STAR continue to have higher akAB scores when compared to HEER participants in both groups (contractor versus store purchasers) for concern for finances³⁶ and the environment,³⁷ and responsibility for finances³⁸ and the environment.³⁹ Additionally, there is no difference in intention scores between nonparticipants seeking ENERGY STAR and HEER participants of both groups⁴⁰.

³⁶ T-tests comparing nonparticipants seeking ENERGY STAR for concern for finances: for HEER participants who purchased their appliance in a store, $t(107)=-2.66$, $p=.01$, and for HEER participants whose contractor purchased their appliance, $t(89)=-2.72$, $p=.01$.

³⁷ T-tests comparing nonparticipants seeking ENERGY STAR for concern for the environment: for HEER participants who purchased their appliance in a store, $t(114)=-1.94$, $p=.05$, and for HEER participants whose contractor purchased their appliance, $t(88)=-2.13$, $p=.04$.

³⁸ T-tests comparing nonparticipants seeking ENERGY STAR for responsibility for finances: for HEER participants who purchased their appliance in a store, $t(113)=-2.17$, $p=.03$, and for HEER participants whose contractor purchased their appliance, $t(88)=-2.94$, $p=.004$.

³⁹ T-tests comparing nonparticipants seeking ENERGY STAR for responsibility for the environment: for HEER participants who purchased their appliance in a store, $t(114)=-2.61$, $p=.01$, and for HEER participants whose contractor purchased their appliance, $t(88)=-2.78$, $p=.01$.

⁴⁰ T-tests comparing nonparticipants seeking ENERGY STAR for intention: for HEER participants who purchased their appliance in a store, $t(107)=1.28$, $p=.20$, and for HEER participants whose contractor purchased their appliance, $t(89)=.26$, $p=.80$.



HEER participants of both groups (contractor versus store purchasers) have higher intention scores than nonparticipants not seeking ENERGY STAR appliances.⁴¹ Also, nonparticipants not seeking ENERGY STAR and HEER participants in both groups (contractor versus store purchasers) do not have different scores for awareness, concern for finances and environment, and responsibility for finances and environment.⁴²

These results suggest that the HEER program influences intention for HEER participants regardless of where participants purchased their appliance. Intention to conserve energy remains high for HEER participants regardless of whether a contractor purchased the appliance for the participant or whether they went online or to a store to purchase the appliance themselves.

Nonparticipant Group Knowledge of HEER Rebates by akAB

While half of nonparticipants in each group knew they could get an appliance rebate from their utility (Table 3.59), these nonparticipants respond differently on responsibility of finances and environment, and intention constructs, depending on their knowledge of HEER rebates.

Table 3.59: Nonparticipants' Knowledge of Utility Appliance Rebates

KNOWLEDGE OF REBATE	NONPARTICIPANTS SEEKING ENERGY STAR (N=93)	NONPARTICIPANTS NOT SEEKING ENERGY STAR (N=48)
No knowledge of HEER Rebate	49%	50%
Knowledge of HEER Rebates	51%	50%

Nonparticipant groups (those seeking ENERGY STAR and those not seeking) that did not know about HEER rebates have higher responsibility for the environment scores, indicating that they feel more environmentally responsible for reducing their energy use, than nonparticipants that did know about the rebates ($F(1,133)=5.74, p=.02$).

Nonparticipants seeking ENERGY STAR appliances have high responsibility for finance scores irrespective of whether they know about HEER rebates or not, but nonparticipants not seeking ENERGY STAR have marginally lower responsibility for finance scores if they do know about

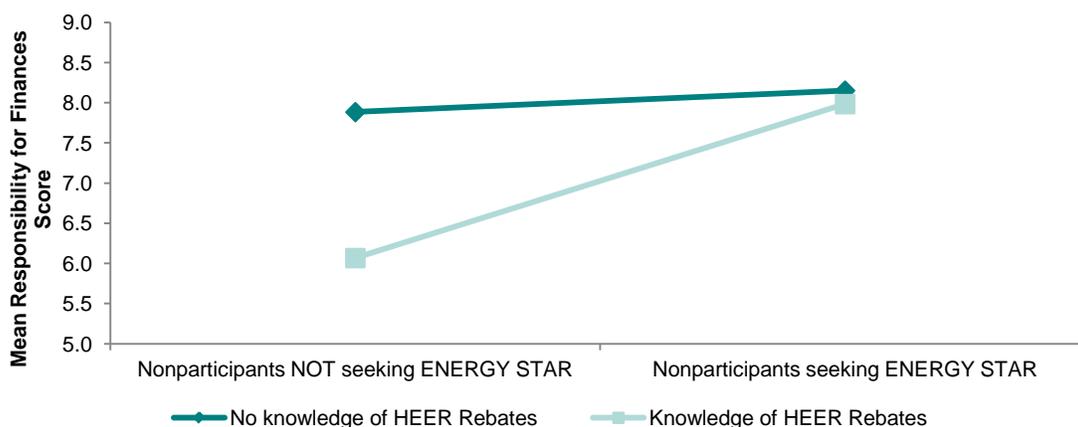
⁴¹ T-tests comparing nonparticipants not seeking ENERGY STAR for intention: for HEER participants who purchased their appliance in a store, $t(48)=2.64, p=.01$, and for HEER participants whose contractor purchased their appliance, $t(50)=2.07, p=.04$.

⁴² All t-tests non-significant with a p-value larger than .05.



HEER rebates ($F(1,133)=3.30, p=.07$). This interaction suggests that this subgroup (nonparticipants not seeking ENERGY STAR that do know about HEER rebates) may not be motivated to participate in the HEER program because they have a low ascription to personal responsibility for finances. The second nonparticipant not seeking ENERGY STAR subgroup, those with no knowledge of HEER rebates, have high scores for financial responsibility. This subgroup may not seek ENERGY STAR appliances for other reasons (see Figure 3.1).

Figure 3.21: Interaction Between Group and Knowledge of HEER Rebate for Responsibility for Finances Scale



In addition to the marginally significant interaction described above, nonparticipant groups (including those seeking ENERGY STAR appliances and those not seeking) that did not know about HEER rebates have higher financial responsibility scores than nonparticipants that did know about HEER rebates ($F(1,133)=5.35, p=.02$). Also, nonparticipants seeking ENERGY STAR appliances have higher responsibility for finance scores than nonparticipants not seeking ENERGY STAR appliances ($F(1,133)=5.09, p=.03$).

Nonparticipant groups seeking ENERGY STAR appliances have higher intention to conserve scores than nonparticipants not seeking ENERGY STAR appliances, regardless of both group's knowledge of HEER rebates ($F(1,133)=5.17, p=.03$). These results suggest that knowledge of HEER rebates is not related to either group's intention to conserving more or less energy.





SECTION II: HEER MARKET CHARACTERIZATION

CHAPTER 4: COMPARATIVE APPLIANCE PROGRAM FINDINGS

CHAPTER 5: PRODUCT MARKET CHARACTERIZATIONS



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

SECTION II: HEER MARKET CHARACTERIZATION



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

4 COMPARATIVE APPLIANCE PROGRAM FINDINGS

Research Into Action reviewed U.S. appliance programs to provide PG&E and SCE a broader understanding of appliance program designs and implementation approaches. This section summarizes the findings and is divided into two sub-sections:

- **Appliance Programs Overview** compares programs by budget, geographic area, and the types of appliances covered.
- **Program Types** compares the three program strategies identified, and discusses key details of each.

APPLIANCE PROGRAMS OVERVIEW

Summary

There is little diversity among current programs. While there may be subtle differences between them, nearly all employ the same fundamental strategy and delivery model. They offer residential end-user rebates for a few appliances (most commonly, clothes washers, refrigerators, and/or room air conditioners [RACs]), and also provide retailer training and several types of marketing (most frequently, POS and some combination of bill inserts, a website promotion, and media advertisements).

However, two programs employ alternate strategies. One, a program offered by Xcel in Colorado, uses a midstream incentive combined with an innovative payment structure based on the market share of efficient products. The other, a NYSERDA program, focuses on building long-term relationships with small local retailers and provides cooperative advertising funds.

Description of Current U.S. Appliance Programs

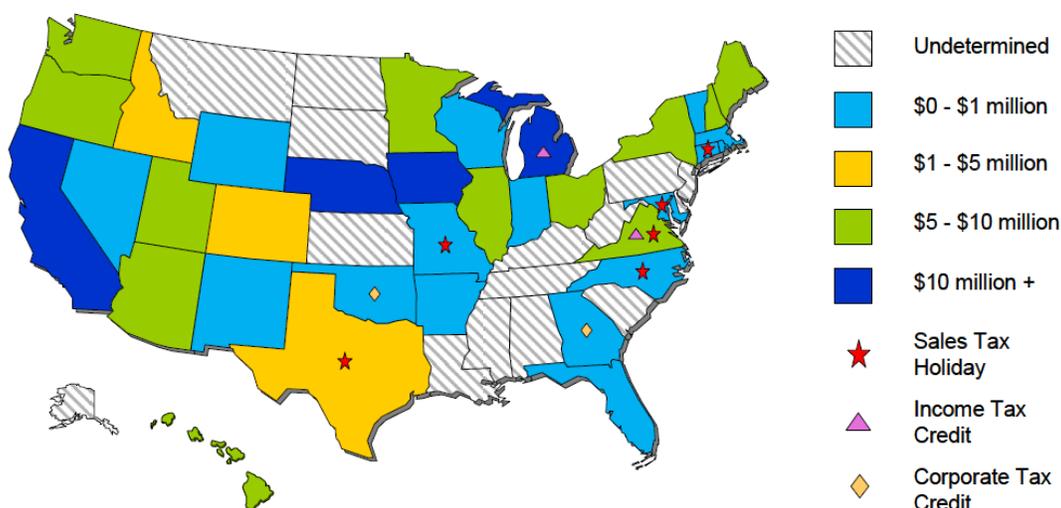
Over 200 organizations currently operate appliance rebate programs. Figure 4.1. shows the incidence and budgets of appliance programs tracked by ENERGY STAR.⁴³ Some items of note:

⁴³ As of 2009, in *ENERGY STAR Guide to Residential Appliance Programs* (http://www.drintl.com/HtmlEmail/ENERGY_STAR_Appliance_Program_Guide_Fall_2009_FINAL.pdf). Note that some estimated budgets include funding for non-appliance measures.



- ➔ California has the largest appliance program budget of any state.
- ➔ Incentives are available in more than four-fifths of states.
- ➔ Most appliance program budgets are under \$1 million (most budgets indicated in Figure 4.1 include multiple programs).

Figure 4.1: ENERGY STAR 2011 Appliance Program Budgets, by State



Source: ENERGY STAR® Summary of Appliance and Residential Water Heater Programs – October 2011 (http://www.energystar.gov/ia/partners/downloads/2011_ENERGY_STAR_Summary_of_Appliance_and_Water_Heater_Programs.pdf).

Most Common Measures

Table 4.1 lists the relative proportion of the most commonly incented appliance types and the average incentive amount for Consortium for Energy Efficiency (CEE) tracked programs. The top products are clothes washers (78% of CEE programs), refrigerators (68% of CEE programs), and room air conditioners (53% of CEE programs). Average incentives are highest for clothes washers, at \$68. Although ENERGY STAR does not track pool pump rebates, one fourth of CEE programs reported offering rebates for pool pumps.



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Table 4.1: Prevalence of Incentives, by Appliance Type

MEASURE	PERCENT OF PROGRAMS TARGETING (N=38) ¹	PERCENT OF U.S. POPULATION ELIGIBLE FOR ENERGY STAR REBATES ¹	ENERGY STAR MEAN INCENTIVE ²
Clothes washers	78%	72%	\$68
Refrigerators	68%	29%	\$43
Room air conditioners	53%	42%	\$39
Dishwashers	39%	28%	\$32
Pool pumps	23%	—	—
Other		—	—
Room air cleaners	18%	—	—
Dehumidifiers	13%	—	—
Freezers	11%	—	—

¹ From CEE 2011 *Summary of Residential Appliance Programs in the United States and Canada* (<http://www.cee1.org/files/CEEAplianceProgramSummaryMay2011.pdf>).

² Approximate values, from *ENERGY STAR® Guide to Residential Appliance Programs*.

Three Appliance Program Strategy Types

All existing appliance programs fall into one of three categories, based on their target market and activity: *end-user incentive*, *midstream incentive*, and *midstream and upstream marketing and education* (marketing and education for midstream and upstream players). This study did not identify any existing appliance programs that use an *upstream incentive* strategy. Table 4.2 presents an overview of each program type and each approach is described in detail below.

Table 4.2: Appliance Program Types and Attributes Summary

CHARACTERISTIC	END-USER INCENTIVE	MIDSTREAM INCENTIVE	MIDSTREAM & UPSTREAM MARKETING & EDUCATION	UPSTREAM INCENTIVE
Prevalence	>95% of programs	1-2 programs	1 program	None identified
Typical large programs	HEER Program (CA), MassSave (MA), Commonwealth Edison ENERGY STAR Clothes Washer Program (IL)	Xcel (CO) ENERGY STAR® Retailer Incentive Pilot	NYSERDA Energy \$mart SM Products Program	

Continued



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CHARACTERISTIC	END-USER INCENTIVE	MIDSTREAM INCENTIVE	MIDSTREAM & UPSTREAM MARKETING & EDUCATION	UPSTREAM INCENTIVE
Target market	End-users; mostly residential	Retailers – big box stores, major national chains	Retailers – local, independently-owned stores, some manufacturers	
Activities	End-user incentives (often mail-in) Marketing support to retailers Retailer training Similar strategy deployed across all product types	Midstream incentives Marketing to end-users Similar strategy deployed across all product types	Cooperative advertising support to retailers End-user education and marketing Strategy differs across product types	
Program theory	Outcomes: Increase sales of efficient appliances, improve customer knowledge and awareness	Outcomes: Increase stocking and sales of efficient technologies	Outcomes: Increase ENERGY STAR market share, increase number of retailer participants, increase stocking of targeted products, reduce incremental cost of ENERGY STAR products, increase consumer efficiency awareness and knowledge	
Product types	Varied – typically three appliance types per program	Refrigerators, clothes washers, dishwashers, RACs, TVs, monitors	HVAC, lighting, appliances, power management	
Evaluation findings	Few stand-alone evaluations completed Cost-effectiveness often bundled with other programs, so hard to distinguish for appliance component High free-ridership	None completed TRC 0.49	Evaluated as market transformation program (lift) Program making progress on nearly all performance indicators TMET 1.8	
Evaluability risks	Challenging to obtain participant contact for POS rebates High free-ridership levels High costs and declining per-unit savings	Retailers may not provide sufficient sales data, especially nonparticipating retailers Challenge to estimate free-ridership Challenge to determine baseline	Challenge to determine baseline – program believes past evaluations overestimated baseline and thus underestimated program impacts	



End-User Incentive Program

Program Theory, Target, and Goal

The stated long-term goal of the larger programs is market transformation (for example, programs operated by the California utilities, MassSave, and LIPA). However, program activities typically focus on resource acquisition by paying rebates to residential end-users to increase in sales of energy efficient appliances.

Program Activities, Measures, and Implementation

- ➔ **Activities:** Programs provide end-user incentives and end-user marketing. Incentives are often mail-in rebates, although online and POS rebates are becoming increasingly common. Marketing strategies are varied and may include point-of-purchase advertising materials, bill inserts, website promotion, or advertising. Most programs combine multiple marketing strategies. Additionally, end-user incentive programs often provide education to retailers about qualified products through in-store trainings. In some states, utilities coordinate appliance programs on a state level.
- ➔ **Measures:** See *Most Common Measures*, above.
- ➔ **Implementation:** Programs may be implemented by the funding utility or a third-party contractor. No data is available on the incidence of either implementation approach.

Outcome and Evaluability Risks

Few process evaluations have been performed on appliance programs. In impact evaluations and cost-effectiveness assessments, appliance programs are often bundled with other programs, such as lighting or homes programs; in these cases, they are often not evaluated for process. The few evaluations that estimate free-ridership find high free-ridership levels. Risks for future program evaluability include the issue of obtaining contact information for POS rebate participants.

Strengths

This program strategy is familiar and it is easy to count the number of units incented and ensure they are in sold in the funder's service territory.



Variations

Although the program theories and goals are all very similar, the activities and measures vary in several respects.

- ➔ **Programs target different products.** Programs provide incentives for an average of three of the eight measure types tracked by CEE.⁴⁴ Large programs do not necessarily incent more measure types than small programs; both the large (above \$1 million budget) and small programs average between 2.7 and 2.8 measures incented. Seven programs incent only one measure; four of these programs incent only clothes washers. Three programs offer five of these measures. In comparison, SCE and PG&E's programs incent three and four of these measures, respectively.
- ➔ **Programs incent different efficiency tiers; incentive amounts vary.** Programs provide a range of different incentive levels for products and provide differing incentives for different tiers of products.
- ➔ **Most programs target all residential end-users, but a few target other markets.** In the CEE database, 79% of programs are geared towards residential customers only; the remaining 21% target "all" markets, or include small and medium commercial markets. One program targets only multifamily residences and one provides incentives to utilities for their programs.
- ➔ **Most programs use the same strategy for all products, but some vary their approach based on the product.** In the CEE database, several programs include product-specific strategies. These strategies include both installer and end-user incentives for pool pumps and retailer incentives for RACs.
- ➔ **Programs use varied marketing strategies.** Three programs in the CEE database provide cooperative marketing funds to retailers. Nine also specify using community events as a marketing strategy.
- ➔ **Most programs provide retailer training; a few do not.** Some programs also provide trade ally training on appliance programs.

⁴⁴ Including clothes washers, dishwashers, refrigerators, room air conditioners, pool pumps, and "other," which includes room air cleaners, freezers, and dehumidifiers.



Midstream Incentive Program

Program Theory, Target, and Goal

This is a market transformation program that aims to increase sales of qualified products by providing cash incentives to retailers. The program expects the incentives will lead retailers to stock (and thus sell) more qualified products. The retailer participants are primarily big box stores like Best Buy. The interviewee stated that Xcel prefers this retailer/midstream program, as opposed to a downstream/end-user incentive program, because they find it easier and less expensive to implement.

Program Activities, Measures, and Implementation

→ Activities:

- The program pays retailers for every qualified unit sold, but uses a *net-to-gross* ratio to “discount” savings. The program only claims savings on a fraction of total units sold, based on their assessment of current product penetration. For example, if the program finds current penetration of a measure is 30%, it will use a *net-to-gross* ratio of 0.70.
- The program also provides marketing support, including in-store displays, bill inserts, and special promotions (store-to-store challenges, sweepstakes), and in-store trainings for retail staff.
- The retailer participants are required to submit monthly sales reports.

→ **Measures:** Refrigerators, clothes washers, dishwashers, room air conditioners, TVs, and computer monitors.

→ **Implementation:** The program is implemented by a third-party, WECC. Participating retailers include Lowes, Sears, Kmart, Sam’s Club, and Best Buy.

Outcome and Evaluability Issues

This is a pilot program that has been operating for three years. To date, 90% of savings have come from TV sales. Due to the increasing efficiency of the TV stock nationwide, and thus decreasing per-unit savings (i.e., a shifting baseline), the interviewee expressed doubt that the program would be renewed in 2012.

Strengths

The interviewee noted the program’s ease of implementation (an ability to coordinate with the same retailers who were already participating in upstream lighting programs, and fewer participants), and the fact that it uses the same program strategy to target both appliances and electronics. *This appears to be unique among all the programs we reviewed.*



Lessons Learned

- ➔ **In the face of retailer resistance, the incentive payment approach changed.** The program shifted its incentive calculation approach early on, away from what they call a “lift” model. The initial approach was to pay retailers for an increase in the percentage of sales of qualified products. If a particular retailer’s pre-program sales of TVs were split – 90% non-qualified and 10% qualified units – the retailer would be paid for increasing the share of qualified unit sales above 10%. Retailers would thus be compensated for shifting their product sales mix, as opposed to increasing total sales. However, the program found retailers were unable or unwilling to comply with the sales data requests necessary for this approach. Nor could the program decide on an appropriate baseline: was it the previous year’s data at the same store, at a store in a different city? In addition, the program worried that the change would not be visible over the duration of the program. However, the interviewee noted that the program faced these challenges in 2008 and that retailers would likely be more willing to comply with sales data requests than they had been three to four years ago. The interviewee also commented that the program has become more “straightforward” over the last few years, as retailers gain familiarity with the process.
- ➔ **Signage continues to be a challenge.** The interviewee noted one of the most difficult aspects of the program is implementing signage for the 40+ TV models, given that most of the retail staff does not know which products qualify for the program. Program staff spends several hours at each store, identifying and labeling units, and make frequent visits.
- ➔ **Distribution decisions are still unknown.** The program staff still does not understand how their retailer participants make decisions about which product types to stock, who distributes them, and where influence over the decision lies.
- ➔ **Training should be conducted in person.** Although some retailers like to do on-line trainings for staff, this program prefers to conduct in-person trainings at the stores, to ensure that the floor sales staff are the ones receiving the training and that they understand the program requirements.
- ➔ **The retailer’s department manager needs to be “on board.”** The interviewee noted that the person in this role can be very helpful in coordinating sales floor staff and ensuring good communication between the program and the retailer.

Other, Similar Programs

AmerenUE implemented a small program in Missouri in 2009 that provided manufacturer and retailer incentives for freezers, RACs, and dehumidifiers. Three programs have also used midstream incentives for RACs only. The California, NEEA, and Nevada BCE Programs are also implementing a midstream/retailer incentive program, but for TVs, desktop PCs, and monitors. The evaluation of the NEEA portion of this program is expected to be published soon.



Midstream and Upstream Education and Marketing Program

Program Theory, Target, and Goal

This is a market transformation program that aims to increase stocking, promotion, and sales of ENERGY STAR-qualified products by providing marketing funds to retailers and educating end-users. The retailer participants are primarily independent and local appliance and hardware stores. NYSERDA has never operated a per-unit incentive program on a regular basis, but did so briefly in 2003-2005, and found the effect on sales disappeared with the availability of the rebate. As a result, the organization favors upstream programs aimed at long-term market transformation.

Program Activities, Measures, and Implementation

→ Activities:

- The program today focuses on the introduction of new technologies or products and less on raising awareness of ENERGY STAR, as this has been measured to be well above the national average in New York State.
- The program provides cooperative advertising incentives, training, sales tools, and other marketing support to retailers in exchange for monthly sales data and a commitment to promoting ENERGY STAR. Cooperative marketing funds include a *flexible option* that funds special promotions suggested by the retailers.
- In the past, the program has been used to fund projects introducing innovative technologies.
- For some products, like smart power strips, the program implementer plays an active role in connecting retailers and manufacturers in order to encourage retailers to stock the product, and may pay a midstream incentive.
- The program may also pay incentives to encourage retailers to increase the share of sales of qualified products, as they did with room air conditioners. In this case, each retailer's incentive payment was customized to the increase in share of sales of qualified products.
- The program also collaborates with other demand-side management programs (such as low-income programs) to introduce measures with high incremental cost, and to pilot end-user marketing and education efforts.
- The program constantly monitors penetration data through monthly sales reports from participating retailers and by examining availability at nonparticipating retailers (mostly big box stores).

→ **Measures:** The program covers four product areas: appliances, lighting, HVAC, and power management. Targeted measures are evolving, determined by ENERGY STAR market penetration and remaining potential.



- **Implementation:** The program is implemented by a third-party, Lockheed Martin. Lockheed has been implementing the program for several years and has a close relationship with both NYSERDA and participating retailers. In some cases, NYSERDA staff begin the relationship with the participant (for example, if the target is a company participating in an R&D program and staff already have a connection).

Outcome and Evaluability Issues

The most recent evaluation (2005) concluded the program is making progress towards achieving its desired outcomes of increasing product availability, market share, and awareness, and decreasing incremental cost. In 2006, the Total Market Effects Test (TMET) for the Products Program was 1.8. The interviewee noted that evaluating a market transformation program is costly and complex. One of the key challenges is selecting a baseline against which to compare program progress. NYSERDA staff believe their past evaluations have used inflated baselines (for example, a geographic area running a local program, but no statewide programs) that thus understated the program impacts.

Strengths

- **Flexibility:** The interviewee noted the program remains flexible in terms of the types of marketing and promotions it funds for its retailer participants, the technologies/measures it will include, and the way in which it operates. This allows the program to capitalize on new opportunities and better meet the needs of participants. This approach also lends itself well to market segmentation and targeted end-user marketing efforts.
- **Long-term impact:** The interviewee noted the program has improved the market share of qualified products in New York and continues to grow, even without rebates.
- **Strength of relationships with retail partners:** The interviewee described a mutual relationship in which the retailers benefit from program marketing funds and, in return, help the program achieve its goals. Their relationship has benefited from the program's flexibility.

Lessons Learned

- **Big box stores, which sell most appliances, do not participate.** According to the interviewee, they are not attracted by the marketing funds and are unwilling to share their sales data.
- **Sales are flat.** NYSERDA program staff feel that they are reaching a plateau in traditionally targeted appliances, and are shifting their focus to other products.
- **Retailers want rebates, but they will do without them.** Retailers did ask for rebates in the program's early years, particularly retailers located near the border with another state where rebates were offered. Over time, however, this has diminished.



Other, Similar Programs

None.



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5

PRODUCT MARKET CHARACTERIZATIONS

This section provides the findings from Research Into Action’s in-depth research of the four selected products: refrigerators, water heaters, pool pumps, and clothes dryers, as well as a comparison of the four products.

PRODUCT OVERVIEW

The appliances under review are very different from one another. However, a few important findings speak to all or most products.

Segmentation

Although diverse, the appliances appear to submit to a *high-touch/low-touch* categorization scheme. There are similarities between refrigerators and clothes dryers on one hand, and water heaters and pool pumps on the other, that may be applicable to other appliances and plug load products, and useful in identifying appropriate program strategies and tactics. Table 5.1 lists generalizations of key features of each category. In naming them, we build on the more common use of *high-* and *low-touch* to refer to a company’s approach to customer service and/or sales.

Table 5.1: Working Segmentation of High-touch/Low-touch Product Categories

CHARACTERISTIC	HIGH TOUCH	LOW TOUCH
Example product types	Refrigerator, clothes dryer	Water heater, pool pump
Definition	A product the user interacts with regularly	A product the user does not interact with regularly
Location	Primary living space within the home	Basement, closet, garage, out-building
Replacement	While working	At failure
Product appearance	Very important	Not important
Brand loyalty	Strong	Weak
Price point and feature intervals	Many small increments along a continuum	Good-better-best
Likelihood that end-user will research purchase online	Very likely (>80%)	Moderately likely, but growing (50-60%)
Percent of replacement products sold and installed by a contractor*	<10%	>30%

* As opposed to products purchased at retail by end-user and installed by the end-user or retailer representative. Does not include products for new homes.



Barriers

- **Barriers to efficiency differ for each appliance** and thus there can be no one-size-fits-all program strategy.

Product Trends

- **The penetration of efficient products and the potential for near-term efficiency gains also differ by appliance.**
- **DOE and ENERGY STAR will increase efficiency standards/specifications for refrigerators, clothes dryers, and water heaters by 2015.** As a result, there is uncertainty about the products that will be available, their market share, and the incremental costs of efficiency.
- **Each appliance is expected to have at least a few models with “smart” or demand response capability on the market by 2015.** However, the number of models and prices are uncertain and any increase in the number of models with smart capabilities will depend on demand. In addition, high-end models are likely to be the first to employ this feature.

Supply Chain

- **Manufacturing of all appliances is consolidated, with three companies holding 80% or more market share in each category.** For refrigerators and clothes dryers the same three dominate: Whirlpool, Electrolux, and GE.
- **There is also consolidation among retailers.** The same three companies account for 40% to 65% market share in the retail distribution channel for refrigerators, clothes dryers, and water heaters: Sears, Lowe's, and Home Depot. This is in accord with the national trend in appliance sales toward national chains, a shift also taking place in electronics.
- **Among low-touch products (water heaters and pool pumps), there is a similar 50-50 split between the percent of products installed by a contractor or service provider versus the end-user.** The program tactics for these products thus need to address the distributor/contractor channel of the supply chain, in addition to the retail channel.

REFRIGERATORS

Energy efficient refrigerators are widely available at most price points and in most configurations. Yet penetration of ENERGY STAR-qualified refrigerators has remained lower than other major appliances (like clothes washers and dishwashers) since at least 2007. Savings from energy efficient refrigerators range from 20% (ENERGY STAR-qualified products) to 35% (ENERGY STAR Most Efficient products). In 2014, the energy consumption of all refrigerators



will drop 25% over the 2012 baseline, when new DOE minimum performance standards go into effect. This change will require all refrigerators sold in the U.S. market to be more efficient than today's ENERGY STAR models. The fact that every household in SCE and PG&E territory owns a refrigerator make this product particularly important to the utility programs.

Key Trends

Efficiency

- ➔ **A revised federal minimum standard takes effect in 2014 and will reduce energy consumption 25% below the current baseline.** The new DOE standards will be nearly equivalent to current ENERGY STAR specifications and only slightly less stringent than the current CEE Tier 3 (30% below current baseline). Estimated annual energy use of the new baseline units ranges from 400 to 600 kWh. DOE estimates an increase in cost to the consumer of around \$100 per unit, with a predicted average unit sales price (in 2009\$) in 2014 of between \$600 and \$1,200 (DOE). Manufacturers report they will need to devote “significant investment” to achieving the new standards, both in designing their products and setting up the plants to manufacture them. At the same time, all manufacturers we interviewed were confident their products would meet the new standards.
- ➔ **Interviewees believe manufacturers will innovate to produce models that exceed the new 2014 baseline,** but speculate there will be fewer models that exceed it (i.e., ENERGY STAR-qualified) than at present, at least initially.
- ➔ **Refrigeration is a mature technology in which manufacturers do not expect major “step changes” or technical innovations before 2018.** Refrigerator efficiency increased dramatically since the first Federal standards in 1978. A 2008 baseline unit used only 30% of the energy of a baseline unit in 1978, and was 10% larger (ENERGY STAR 2009). Manufacturers note small efficiency gains (5% to 10%) are still possible through a number of component substitutions, including more efficient variable-speed compressors and improved insulation. However, they think these improvements follow the law of diminishing returns and energy savings will decrease in subsequent models.
- ➔ **Smart-grid compatible refrigerators will be on the market in 2015.** “Smart” refrigerators will shift demand caused by high-energy functions like defrost and ice production to off-peak hours. Although few smart models are available today, all major manufacturers have programs to develop them. Manufacturers say penetration will



depend on the establishment of communication protocols/standards and expect the number of models to increase after 2015.

- ➔ **ENERGY STAR penetration rose to 50% in 2010, but had been consistently around 30% since 2004.** This is low relative to other appliances where penetration in 2010 was above 50%, including dishwashers (100%) and clothes washers (64%).⁴⁵
- ➔ **Today's ENERGY STAR refrigerators are probably comparable in energy consumption to European best performers or "A+++" models.** Product test procedures differ by region, making it challenging to compare products qualified by different specifications, although an international committee is developing a standardized test procedure. Engineering analysis conducted for DOE found that top performers in the U.S. and E.U. are likely comparable in efficiency.
- ➔ **As in all products, efficiency "trickles down" from most to least expensive products.** Interviewees note that innovative, high-efficiency features enter the market in the most expensive products. Over a few years, as the manufacturers' costs decline, these features or components are included in lower-cost products. One interviewee noted that in 2007-2008, an ENERGY STAR refrigerator carried a significant price premium over baseline models; but today, they are found at every price point and are "really close in price" to baseline models, or just one "price point" (\$50 to \$100) apart.

Products

- ➔ **There are hundreds of refrigerator models.** These models do not submit to the three-step good-better-best categorization common to HVAC and other low-touch products. Rather refrigerator models fall along a continuum, with many small steps in which price and number of features increase in parallel.
- ➔ **Average refrigerator size increased 10% from 1990 to 2000,** but has been constant since because few homes have room for bigger units.⁴⁶

⁴⁵ ENERGY STAR. 2010. *Unit Shipment and Market Penetration Report: Calendar Year 2010 Summary*. Washington, D.C.: U.S. Environmental Protection Agency.

Utilities indicated they may pursue CEE Tier 3 as a measure qualification in 2013-2014. Market penetration of CEE Tiers is not readily available and was not collected for this report.

⁴⁶ ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.



- ➔ **The most common refrigerator configuration sold (in 2008) was the top freezer without ice in the door, but other configurations are gaining market share.**⁴⁷ Among the three main configuration types, top freezer is most common (54%), followed by side-by-side (32%) and bottom freezer (14%). Experts expect bottom freezer and French door bottom freezer models (bottom freezer with two refrigerator doors) to gain market share over the coming years.⁴⁸
- ➔ **Features on the rise include improved food preservation capabilities, air filtration, and increasing use of electronic controls.** Manufacturers note food preservation will become more important as food costs rise. Refrigerators, like all products, will employ more electronic features (i.e., information displays and controls), as consumers expect appliances to function like their other electronic devices.
- ➔ **Refrigerators sold in the U.S. are fundamentally similar to those sold elsewhere in the world, with a few minor differences.** Refrigeration technology is very similar around the world. American refrigerators tend to be larger than European products and are more likely to have automatic defrost. Japanese refrigerators tend to have more compartments with adjustable temperatures, a feature manufacturers say they are likely to incorporate into future U.S. products.

Sales

- ➔ **After a rocky decade, U.S. refrigerator sales in 2010 were at levels similar to 2000.** Sales of all core appliances (laundry, cold appliances, dishwashers, and cooking) increased after 2000 and peaked in 2004-2006. Sales began declining in 2006 and growth resumed in 2010. As of October 2011, year-to-date refrigerator sales were down 4.3%. About 11 million refrigerators are sold annually.⁴⁹

⁴⁷ ENERGY STAR 2009.

⁴⁸ ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.

⁴⁹ ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.

Wolfe, Alan. 2010. "Top 10 Majap Dealers Increase Market Stranglehold." *TWICE*. June 21, 2010.

UBM Canon. 2011. *59th Annual Appliance Industry: Overview and Forecast 2011*.



- **Stand-alone freezer sales are up 34.1% in 2011.**⁵⁰
- **U.S. refrigerator sales are 14% of the world market and about half that of Western Europe, which is 30% of the world market.**
- **U.S. buyers are increasingly shopping by appliances by first choosing the brand, then visiting a retailer that carries the brand.** Nearly half of major appliance buyers base their selection of retail stores to visit based on the brands the store carries. The percent of buyers who shop based on brand increased from 2010 to 2011.⁵¹

Installed Base

- **Nearly all households (99%) own a refrigerator.**⁵²
- **About one-third of households own a stand-alone freezer.**⁵³
- **About one-fifth of California homes have a second refrigerator, a smaller percent than in the rest of the U.S.**⁵⁴
- **Although the average lifetime of a refrigerator is 12 years, many units are considerably older.** One quarter of the installed base is 10 to 19 years old and 8% are more than 20 years old.

⁵⁰ Wolfe, Alan. 2011. "Walmart Offers Free Shipping for CE." *TWICE*. November 21, 2011.

⁵¹ J.D. Power and Associates. "Laundry and Kitchen Appliance Owners Are Increasingly Seeking Brands First, Retailers Second." *2011 Kitchen Appliance Satisfaction Study and 2011 Appliance Retailer Satisfaction Study*. (September 2, 2011).

⁵² ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.

KEMA. 2010. *2009 California Residential Appliance Saturation Study*.

⁵³ DOE. 2011. *Technical Support Document*. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking. Washington, D.C.: U.S. Department of Energy, Energy Efficiency and Renewable Energy.

⁵⁴ ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.



Supply Chain

Manufacturers

Market Share

The U.S. refrigerator market is dominated by three players who together hold over 80% of the market: Whirlpool, GE, and Electrolux. The three have shuffled positions during the last 15 years, with Whirlpool taking over from GE as the dominant brand, and Electrolux and Haier gaining market share. Samsung, although not on the chart of top U.S. refrigerator manufacturers, reports rapidly growing sales worldwide and in the U.S. Table 5.2 lists manufacturers and their U.S. market share in 1995, 2005, and 2008.

Table 5.2: U.S. Refrigerator Manufacturer Market Share (1995-2008)

COMPANY	1995	2005	2008
Whirlpool	27%	25%	33%
GE	35%	29%	27%
Electrolux	17%	25%	23%
Haier	0%	2%	6%
W.C. Wood	0%	1%	1%
Other	21%	18%	10%
Total	100%	100%	100%

Source: DOE. 2011. *Technical Support Document*. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking. Washington, D.C.: U.S. Department of Energy: Energy Efficiency and Renewable Energy.

Refrigerator manufacturers often make products that are marketed under another company's brand. This is the case with Sears's Kenmore brand, which may be made by any of the top manufacturers. The research team sought market share data for refrigerator brands, but these data were not publicly available.

Freezers are an even more consolidated market than refrigerators. Electrolux holds nearly two-thirds of the market with only two significant competitors. Table 5.3 lists manufacturers and their U.S. market share in 1995, 2005, and 2008.



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Table 5.3: U.S. Freezer Manufacturer Market Share (1995-2008)

COMPANY	1995	2005	2008
Electrolux	67%	67%	64%
W.C. Wood	30%	21%	19%
Haier	0%	11%	16%
Sanyo	1%	1%	1%
Whirlpool	1%	0%	1%
Other	1%	0%	0%
Total	100%	100%	100%

Source: DOE. 2011. *Technical Support Document*. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking. Washington, D.C.: U.S. Department of Energy: Energy Efficiency and Renewable Energy.

Worldwide, the refrigerator market looks very different than in the U.S. Sales are less consolidated, with the top ten manufacturers holding just over half the market. No single manufacturer has more than an 11% market share. Whirlpool is the top player, as in the U.S., but GE drops to eighth place. Electrolux and Haier are the second and third-ranked companies. Haier and Samsung are rising contenders, as is GD Midea. Table 5.4 lists manufacturers, their worldwide market share in 2010, and year-on-year market share growth from 2009 to 2010.

Table 5.4: Top Ten Worldwide Refrigerator Manufacturers by Market Share (2010)

COMPANY	2010	2009-2010 YEAR-ON-YEAR GROWTH
Whirlpool	11%	4%
Electrolux	7%	3%
Haier	7%	13%
Bosch	6%	5%
LG	5%	7%
GD Midea	4%	15%
Samsung	3%	12%
GE	3%	1%
Indesit	3%	3%
Panasonic	3%	4%
Total	52%	—

Source: Euromonitor International. 2010. "Major Appliances Millionaires Club – new 2010 company rankings." *Euromonitor Global Market Research Blog*. December 3, 2010.



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Component Manufacturers

The compressor is the key energy-using component in the refrigerator and freezer. Table 5.5 lists compressor manufacturers and their market share in the U.S. in 2001 and worldwide in 2005 and 2006.

Table 5.5: Compressor Manufacturers Market Share, by Percent

COMPANY	U.S. 2001	WORLDWIDE 2005	WORLDWIDE 2006
Embraco	56%	20%	25%
ACC	NA	15%	NA
Tecumseh	NA	14%	NA
Matsushita	NA	13%	18%
LG	NA	10%	NA
Danfoss	<1%	9%	15%
Others	NA	20%	NA
Total	—	99%	—

Source: DOE. 2011. *Technical Support Document*. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking. Washington, D.C.: U.S. Department of Energy: Energy Efficiency and Renewable Energy.

Pricing

DOE noted in its Technical Support Documents⁵⁵ for the most recent standards update that manufacturers typically use a “flat markup,” passing along increased production costs to consumers, with some exceptions at either end of the spectrum. Some industry experts and manufacturers disputed the assertion that manufacturers mark up all products equally.

Manufacturers find costs more difficult to pass through at the low end of the market, where customers are more price sensitive, and there is a ceiling to what they can charge at the high end. DOE estimated a manufacturer’s mark-up to retailers is 1.26.

Manufacturers do not think consumers are willing to pay higher unit prices for efficiency alone, but think they will pay a higher price when an efficient unit is bundled with other premium features.

⁵⁵ DOE. 2011. *Technical Support Document*. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking. Washington, D.C.: U.S. Department of Energy: Energy Efficiency and Renewable Energy.



Regulation and Voluntary Standards

Regulation is an important catalyst of efficiency improvements. Whirlpool, in public comments to DOE, said it was unwilling to undertake costly alterations to its manufacturing facilities unless “required to do so by regulation,” citing the impact on shareholders. However, Whirlpool also articulated how even voluntary standards have a strong impact on product design because they serve as benchmarks, a sentiment expressed by many other manufacturers of consumer electronics products. “The industry will manufacture units to meet the baseline energy requirement, the ENERGY STAR criteria, and (perhaps) the criteria of the top Consortium for Energy Efficiency Tier. It is unlikely that products would be manufactured between these criteria.”⁵⁶ These refrigerator-specific comments parallel nearly identical findings on the importance of mandatory and voluntary standards to motivating the design of efficient electronics products.⁵⁷

Product Design and Manufacturing

Refrigerator design and manufacturing follow a model also found in consumer electronics. Low-end and “commodity” products (for example, compact refrigerators or some top-mount products) are more likely to be designed and/or manufactured by an original equipment manufacturer (OEM). High-end products are more likely to be fully specified and manufactured by the brand. Manufacturing occurs in Asia but also in North America, a point of distinction with consumer electronics products, which are rarely manufactured in this region. Some industry experts predict an even greater shift to North American manufacturing in the refrigerator market, given the high costs of shipping these large devices.

New refrigerator models come to market every 18 months. Older models are closed out, either because demand lags or the manufacturer updated the model’s design to include new features. Extremely popular models can stay on the market for four to five years. Design can take longer than 18 months if there are technical challenges.

Manufacturers are forward-looking, perhaps more so than regulators. They take as axiomatic that future products will be different than current products. GE, in comments to DOE, warned that regulators should not “assume that since there are no [products of a certain type] in the market

⁵⁶ Hoyt, J.B. 2010. Comments on “Pre-NOPR for Refrigerators-Freezers: Docket no. EERE-2008-BT-STD-0012.” Benton Harbor, Mich.: Whirlpool Corporation. January 15, 2010.

⁵⁷ Research Into Action. 2009. *Electronics and Energy Efficiency: A Plug Load Characterization Study*. Rosemead, Calif.: Southern California Edison.



currently . . . there will be none in the future,” and noted manufacturers will design products to meet changing regulations.⁵⁸

Retailers

Nearly all refrigerators reach consumers through retailers; distribution, like manufacture, is concentrated in a small number of big players.

Market Share

As of 2010, the ten largest major appliance retailers comprised 84% of U.S. appliance sales volume (Wolfe 2010). Table 5.6 lists retailers and their U.S. major appliance market share in 2007.

Table 5.6: U.S. Retailer Market Share, Major Appliances (2007)

COMPANY	MARKET SHARE
Sears	30%
Lowe's	15%
Home Depot	14%
Best Buy	7%
Others: Wal-Mart, HHGregg, PC Richard & Son, Brandsmart USA, Conn's, Costco	NA

Source: Wolfe, Alan. 2011. "Walmart Offers Free Shipping for CE." *TWICE*. November 21, 2011.

Among refrigerator sales specifically, Sears has long been the top retailer, but has lost ground since 2003 to home improvement stores and mass merchants.⁵⁹ Since 2008, Sears has used aggressive price-cutting to lure customers, in addition to other features like service, financing, and aggressively marketing efficiency rebates. Table 5.7 lists retailers and their U.S. refrigerator market share in 2005, 2007, and 2009. Note that data for each year originate in three different sources.

⁵⁸ Kline, Kelley. 2010. Comments on "NOPR for Refrigerators, Refrigerators-Freezers, and Freezers, 75 Fed. Reg. 59470." *GE Appliances and Lighting*. November 24, 2010.

⁵⁹ ENERGY STAR. 2009. *ENERGY STAR Program Requirements for Refrigerators*. Washington, D.C.: U.S. Department of Energy.



Table 5.7: U.S. Retailer Market Share, Refrigerators (2005-2009)

COMPANY	SOURCE #1 2005	SOURCE #2 2007	SOURCE #3 2009
Sears	35% ¹	33%	32%
Home improvement (Home Depot, Lowe's)	24%	33%	25%
Independent appliance stores	—	22%	19%
Mass merchants and clubs (Costco, Sam's Club)	2%	11%	—
Appliance or consumer electronics store	31%	—	8% ²
Other	7%	4%	14% ³
Total⁴	99%	103%	98%

Source #1: DOE. 2011. *Technical Support Document. Refrigerator, Refrigerator-Freezer and Freezers Rulemaking*, citing AHAM Fact Book 2005. Source #2: ENERGY STAR. 2009. *ENERGY STAR Program Requirements for Refrigerators*, citing *Home Furnishing News*. Source #3: KEMA. 2009. *Process Evaluation of Southern California Edison's 2006-2008 Home Energy Efficiency Rebate (HEER) Program: Final Report*

¹ Includes Kohl's

² Specifically "big box" stores.

³ Online (2%); hardware stores (2%); brand retailer store (2%); other (8%)

⁴ Source data do not add to 100%.

Pricing

DOE estimates the average retailer mark-up to the consumer is 1.45. Manufacturers note they do not set retail prices.

Efficiency and Product Marketing

Retailers seek to differentiate themselves from competitors with the products they carry. They market a product's characteristics, which include innovation, brand, price, and benefits. Retailers view ENERGY STAR as a product characteristic, and one that is highly marketable. One experienced distributor stated that ENERGY STAR plays a prominent role in product marketing and is highly credible, carrying as much importance as the manufacturer brand. Not surprisingly, retailers request ENERGY STAR-qualified products from manufacturers.

Opportunities

→ **Change Product Design to Reduce Per-Unit Energy Consumption.** Although refrigeration is a mature technology, there are still opportunities for manufacturers to reduce energy consumption:

- Increases in compressor efficiency
- Decreases in outside air penetration and/or increase effectiveness of insulation
- Increases in fan motor efficiency

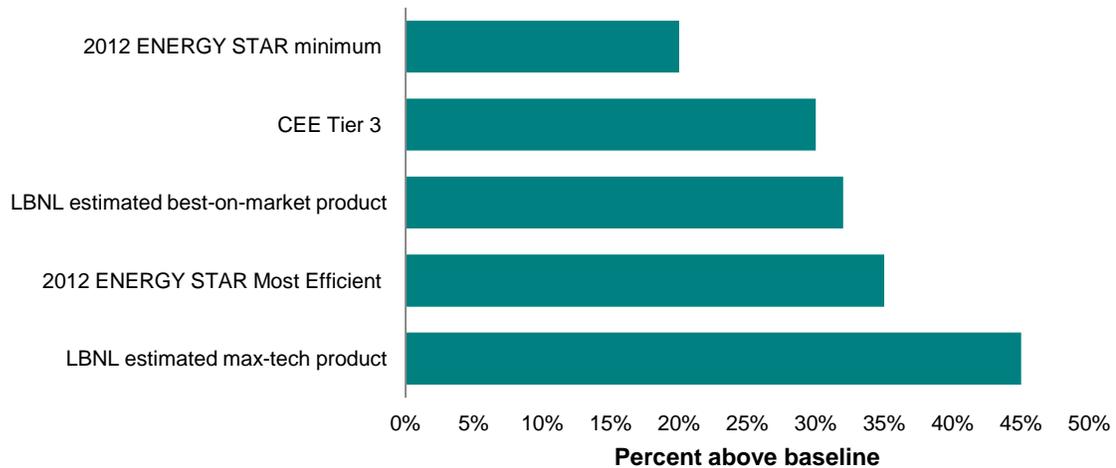


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- Improvements to defrost capability
- Addition of “smart” capabilities (which have load shifting potential, as opposed to reducing total energy consumption)

Figure 5.1 shows the various efficiency specifications and LBNL estimates and their percent efficiency above the 2012 baseline.

Figure 5.1: Refrigerator Savings Potential, Percent above 2012 Baseline



Efficiency gains in refrigerators come from several sources, including:

- Increases in compressor efficiency
- Decreases in outside air penetration and/or increase effectiveness of insulation
- Increases in fan motor efficiency
- Improvements to defrost capability
- Addition of “smart” capabilities (which have load shifting potential, as opposed to reducing total energy consumption)

➔ **Increase sales of efficient models.** ENERGY STAR penetration hovered around 30% for several years, rising in 2010 to 50%. Considering the widespread availability of ENERGY STAR models at most price points and configurations, programs could work to increase sales of these models.



- ➔ **Retire old, inefficient products.** Old, inefficient refrigerators consume more electricity than their newer counterparts. Three-quarters of refrigerators are replaced while still working, and nearly half of those stay on the grid – they are either kept by the owner, given away, or sold.⁶⁰
- ➔ **Alter end-user refrigerator-related behavior.** Behavioral opportunities reduce energy use by changing the way end-users interact with the unit. These opportunities would be obtained by encouraging end-users to:⁶¹
 - Lower ambient/room temperature
 - Lower refrigerator/freezer set points
 - Allow food to cool before placing in unit

Barriers

SCE's 2006-08 HEER program evaluation and the associated general population survey identified three key barriers to the purchase of an energy efficient refrigerator.

- ➔ **First cost:** The most common reason for not buying an efficient unit (cited by 57% of respondents), the first cost barrier may be particularly high at the lowest price points, where anecdotal research shows the highest incremental costs between baseline and ENERGY STAR units.
- ➔ **Low priority of efficiency and utility rebates during the purchase decision:** Few respondents demonstrated concern about these issues in regard to the refrigerator purchase decision. ENERGY STAR was mentioned by 12% of buyers, rebates by 2%.
- ➔ **Nearly one-quarter of refrigerator buyers are unaware of ENERGY STAR:** And, by correlation, energy efficiency. Although most (68%) purchasers recalled buying an ENERGY STAR product, 24% had never heard of ENERGY STAR.

The 2006-08 HEER evaluation, together with the current research, ruled out several potential barriers:

- ➔ **Availability:** ENERGY STAR-qualified products are widely available at nearly all but the lowest price points.

⁶⁰ ENERGY STAR 2009.

⁶¹ Geppert, Jasmin. 2011. *Modeling of Domestic Refrigerators' Energy Consumption under Real Life Conditions in Europe*. Doctoral Dissertation. Bonn, Germany: Rheinische Friedrich-Wilhelms-University.



- ➔ **Lack of awareness of rebates:** Awareness of refrigerator rebates consistently ranked at the top of the charts, including the highest awareness (78%) and highest participation rate (10%) among the general population, and the highest awareness among program participants (98%).
- ➔ **Early replacement aversion:** Nearly three-quarters of refrigerators are replaced while still working.⁶²
- ➔ **Increased space or structural requirements of the efficient product:** ENERGY STAR products do not differ from baseline products in this regard.
- ➔ **Limited number of manufacturers:** All major manufacturers make a variety of ENERGY STAR products.
- ➔ **Unfamiliar technology:** There are not observable differences between efficient and baseline refrigerators.

WATER HEATERS

Water heaters represent one of the largest single sources of household energy use, accounting for up to 17% of residential energy consumption.⁶³ Although technologies exist that reduce energy use in excess of 50%, efficient water heating technologies represent only about 1% of the installed base of 100 million units. While opportunities to increase the efficiency of residential water heating also include improved efficiency in hot water system design, because of retrofit costs, some of the major increases in hot water system design efficiency are more cost-effective for new homes or major remodels. As such, while we have included those system design opportunities that are most widely applicable, this section focuses on water heaters as an appliance.

Product Type Overview

There is more variety in residential water heater technology than in perhaps any other household appliance or system. Current utility programs address only one water-heater product type: classic

⁶² ENERGY STAR. 2009. *Refrigerator Market Profile*. Washington, D.C.: U.S. Environmental Protection Agency.

⁶³ D&R International. 2010. *Energy Star Water Heater Market Profile: Efficiency Sells*. Washington, D.C.: U.S. Department of Energy.



storage water heaters. Table 5.8 below lists types of gas water heaters. Table 5.9 lists types of electric water heaters.

Table 5.8: Gas Water Heater Product Types

PRODUCT TYPE	DESCRIPTION	EFFICIENCY	COVERED BY ENERGY STAR STANDARD?
BASELINE PRODUCT TYPE			
Gas storage	Insulated pressure vessel, gas burner, center flue, exhaust system.	EF > .59 for a 40 gallon unit	
EFFICIENT PRODUCT TYPES			
ENERGY STAR gas storage	A gas-fired high-efficiency storage water heater. A variety of technologies and components may be combined, including those included below, blowers (regulated, forced airflow), dampers, and others.	EF .67	Yes
Condensing	Increases the efficiency of heat extraction from the flue gasses by condensing them.	EF .80-.85	Yes
Tankless	No storage tank. Generates hot water on demand, eliminating standby losses.	EF .82	Yes
Hybrid	Both a storage tank and a tankless heater. Combines the benefits of both types: lowers standby losses while potentially decreasing load on the burner.	No testing method, estimated EF .75	No
Absorption heat pump	Uses gas to transfer heat from ambient air to water.	EF 1.4	No
Solar with gas backup	Uses solar energy for at least half of the heating load, with a backup gas unit.	Solar Fraction (SF) >.5	Yes

Sources: ACEEE. 2011. *Emerging Hot Water Technologies and Practices for Energy Efficiency as of 2011*.

DOE. 2010. *Residential Heating Products Final Rule Technical Support Document*.

ENERGY STAR. 2009. *ENERGY STAR Qualified Water Heaters: Partner Resource Guide*. U.S. Department of Energy.



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Table 5.9: Electric Water Heater Product Types

PRODUCT TYPE	DESCRIPTION	EFFICIENCY	ENERGY STAR STANDARD?
BASELINE PRODUCT TYPE			
Electric resistance storage	Insulated tank, upper and lower resistance heating system, surface mounted temperature controls.	EF > .90	No
EFFICIENT PRODUCT TYPES			
Point-of-use (POU) tankless	Uses traditional resistance technology but generates hot water as needed at the point of use, avoiding distribution and standby losses.	"Efficiency" (generalized EF) .95	2012, likely
Heat pump	Uses refrigeration circuits to extract ambient heat to warm stored water. Best suited to cooling climates. Also available as a retrofit.	EF 2.0-2.2	Yes
Integrated HVAC and water heating	Allows for the recovery of waste heat from a ground source heat pump, increasing the efficiency of heat pump water heaters.	EF 2.5	No
Solar with electric backup	Uses solar energy for at least half of the heating load, with a backup electric unit.	Solar Fraction (SF) > .5	Yes

Sources: ACEEE. 2011. *Emerging Hot Water Technologies and Practices for Energy Efficiency as of 2011*.

DOE. 2010. *Residential Heating Products Final Rule Technical Support Document*.

ENERGY STAR. 2009. *ENERGY STAR Qualified Water Heaters: Partner Resource Guide*. U.S. Department of Energy.

Key Trends

Product Types

- ➔ **In the retail sector, water heaters are generally tiered into good-better-best categories, which are primarily correlated with warranty length.** Although there are many water heater models (one manufacturer referred to the model-level product differentiation in terms of SKUs), products tend to be tiered into good-better-best categories. Good or commodity products are the lowest priced, have the fewest features, and the shortest warranties. Better and best models include longer-lasting parts (including a self-cleaning feature, a larger anode, an interior tank coating, and/or higher quality valves and heating elements) and correspondingly longer warranties. This classification applies primarily to the retail sector rather than wholesale sector.
- ➔ **At least one new class of products, condensing gas water heaters, is poised to enter the residential market before 2015, according to manufacturers and industry experts.**



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- ➔ **High efficiency water heaters have very low market penetration, according to manufacturers and industry experts.** More than 80% of storage water heaters sold are minimum efficiency storage models, described by manufacturers as basic and commodity products.
- ➔ **About 10% of water heater sales are tankless units.** This percentage is expected to increase over the next few years, but not dramatically, and generally not until housing starts resume, as most tankless water heaters are best suited to new construction or remodels.⁶⁴

Codes and Standards

- ➔ **A new federal water heater standard, requiring significant increases in efficiency for large-capacity units, will go into effect in 2015.** The previous (2004) standard of .575 EF for gas and .9 EF for electric represented a 10% increase in efficiency over the original 1990 standard. The new 2015 standard, while requiring a 5% increase in efficiency for units below 55 gallons, will require a 30% increase in efficiency for larger gas units and a 120% increase in efficiency for larger electric units.⁶⁵
- ➔ **New federal test procedures under development will also likely be in place by 2015, potentially allowing additional water heater technologies to qualify as efficient products.**⁶⁶
 - Currently, there are no established criteria to rate the efficiency of electric point of use (POU) water heaters or hybrid water heaters. The current DOE test procedures overstate the efficiency of gas tankless water heaters, and understate the efficiency of heat pump water heaters. New test procedures may fix these issues.
 - The new test procedures will likely *not* change the efficiency metric used to rate water heaters. The current efficiency metric for residential class units is the

⁶⁴ Charles Adams. 2011. "A.O. Smith Corporation comments on ENERGY STAR® Version 2.0; Draft 1, for water heaters." Milwaukee, Wisc.: AO Smith Corporation.

⁶⁵ D&R International. 2010. *Energy Star Water Heater Market Profile: Efficiency Sells*. Washington, D.C.: U.S. Department of Energy.

⁶⁶ Charles Adams. 2010. "Water Heater Rating Improvement Act of 2009: Senate Bill S. 2908." A.O. Smith. Presented at ACEEE Water Heater Forum 2010.

Department of Energy (DOE). 2011. *Energy Efficiency Program: Test Procedures for Residential Water Heaters, Direct Heating Equipment, and Pool Heaters*. Request for information. Federal Register 76(197).



energy factor (EF). The EF metric effectively excludes electric POU units, and other technologies that increase efficiency by eliminating distribution losses. Furthermore, products classified as commercial products because of their thermal input, such as most condensing water heaters, use Thermal Efficiency (TE) as their efficiency metric, which is not directly comparable and which ENERGY STAR does not recognize.

- ➔ **ENERGY STAR introduced voluntary standards for water heaters in 2009.** Product types covered under the current standard include gas storage, gas condensing, whole home gas tankless, heat pump, and solar water heaters. Products not included in this standard are electric storage, electric tankless, and add-on heat pump units.⁶⁷
- ➔ **ENERGY STAR version 2.0 will go into effect in November 2012 and may expand the product types covered.** The final specification is still in development, but will likely not increase the efficiency level for gas storage water heaters, due to the low 11% penetration rate of qualified products. It may expand the product types covered to include POU electric and add-on heat pump units in addition to gas condensing, storage and tankless, classic heat pump, and solar. While the specification will continue to include gas condensing water heaters, the specification will likely still not include any of the currently available gas condensing water heaters, which are designated as “commercial” products.⁶⁸

Efficiency

- ➔ **Market penetration of ENERGY STAR qualified units was 10-13% in 2009, a penetration rate significantly lower than most appliances.** (D&R 2010). About two-thirds of these efficient units were high efficiency gas storage models. This level was expected to decrease in 2010 due to an increase in ENERGY STAR efficiency specifications for gas storage models.
- ➔ **The bundling of efficiency with warranty and other product features has decreased since the introduction of ENERGY STAR criteria, according to manufacturers.**
- ➔ **The majority of high efficiency water heaters are sold in areas with rebates, according to manufacturers.** High efficiency products also tend to sell slightly better in

⁶⁷ ENERGY STAR. 2009. *ENERGY STAR Program Requirements for Residential Water Heaters*. U.S. Department of Energy.

⁶⁸ ENERGY STAR. 2011. *ENERGY STAR Program Requirements Product Specification for Residential Water Heaters: Eligibility Criteria*. Version 2.0, Draft 2. Adams 2010. Adams 2011.



the retail distribution chain, where the customer purchases them directly, than in the wholesale distribution chain, where plumbers purchase them.

- ➔ **Smart grid-compatible water heaters will be on the market in 2015.** Current availability of smart models is limited but the technology exists. Manufacturers say introduction will depend on demand. Smart water heaters require electronic controls systems, which are not currently standard on most models (Interviews).
- ➔ **Absent intervention, manufacturers do not predict substantial increases in the market share of the most efficient products in the next few years.** Because of the large incremental cost of efficient water heaters, low levels of planned replacement, and additional installation requirements of gas condensing water heaters and heat pump water heaters, the market share of these products is not likely to expand significantly in the near future without intervention.

Sales

- ➔ **End-users rarely switch fuels.**⁶⁹
- ➔ **Fuel type and tank size are the top two factors driving consumer purchase decisions.**⁷⁰
- ➔ **End-users do not have a great deal of brand loyalty.** In a 2006 survey, only 13% of consumers recalled that their new water heater was the same brand as the old one.⁷¹
- ➔ **More than two-thirds of water heater replacements are end-of-life replacements due to unit failure.** Because of the recession, this proportion has increased over the past several years.⁷²
- ➔ **Plumbers install about 60% of all water heaters and it is not a focus of their business.** For most plumbers, water heater installations make up only 5-20% of their business.⁷³

⁶⁹ D&R International. 2009. *Water Heater Market Profile 2009*. US Department of Energy.

⁷⁰ D&R International 2009.

⁷¹ KEMA. 2006. *Assessment of the Residential Water Heater Market in the Northwest*. Prepared for NEEA.

⁷² D&R International 2009.

⁷³ D&R International 2010. KEMA 2006.



- **Big retailers receive most of their marketing collateral from manufacturers.**⁷⁴
- **Increasing use of online resources is leading to better-informed consumers, according to manufacturers.** In 2006, half of consumers considered only one water heater. In 2009, 52% of prospective water heater purchasers said they planned to use the Internet to help them choose a model.⁷⁵

Installed Base

- **In California, 80% of water heaters are gas-fueled, compared with about 55-60% of water heaters nationally.**⁷⁶
- **About 1% of the installed base of 100 million units meets ENERGY STAR qualification levels.**⁷⁷
- **About half of all water heaters in use today were manufactured between 1990 and 2003.** Water heaters have an average lifespan of 13 years.⁷⁸
- **As many as 30% of homes may not be suited to the new classes of water heater products.** Many homes are limited to classic gas or electric storage water heaters unless they undertake costly renovations due to increased space requirements, unit location, venting, drain, or power supply issues.⁷⁹
- **Water heating accounts for 14% of household energy use.**⁸⁰

⁷⁴ D&R International 2010.

⁷⁵ KEMA 2006. KEMA. 2009. *Process Evaluation of Southern California Edison's 2006-2008 Home Energy Efficiency Rebate (HEER) Program: Final Report*. Report ID: SCE0278.

⁷⁶ Martha Brook. 2008 "Why California Needs Efficient Water Heaters." California Energy Commission. Presented at ACEEE Water Heater Forum 2008. Louis-Benoit Desroches and Karina Garbesi. 2011. *Max Tech and Beyond: Maximizing Appliance and Equipment Efficiency by Design*. Lawrence Berkeley National Laboratory (LBNL). D&R International 2010.

⁷⁷ D&R International 2010.

⁷⁸ D&R International 2010.

⁷⁹ Adams 2010.

⁸⁰ ENERGY STAR 2009.



Supply Chain

Manufacturers

Market Share

Storage

Three major players - who together hold over 95% of the market - control the U.S. storage water heater market: AO Smith, Rheem-Rudd, and Bradford White (Table 5.10). The three have dominated the water heater market since at least 2001, although AO Smith recently acquired American to take over the top spot from Rheem-Rudd. The top two manufacturers produce products sold under several brand names. At least two-dozen smaller manufacturers produce the other 4% of products.⁸¹

Table 5.10: U.S. Gas and Electric Storage Water Heater Manufacturer Market Share

MANUFACTURER	2001	2005**	2008*	BRANDS (2010/2011)
AO Smith	31%	25%	46%	American, Whirlpool, State Water Heater, Kenmore, Reliance, US Craftmaster, Lochinvar, Tagaki
Rheem-Ruud	41%	40%	37%	Rheem, Ruud, GE (except Geospring HPWH), Richmond, Menard's,
Bradford White	14%	17%	13%	None
American	14%	17%	—	
Others (12+ companies)	<1%	1%	4%	
Total	100%	100%	100%	

* Appliance Magazine; cited in DOE 2010 and ENERGY STAR 2010. One manufacturer confirmed these market share figures are still accurate for 2011.

** KEMA 2006.

Tankless

Manufacturers and industry experts state that most tankless units come from Japanese manufacturers. Rinnai, Noritz, Rheem/Paloma, Tagaki (a joint venture with AO Smith), and Bosch account for over 80% of the tankless gas water heater market.

⁸¹ Department of Energy 2010.



Heat Pump

Smaller companies manufacture many of the heat pump water heaters and add-on heat pump models.⁸² Among market leaders, AO Smith and Rheem-Ruud both manufacture heat pump water heaters, as does G.E.

Decision-Making

In interviews, manufacturers indicated that meeting DOE specifications is the most important driver of water heater design, “The majority of our design resources are taken up in trying to meet energy efficiency requirements.” Other important drivers include making products suitable for emergency replacement (making equivalently sized units with connections in the same locations), or meeting a specific need in the marketplace.

For commodity gas and electric storage products, which make up as much as 85-90% of sales, qualifying for ENERGY STAR “does not matter in the least.” Manufacturers note that a large subset of their customers don’t care about efficiency, and that they [manufacturers] don’t even think about meeting ENERGY STAR criteria for their opening price point products: they do not think it is possible to do so and have a price-competitive product.

The introduction of the 2009 ENERGY STAR specification had a significant influence on water heater design. Before the specification, manufacturers indicated they tended to bundle efficiency with a longer warranty and other features and, as a result, availability of the most efficient units was typically limited to the “best” category. Since 2009, availability of efficient models in the “good” and “better” categories has increased. Nevertheless, our retail website research indicates that efficient models in the “good” and “better” categories are more costly than their less-efficient counterparts.

Product Design

Water heater manufacturers generally design and manufacture products in-house, without the use of OEMs. The two top manufacturers both make brands for individual retail chains (AO Smith manufactures the Whirlpool brand, which is sold exclusively at Lowe’s, for example).

Water heaters have longer product lifecycles than appliances. A product family may have a new generation only every three to five years. A typical water heater model may be on the market for four to six years before getting a major design overhaul. Many of these redesigns are driven by increases in DOE minimum efficiency requirements.

⁸² Department of Energy 2010.



In interviews, manufacturers stressed that the design of the “good” or “commodity” water heater – the basic gas or electric storage models that make up the vast majority of sales, is essentially the same across manufacturers and has included the same technology for several decades.

Component Manufacturers

The component manufacturing industry is concentrated among a few key suppliers. For gas storage water heaters, the control valve is the key energy-using component purchased from outside suppliers. Blowers and dampers are also key components that affect product efficiency. For electric storage units, the thermostat and heating elements (the key energy-using component) are both purchased from suppliers. AO Smith supplies other manufacturers with these parts, as well as manufacturing its own water heaters. Table 5.11 lists storage water heater component manufacturers.

Table 5.11: Storage Water Heater Component Manufacturers

FUEL	KEY COMPONENT	MANUFACTURERS
Gas	Control Valves, Blowers, Dampers	White Rodgers (Emerson) Robertshaw Honeywell Fasco AO Smith Field Controls
Electric	Thermostats, heating elements	Therm-o-disc (Emerson) AO Smith Offshore (unknown)
Both	Insulation	Dow Chemical BASF Bayer

Pricing

Although manufacturers are reluctant to talk about their markup and production costs, roughly 6% of manufacturer revenue is profit.⁸³

⁸³ Department of Energy 2010.

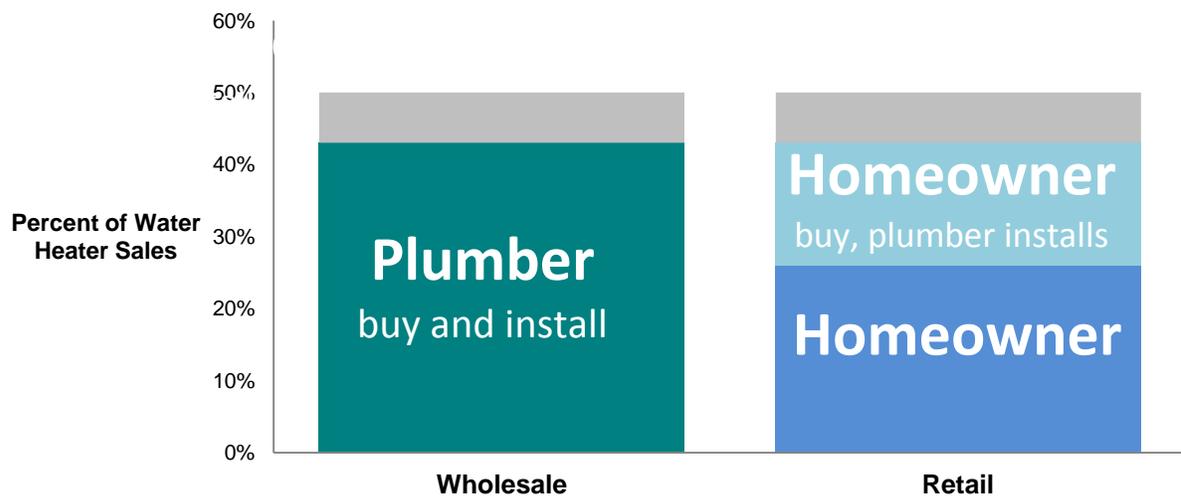


Distribution

Water heaters reach consumers through two channels: retailers and wholesalers/distributors, with roughly 50% of water heaters going through each channel. This ratio has been gradually shifting towards the retail channel, especially now that new construction rates have decreased.⁸⁴ Most water heater manufacturers distribute products through both retail and wholesale channels, although the brands offered often differ (Bradford White is the notable exception, only distributing through wholesale channels.)

Within each channel, there is one dominant population of purchasers: plumbers are the majority of purchasers in the wholesaler/distributor channel and homeowners are the majority of purchasers in the retailer channel (Figure 5.2). While plumbers generally purchase water heaters in response to a customer order, they may also stock a limited number of the most popular models to facilitate emergency replacements.

Figure 5.2: Water Heater Purchasers and Installers, by Distribution Channel



Source: D&R International 2009.

⁸⁴ KEMA 2006.



In general, the types of products offered are similar in both channels with one exception: most tankless water heaters are sold through the wholesale channel.⁸⁵ Sales of efficient products may differ somewhat across distribution channels. For example, one manufacturer noted that, although efficient product penetration is low overall, high efficiency storage products may sell *slightly* better in the retail channel than in the wholesale channel, because consumers can better compare products at retailers (or, alternatively, because higher profit margins may encourage salesmanship).

Wholesalers/Distributors

The wholesale channel is relatively unconsolidated. The three largest players make up about 30% of the national market: Ferguson, Johnstone, and Winnelson. Other wholesalers include Hajoca and regional chains.

Retail

The U.S. retail channel is consolidating, with the same affect on water heater distribution as on appliances and electronics. The majority of sales take place at national chains, which are gaining market share at the expense of regional chains and hardware stores.

The same national chains that dominate appliance distribution also top the list of national water heater retailers: Sears, Home Depot, and Lowe's make up 43% of water heater retail sales.⁸⁶ Other players include hardware chains (Ace, True Value) and regional chains (such as Menard's).

Pricing

The average retailer markup to the consumer is 1.45. The average wholesaler/distributor markup is 1.28 for electric water heaters and 1.35 for gas. Contractor markup to the consumer averages 1.10.⁸⁷

⁸⁵ Department of Energy 2010.

⁸⁶ D&R International 2009.

⁸⁷ Department of Energy 2010.



Opportunities⁸⁸

There are five types of water heaters opportunities. The first two (efficient products and component substitution) are relevant to specific fuel types. The other three are applicable to all water heaters, regardless of fuel type.

- 1. Increase efficient product penetration.** Many advanced product types are available with savings up to 50% over standard storage units, but with low to no market penetration.
- 2. Increase use of efficient components.** The use of more efficient components has the potential to increase the efficiency of gas storage units by up to 10%.
- 3. Increase adoption of water heater controls.** Electronic controls allow the water heater to shift demand and/or enter standby mode, and can be retrofitted to existing gas or electric units. However, the savings potential is unknown.
- 4. Encourage behavior changes.** The way in which end-users interact with their water heater has the potential to reduce energy consumption by up to 10%.
- 5. Increase adoption of efficient hot water system design.** Design of the hot water delivery system in a new or remodeled building can reduce energy consumption up to 40%.

Efficient Products

The biggest opportunity for water heater energy savings comes from increasing the penetration of efficient product types that currently have low or no market penetration. This is due to the small savings potential from efficiency improvements to storage units, the unknown savings of behavior changes and controls, and the limited applicability of system design changes to the retrofit market. Manufacturers call particular attention to gas condensing water heaters and electric heat pump water heaters as product types that present an opportunity for savings. Since end-users rarely switch fuel types, product substitution opportunities should be considered within each fuel category.⁸⁹

⁸⁸ Unless otherwise noted, opportunities come from ACEEE 2011, DOE 2010, and Desroches 2011.

⁸⁹ Department of Energy 2009.



Component Substitution

Manufacturers note that both gas and electric storage water heaters are very close to their maximum achievable efficiency levels. For electric units, the only remaining opportunity is insulation improvements. For gas models the savings from these components, which are already included in many “better” and “best” models, is less than 10%. Manufacturers comment that they must include all of these components to meet current ENERGY STAR specifications for non-condensing gas storage water heaters.

In fact, ENERGY STAR elected not to include a standard for the electric resistance storage water heater in its 2009 standards; because it determined that the maximum 4% achievable savings was not sufficient to warrant inclusion.⁹⁰

Controls

Hot water heater controls can make water heaters suitable for demand response programs and allow water heaters to use standby modes, depending on household usage patterns. These opportunities could be implemented as retrofits for electric units, but are less suitable for gas retrofits because of the pilot light in gas water heating systems.

Behavior Changes

There are several opportunities for behavior change to reduce water heater energy use. In addition to reducing overall hot water demand, changing temperature settings and minimizing the use of the hot water tap for short draws can save significant amounts of energy. Distribution efficiency is particularly low (15-40%) at sinks, where hot water use tends to be very brief. Hot water use for clothes washers can account for up to 12% of water heater energy use.⁹¹

System Design Changes

The design of the hot water distribution system significantly impacts water heater energy use, but particularly for POU and tankless units. Table 5.12, Table 5.13, and Table 5.14 list opportunities for gas and electric water heaters, their current availability/penetration, savings potential and incremental installed cost.

⁹⁰ ENERGY STAR 2009.

⁹¹ Mark Hoeschele. 2008. “The Real World: Detailed Usage Patterns from One House & How do Load Patterns Affect Gas Tankless Performance?” Davis Energy Group, Inc. Presented at ACEEE Water Heater Forum 2008.



Table 5.12: Gas Water Heater Opportunities

OPPORTUNITY	DESCRIPTION	AVAILABILITY/ PENETRATION	SAVINGS POTENTIAL ¹	INCREMENTAL INSTALLED COST
EFFICIENT PRODUCT TYPES				
Condensing	Increases the efficiency of heat extraction from the flue gasses by condensing them	Not commercially available in residential class storage unit; small commercial models available	35-40% over storage 12-15% over tankless ²	\$1,150
Tankless	Generates hot water on demand, eliminating standby losses.	Widely available/ <10% of sales	<30%	\$750
Tankless condensing	Generates hot water on demand using condensing technology to increase efficiency of flue gas heat extraction	Commercially available	37%	\$1,990
Hybrid storage and tankless	Combines the benefits of storage and tankless units, lowering standby losses while potentially decreasing load on the burner.	Limited availability (4 models)	<20% (Dependent on use patterns)	\$1,130
Absorption heat pump³	A gas-fired heat pump water heater.	Not commercially available	40-50%	N/A
ENERGY STAR gas storage	A gas-fired, high-efficiency storage water heater. A variety of technologies and components may be combined, including those included below, power venting (regulated, forced airflow) and others.	Widely available/ <10% of sales	7%-12%	\$300
COMPONENT SUBSTITUTIONS				
Insulation improvements	Reduces standby loss.	Available		
Blowers	Maximizes combustion efficiency by regulating airflow	Available		
Dampers	Reduces standby loss by covering the flue (through which exhaust escapes) when combustion is not occurring.	Available		
Heat exchanger improvements	There are several methods to improve heat transfer from the hot air resulting from combustion to the water, including increasing the surface area between the air and water and slowing down the air as it travels through the system.	Available	10% (maximum) over baseline storage	N/A



OPPORTUNITY	DESCRIPTION	AVAILABILITY/ PENETRATION	SAVINGS POTENTIAL ¹	INCREMENTAL INSTALLED COST
Electronic ignition	Reduces energy lost through the pilot light.	Available		

1 Versus current federal minimum efficiency storage units, EF .575, unless otherwise noted

2 Versus non-condensing tankless. ACEEE 2011; Interviews

3 Garrabrant

Table 5.13: Electric Water Heater Opportunities

OPPORTUNITY	DESCRIPTION	AVAILABILITY	SAVINGS POTENTIAL	INCREMENTAL INSTALLED COST
EFFICIENT PRODUCT TYPES				
Heat pump (add-on or integrated)	Uses refrigeration circuits to extract ambient heat to warm stored water. Best suited to cooling climates. Available as a retrofit or as an integrated unit.	Available	> 50%	\$825
Point-of-use (POU) tankless	Uses traditional resistance technology but avoids distribution and standby losses.	Available	Dependent on distribution system, use pattern, and replaced unit.	\$1,200, does not replace tank system.
Integrated HVAC and water heating	Allows for the recovery of waste heat from ground source heat pump (GSHP), increasing the efficiency of heat pump water heaters.	Low penetration/ <1% of installed base	45-67%	\$900 at time of GSHP purchase
COMPONENT SUBSTITUTIONS				
Insulation improvements	Reduces standby loss	Available	<5%	N/A
CONTROLS				
Demand response controls	Can allow utility control of water heater units. Requires electronic controls, which are not standard most models today.	Available/ Very low penetration	N/A (Unknown demand reduction)	N/A



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Table 5.14: Gas and Electric Water Heater Opportunities

OPPORTUNITY	DESCRIPTION	AVAILABILITY	SAVINGS POTENTIAL	INCREMENTAL INSTALLED COST
EFFICIENT PRODUCT TYPES				
Solar with electric or gas back-up	Uses solar energy for at least half of the heating load, with a backup electric or gas unit.	Available	>50%	\$3,400-\$3,500
CONTROLS				
Intelligent controls	Tracks household usage patterns to set standby settings, minimizing operating cost and energy use while meeting household demand.	Available/ Very low penetration	<30% reduction in standby losses ¹	N/A
BEHAVIOR CHANGES				
Lower heat settings	Factory standard settings are often 140°F, but 120°F is often sufficient.	—	6-10% ²	
Avoid short draws	In half of hot water draws (when the “hot” faucet is on), hot water never actually reaches the end-user (Interviews; Hoeschele).	—	<7% ³	No Cost
Conserve hot water	Shorter showers, minimizing hot water waste during heat up, wash clothes in cold water.	—	varies	
SYSTEM DESIGN CHANGES				
Drain water heat recovery systems	Recovers waste heat from hot water in drainpipes by wrapping the drainpipes around the incoming hot water pipe. Feasible for 50% of new construction and 10% of retrofits.	Available/ <1% of installed base	9% to 30%	\$1,000
Demand-activated recirculation pumps	Reduces waste from heated water in pipes after faucet is turned off. Pumps hot water to fixture, recirculating standing warm pipe water directly back to water heater.	Available/ <1% of installed base	<25%	\$1,000
Distribution system design	Minimizes pipe volume between water heater and end use, insulate piping.	Available	<41% ³	Varies

¹ Mike Parker. 2009. “Water Heater Electronics.” A. O. Smith. Presented at ACEEE Water Heater Forum 2009..

² Department of Energy. 2011. *Energy-Efficient Water Heating*. EERE Energy Savers.

³ Maximum potential savings, based on measurements of 59% distribution efficiency overall in a typical household with a gas storage water heater, and 7% of hot water energy use coming from draws where no hot water reached the end-user (Hoeschele).



Barriers

There are several key barriers to increasing the market penetration of efficient water heaters.

- ➔ **Unfamiliar technology.** Both end-users and plumbers are thought to be wary of unfamiliar technologies. Choosing a highly efficient water heater requires the homeowner or plumber to identify the technology best suited to the home, which likely requires research and a high level of awareness of innovative products and technologies. A lack of familiarity can foster suspicions of reliability and maintenance requirements. Plumbers are reluctant to install untested technology, for fear of customer dissatisfaction.⁹²
- ➔ **Low importance of energy efficiency in consumer decision-making.** Efficiency does not play an important role in water heater purchase decisions. In one survey, only one-fourth of consumers were interested in paying more for an ENERGY STAR water heater.⁹³ Fuel type, tank size, warranty, price, speed of procurement and installation, and recommendations from plumbers are the key factors affecting customer water heater purchase decisions.⁹⁴
- ➔ **Retailers, wholesalers, and plumbers do not stock efficient products.** Home improvement stores rarely stock efficient models, but instead make them available for special order (interviews). A basic search of the websites of three major retailers, Home Depot, Lowe's, and Sears, showed the availability of efficient models to be limited in stores; many models were available online or by special order only. Similarly, plumbers stock units for which there is a demand and which they know how to install. Wholesalers stock units for which there is a demand among plumbers. Manufacturers familiar with the wholesale sector commented that even when end-user incentives were available, reducing the first cost to the end-user, without incentives for the contractor or wholesaler, getting wholesalers and plumbers to stock and promote efficient products was "a big hurdle."
- ➔ **First cost.** Because of low consumer value of water heater features and frequent emergency replacement, first cost (including installation costs) and payback period is a primary consideration for purchasers. The incremental cost of efficient units is high, and payback period for gas units may exceed the expected product lifespan.⁹⁵ Electric unit

⁹² KEMA 2006.

⁹³ KEMA 2006.

⁹⁴ D&R International 2009.

⁹⁵ ENERGY STAR.2012. "Save Money and More with Energy STAR Qualified High-Efficiency Gas Storage Water Heaters" http://www.energystar.gov/index.cfm?c=gas_storage.pr_savings_benefits.



payback periods can be lower, but with potentially even higher first costs. As evidence of this, manufacturers noted sales of efficient water heaters dropped noticeably after the end of the ARRA-financed rebates and tax credits, which significantly lowered first cost.

- **Early replacement aversion.** Emergency replacement constrains the buyer's ability to compare product features and willingness to adopt innovative or unfamiliar technologies.⁹⁶

POOL PUMPS

The central function of a pool pump is to circulate water through the pool's filter. However, pool pumps can play a variety of additional roles in the pool system, including generating suction to operate pool cleaners, providing water to fountains and other water features, and powering spa jets. In many cases, the filtration pump provides power for these secondary functions, although some pools may have dedicated pumps for some non-filtration functions. This section focuses only on filtration pumps because they are common to all pools, and because filtration typically requires the largest amount of pump run-time and, as a result, uses the greatest amount of electricity.

Pool pumps fall into three broad technology types:

- **Single speed** pumps use a one-speed motor, which must be powerful enough to perform the most demanding task required of it, typically vacuuming the pool or backwashing a filter. Single speed pool pumps have been on the market the longest, are the most common in the installed base, and are the least expensive option. Title 20 prohibits the use of single-speed pumps one horsepower or larger to filter pool water.
- **Two-speed** pumps use a motor capable of running at two defined speeds: a high speed for tasks requiring greater flow, and a low speed for filtration. Two-speed pumps have been available for more than 10 years, but have gained relatively little market acceptance. Two-speed pumps are typically more expensive than single-speed pumps and require a timer capable of controlling both speeds, which further increases the cost over single-speed alternatives.
- **Variable speed** pumps use a variable-speed drive to control the frequency of the electricity reaching the motor, and as a result, the speed at which the motor runs. Variable speed pumps have been available for approximately five years, and are gaining in market

⁹⁶ KEMA 2006.



acceptance. Unlike two-speed pumps, the necessary controls are typically integrated into a variable-speed pump. Nonetheless, variable-speed pumps are the most expensive option, in some cases costing as much as three times as much as single-speed pumps.

Key Trends

Products

- ➔ **Variable speed technology represents a major change for the pool pump industry.** One pool pump manufacturer described variable-speed technology as “the biggest innovative product to the pool industry in probably 50 years.”
- ➔ **Manufacturers anticipate that innovation in the pool pump industry will lead to variable-speed pumps for a wider range of applications.** Major manufacturers cited plans to design variable-speed pumps for larger residential and small commercial applications and to adapt variable-speed pumps to meet safety requirements that apply to commercial pools in some jurisdictions.
- ➔ **Two speed pumps and replacement motors with integrated controls and more efficient motor designs are entering the market.** One major motor manufacturer and two smaller pump manufacturers currently offer lines of two-speed pumps and motors that seek to overcome factors that have made two-speed pumps less attractive relative to variable-speed pumps as pool owners seek to comply with Title 20 and other regulations. These new two-speed pumps include built-in controls, which eliminate the need for an external controller typically required of a two-speed pump. They also use more efficient motor designs, which allow them to avoid the loss of motor efficiency at low speeds common with traditional two-speed pumps.
- ➔ **Manufacturers expect to see continued advances in pool controls over the next few years.** Interview contacts anticipate that pool controls will integrate multiple elements of the pool system, including the pump, lighting, heating, and chemical systems, and will allow for remote monitoring and control, for example through apps on smart phones and tablet computers.
- ➔ **A shortage of rare earth magnets has increased the prices pool pump manufacturers must pay for the efficient motors they use in high-end pumps.** One manufacturer reported the price of the rare earth magnets used in motors had increased by 4000% over the past year, but noted that his company had not passed this increased cost on to consumers. Recently, rare earth magnet prices have fallen since their peak in July and August, 2010 (Bradsher, 2011).

Efficiency

- ➔ **Pool pump efficiency standards similar to California’s Title 20 are becoming more common.** The Association of Pool and Spa Professionals published a standard similar to



Title 20 (ANSI/APSP-15) for states and other jurisdictions to use as a basis for their own regulations. Connecticut, Washington State, Florida, and New York have adopted efficiency standards paralleling Title 20 requirements. Connecticut and Washington State's requirements took effect in 2010, and Florida's requirements became effective in 2011 (ASAP).

- ➔ **ENERGY STAR plans to release a specification for residential pool pumps in August, 2012.** In the early phases of the specification development process, the EPA has proposed including single-speed, multi-speed and variable-speed pumps for residential in-ground swimming pools in the specification. The EPA does not anticipate including replacement motors in the specification. The EPA will strive to make the specification consistent with Title 20, ANSI/APSP-15, and the Consortium for Energy Efficiency's Residential Swimming Pool Initiative (Kent, 2011).
- ➔ **Title 20 lacks an effective enforcement mechanism.** While building inspections provide an enforcement mechanism for efficiency standards in new pool construction, no similar mechanism exists for pool pump retrofits. In addition, since Title 20 applies only to filtration pumps, California retailers may sell single-speed pumps larger than one horsepower for other uses, for example to feed water features. Interviews with pool pump manufacturers, motor manufacturers, and contractor survey findings suggest that some contractors seek to undercut their competition by installing non-compliant filtration pumps. Additional research would be required to validate and quantify non-compliance.
- ➔ **A significant portion of California pools have filtration pumps not regulated by Title 20.** Past evaluation efforts of SCE and PG&E's pool pump efficiency programs estimated that one-fourth of the pools in PG&E territory and one-third the pools in SCE territory used filtration pumps smaller than one horsepower (KEMA 2009a). These pumps are not covered under Title 20 requirements, which specify that replacement pumps must be multi-speed. A utility program that encourages the replacement of pumps under one horsepower with multi-speed pumps may represent an energy savings opportunity.

Sales

- ➔ **While variable-speed pumps make up only a small portion of the installed base, they constitute a growing share of the replacement market.** Sales estimates by one manufacturer suggest that approximately 3% of U.S. in-ground pools use variable-speed pumps. However, the same manufacturer estimated that approximately one-third of the residential in-ground pumps his company sells in the U.S. are variable speed. Another major manufacturer confirmed the growing market share of variable-speed pumps. More precise market share and installed base data are available for purchase from PK Data. Appendix B lists relevant reports.
- ➔ **The market share of variable-speed pumps in California is higher than in other parts of the country.** Manufacturers credit Title 20 requirements, which require that pool



pumps greater than 1 total horsepower be able to run at two or more speeds, utility rebate programs, and the prevalence of pools with more complex water features, which can particularly benefit from variable-speed pumps, for increasing the prevalence of variable-speed pumps in California.

- ➔ **The U.S. market share of variable-speed pumps has surpassed that of two-speed pumps.** Although two-speed pumps have been available longer than variable speed pumps, two major manufacturers reported selling more variable-speed pumps than two-speed pumps in the U.S. One manufacturer suggested that unreliability of two-speed pumps may be one cause of their relatively low uptake.
- ➔ **The role of the Internet in pool product purchase and distribution is growing.** The majority of U.S. pool and spa owners (69%) currently cite the Internet as their first choice as a source of information about operating their pool or spa. Although the proportion of U.S. pool and spa owners who purchased products online is much lower (8.5%), it nonetheless represents an increase of 17 times the proportion that purchased online in 2004. Pool retailers are also increasingly purchasing their merchandise online; in 2011, online sales made up 9% of distribution dollar volume in the U.S., a three-fold increase from 2005 (P.K. Data, 2011).
- ➔ **Replacement motor sales suggest that pool owners replace the motor, rather than the whole pump, in a significant proportion of cases.** A major motor manufacturer estimates that consumers purchase approximately 500,000 replacement pool pump motors each year in North America. Based on estimates of pool pump measure life and the installed base of swimming pools in the U.S., those replacement motor sales could represent close to half of all the pool pumps that fail in a given year.⁹⁷ Consistent with this assessment, one major pool pump manufacturer noted that, when pumps fail, the motor is typically at fault.

Swimming Pool Industry

- ➔ **The swimming pool industry contracted as a result of the economic downturn.** Industry analysts estimate that 18-20% of the pool builders, equipment retailers, and service contractors doing business in 2005 are no longer in the swimming pool market (P.K. Data, 2011). The decline in pool construction has been particularly steep; one major distributor notes that, while it expects construction of new pools to increase by 5% in

⁹⁷ The U.S. installed base of above-ground, in-ground, and commercial pools is 10,673,000 (P.K. Data, 2011). Estimated pool pump measure life is 10 years (Davis Energy Group, 2004). Given these estimates, approximately one million pool pumps likely fail in a given year in the U.S.



2011, pool construction will remain 80% below its 2005 peak (Making a Splash in the Pool Industry, 2011).

- ➔ **As pool construction has declined, pool service and maintenance have come to represent a larger portion of the swimming pool industry.** A leading distributor estimates that nearly 90% of the pool industry's revenues come from maintenance, repair, and replacement (Making a Splash in the Pool Industry, 2011). In addition, in an industry survey, more pool service contractors reported an increase in profits in 2011 than reported a decline (Webb, 2011).
- ➔ **In response to online competition, small pool service companies can emphasize personalized service, expertise, and convenience.** It is unlikely that small pool service companies will be able to compete with online retail based on price. While service contractors may take a markup as high as 100% on pool equipment, online retailers typically take no more than 20%. Nonetheless, small contractors can continue to provide value to homeowners by identifying and correctly diagnosing problems and providing the appropriate solutions (Abbott, 2011).

Supply Chain

Pump Manufacturers

Pool pump manufacturers design, manufacture, and sell pool pumps. As a result of consolidation in the pool pump industry, individual manufacturers may sell pumps under multiple brand names. For example, after acquiring Sta-Rite, Pentair has continued to produce pumps under the Sta-Rite brand.

Market Share

The California Energy Commission's Appliance Database lists five manufacturers that produce pool pumps compliant with Title 20 (Table 5.15). Market share data is available for purchase from a third-party source but was not obtained for this memo. However, one manufacturer estimated that Pentair has the largest market share, followed by Hayward, with Jandy/Zodiac ranking third. The manufacturer estimated these three companies represent at least 90% of the pool pump market.



Table 5.15: Top Pool Pump Manufacturers

COMPANY	ESTIMATED MARKET SHARE	NUMBER OF TITLE 20 COMPLIANT MODELS
Pentair	50%	114
Hayward	30%	69
Jandy/Zodiac¹	10-12%	79
Speck Pumps	N/A	33
Waterway	N/A	2
Total		297

¹ The CEC Appliance Database lists Zodiac Pool Systems, Inc. and Jandy Pool Products, Inc. as separate manufacturers. The companies are listed together here because Zodiac's parent company acquired Jandy in 2006, and the two companies merged in 2007.

Product Design

Swimming pool pumps have relatively long product lifecycles, especially when compared with appliances and consumer electronics. One manufacturer reported that, while his company regularly introduces new pump models and discontinues others, some pump models had remained relatively unchanged for 20 years, "Because they just keep doing what they need to do." Manufacturers noted that the product development process has accelerated somewhat in the past five years as variable-speed technology has become more prevalent.

The process of developing a new pool pump involves individuals throughout the pump manufacturer's organization and, in cases in which the new product uses technology that is new to the industry, can take more than two years. A pump manufacturer's product manager leads the product design process, which typically follows several steps:

- ➔ The product manager identifies unmet needs within the industry and opportunities for product improvement.
- ➔ Upper management approves the product manager's business case for a new product addressing the identified needs.
- ➔ The manufacturer's engineering group develops the new product based on requirements provided by the product manager.
- ➔ The new product undergoes testing and refinement and ultimately must meet the certification and testing requirements of agencies like UL and NSF.

Manufacturing

In contrast to the way some appliances and most consumer electronics are manufactured, pool pumps are made in the U.S. in factories owned by the manufacturer (not by OEMs). Most pump manufacturers have expertise in injection molding and fabricate the plastic components of the



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pump, which they then assemble with a motor purchased from an external supplier. Manufacturers may fabricate the drives that control variable-speed pumps themselves or purchase them from suppliers.

Distribution

Pool pump manufacturers sell the majority of their pumps to wholesale distributors, who in turn sell to small retailers and contractors, although some large national retailers purchase pool pumps directly from manufacturers. This is consistent with product distribution across the industry as a whole. In 2008, approximately two-thirds of the revenue the U.S. pool sector generated went through distributors (Robledo, 2008).

Pool owners obtain a pool pump in one of two ways: they purchase it at a brick-and-mortar or online retailer, or they purchase it from a pool service contractor. Pool owners who purchase pumps from a retailer may install the pumps themselves or use the retailer's installation service; contractors typically install the pumps they sell. Market research data available for purchase may include a detailed break-down of the proportion of pool pumps purchased through each distribution channel (see Appendix B for a listing of relevant reports). Publicly available information and interview data provides more general, qualitative, information about pool pump distribution.

Most pool owners do not use contractors for regular pool maintenance, but those that do typically turn to their pool maintenance contractor to replace equipment like the pump. One manufacturer cited market research estimating that pool service contractors regularly service 25% of residential pools, but suggested that this proportion may be higher in California. This is consistent with data from past evaluations of PG&E's pool pump program, which found that contractors regularly service approximately one-third of the residential pools in PG&E territory (KEMA).

Manufacturer interviews suggest that homeowners who do not rely on contractors for regular pool maintenance may nonetheless turn to contractors to replace major equipment like the pool pump. One manufacturer estimated that the largest portion of his company's pumps go to pool service contractors, although there is overlap between contractors and retailers. Another manufacturer noted that pool retailers often offer installation services for the equipment that they sell.

Opportunities

Manufacturer interviews suggest that there are some component-level opportunities to increase the efficiency of pool pumps, primarily through increasing the efficiency of the motor and improving the hydraulic efficiency of the pump and the pool system. However, the largest energy savings come from replacing single or dual speed pumps with pumps that use a variable-speed drive to control the motor and, as a result, the flow rate. Interview findings suggest that pool pump manufacturers see the potential to gain a competitive advantage by offering energy



efficient, and particularly variable-speed, pumps. All of the major manufacturers offer variable-speed options, and the interviewed manufacturers expect variable-speed technology to become increasingly prevalent.

Manufacturers' marketing materials claim that variable-speed pumps can achieve energy savings as high as 90%, but these claims typically do not use a Title 20-compliant pump as a baseline. Nonetheless, manufacturers estimate that the ability to operate at slower speeds and achieve greater precision in speeds that variable-speed pumps allow can achieve savings of 50-75% over two-speed pumps. Savings calculators on major pump manufacturers' websites are consistent with these estimates. Table 5.16 provides savings estimates from one major manufacturer's savings calculator for the energy savings a variable-speed pump would achieve over a Title 20-compliant two-speed pump.

Table 5.16: Annual Percent Energy Savings of Variable Speed Pumps Over Title 20-Compliant Two-Speed Pumps

PUMP SIZE	ENERGY SAVINGS BY VOLUME OF WATER PUMPED PER DAY (GALLONS)					
	10,000		25,000		40,000	
	kWh	Percent	kWh	Percent	kWh	Percent
1 HP	677	74%	1,877	75%	2,607	71%
1.5 HP	677	74%	1,877	75%	2,607	71%
2 HP	821	77%	2,278	79%	3,181	75%
3 HP	881	79%	2,447	80%	3,421	76%

Source: Hayward Energy Solutions Energy Calculator,
<http://www.haywardnet.com/inground/products/energysolutions/calculator.cfm>

Manufacturers' savings calculators also suggest that replacing smaller, single-speed filtration pumps that are not covered by Title 20 with variable-speed pumps represent an opportunity for energy savings (Table 5.17).

Table 5.17: Annual Percent Energy Savings of Variable Speed Pumps over Single Speed Pumps Not Covered by Title 20

PUMP SIZE	ENERGY SAVINGS BY VOLUME OF WATER PUMPED PER DAY (GALLONS)					
	10,000		25,000		40,000	
	kWh	Percent	kWh	Percent	kWh	Percent
0.5 HP	892	79%	2,208	78%	3,464	76%
0.75 HP	1,011	81%	2,506	80%	3,941	79%

Source: Hayward Energy Solutions Energy Calculator,
<http://www.haywardnet.com/inground/products/energysolutions/calculator.cfm>

The amount of energy savings variable-speed pumps achieve in a particular application depends on the type of pump being replaced, the characteristics of the pool system, and the way the pool



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owner uses their existing pump. For example, variable-speed pumps may achieve smaller efficiency gains in older pools with smaller diameter, less hydraulically efficient plumbing.

Pool owners can achieve variable-speed functionality in their pool pumps in one of two ways:

- ➔ **Pump replacement:** Pool owners can replace their complete pump with a model that includes a variable-speed drive. Variable speed pumps entered the market approximately five years ago, and currently all the major pool pump manufacturers offer variable speed pumps. Variable speed pumps are widely available through pool equipment retailers, particularly in states like California where efficiency standards require pumps to be replaced with multi-speed models.
- ➔ **Motor replacement:** Interview findings suggest that the motor is most often the cause of pool pump failure and that a significant portion of pool owners choose to replace a failed motor rather than make the more costly upgrade required to replace the pump as a whole. Two major motor manufacturers offer replacement motors with integrated variable-speed drives and controls. However, these products have come to the market more recently and are less widely available than variable-speed pumps.

In addition to energy savings, variable-speed pumps provide a variety of non-energy benefits to pool owners, including quiet operation and reduced wear on pump components associated with running at a lower speed. Variable speed pumps can also contribute to improved water quality as lower flow allows for better filtration and running the pump longer reduces the amount of time the pool sits stagnant, which helps to ensure that pool chemicals remain evenly mixed.

Barriers

There are few technical barriers to replacing an existing single- or dual-speed pump with a variable-speed pool pump. Two leading manufacturers build variable-speed pumps in the same form factor and using the same plastic components used in common single and multi-speed pump models, which minimizes the incremental installation cost of replacing these pumps with variable-speed models. The variable-speed pump models currently available are also more likely to have built-in controls and are more compatible with a range of existing control systems than were earlier variable-speed pump models (Robledo, 2011).

The barriers to variable-speed pumps are more ambiguous than barriers to efficiency in the other products studied. For most of the following barriers there is some evidence of change already in the market:

- ➔ **First cost:** While first costs are a primary barrier to adoption of variable-speed pumps nationally, they may play a less significant role in California. One manufacturer noted that, particularly in a down economy, consumers may be reluctant to invest in a higher-priced alternative when they were largely satisfied with the performance of their existing pump prior to its failure. However, another manufacturer noted that, comparing the cost of a variable-speed pump with the relatively costly upgrades necessary even to meet the



minimum requirements of Title 20 results in a much lower marginal cost for the variable-speed pump.

- ➔ **Lack of contractor understanding of efficiency benefits:** The potential to achieve energy savings by running a variable-speed pump for a longer time but at a slower speed may be counter-intuitive to pool service contractors. In the past, contractors who sought to achieve energy savings as a customer service benefit for their clients, did so by minimizing the amount of time a single-speed pump would run. However, pool pump manufacturers have found it difficult to engage contractors in the training they offer. Many contractors are independent operators or work for very small companies, are focused on meeting day-to-day obligations, and are reluctant to attend trainings and adopt new technologies.
- ➔ **Lack of end-user understanding of efficiency benefits:** Pool pump manufacturers reported that the growth in sales of variable-speed pool pumps has largely resulted from promotion on the part of contractors, retailers and manufacturers rather than demand from consumers. Manufacturers suggested that consumer education, particularly materials focused on calculating energy savings and payback periods, could help overcome first cost barriers. These findings are consistent with an evaluation of the Long Island Power Authority’s pool pump rebate program, which found that end-users were interested in the benefits of variable-speed pool pumps but had largely been unaware that they were available (Opinion Dynamics Corporation, 2011).
- ➔ **Early replacement aversion: End-users typically replace pool pumps at failure.** When they fail, pool pumps must typically be replaced within a few days, “Because the [pool] is going to be turning green.” This type of emergency replacement constrains the buyer’s ability to compare product features and willingness to adopt innovative or unfamiliar technologies. Nonetheless, manufacturers note that, as variable-speed pumps have become more prevalent, early replacement has become more common. Contacts credit utility rebate programs and the ability of some contractors to effectively present the pump’s energy savings benefits for this increase in early replacement.

CLOTHES DRYERS

Clothes dryers are one element in a larger laundry end-use that also includes the clothes washer and water heater. Clothes dryer energy use depends not only on the efficiency of the dryer but also on the performance of the clothes washer – washers with faster spin cycles produce clothes with less moisture, requiring less energy to dry.

The clothes dryer supply chain is similar to that of other major home appliances, but the energy efficiency story is very different. Dryers are manufactured and distributed by the same key players in about the same proportions. But clothes washer and refrigerator efficiency has improved markedly over the last two decades; Dryer efficiency has not changed. Nor are there



efficiency labels for clothes dryers (for example, EnergyGuide or ENERGY STAR) as there are for all other major home appliances.

The lack of publicly available efficiency information for clothes dryers must not be understood to mean that dryers are insignificant energy consumers or that all dryers are equally efficiency. To the contrary, dryers account for a significant amount of household energy use. A typical electric dryer uses at least 800 kWh annually, or about 6% of a household's total electric consumption. The energy consumption of different clothes dryer models has also been shown to vary up to 22% (when doing the same amount of drying “work”) based on the performance of features like automatic cycle termination, which turns the machine off when clothes reach a specified moisture content (Bendt).

Key Trends

Efficiency

- ➔ **California residents know that some clothes dryers are more energy efficient than others, even though there is no publicly-available information about dryer efficiency.** In the GPS, 92% of all respondents thought the statement, “Some clothes dryers are more energy efficient than others,” was true (93% of SCE customers and 91% of PG&E customers). This is likely due to respondents' ability to generalize what they know about efficiency variation from other major home appliances to clothes dryers. It also provides utilities a key piece of information for marketing clothes dryer measures. Programs do not need to convince potential participants that clothes dryers vary in efficiency, they just need to provide information about that variance and the benefits of the efficient products, as they do for other appliances.
- ➔ **A revised Federal minimum standard for clothes dryers takes effect January 1, 2015 and will increase minimum efficiency requirements by up to 24%.** This is the first update to the Federal standards since 1994. In addition to the increase in efficiency levels, the new standard adds product classes. Table 5.18 shows the existing and revised standard levels. Clothes dryer efficiency is measured in pounds (of clothes) dried per kWh.



Table 5.18: Existing and Revised Federal Clothes Dryer Standards

PRODUCT CLASS	ENERGY FACTOR MINIMUMS (LBS/KWH)		EFFICIENCY INCREASE
	Current (Effective 1994)	New (Effective Jan 1, 2015)	
Electric vented standard	3.01	3.73	24%
Gas vented standard	2.67	3.3	24%
Electric vented compact			
120V	2.9	3.27	13%
240V	3.13	3.61	15%
Electric ventless compact	N/A	2.55	N/A
Electric combination washer-dryer	N/A	2.08	N/A

Source: ENERGY STAR 2011.

- ➔ **The new DOE test procedure does not measure the performance of a key feature that determines dryer efficiency: automatic cycle termination (ACT).** ACT prevents unnecessary energy use by allowing the dryer to turn off automatically when the temperature or moisture content of the clothes reaches a pre-defined point. In recognition of this gap, DOE reopened rulemaking and is seeking data and comments regarding test procedure methods for automatic cycle termination. Appliance manufacturers are working with DOE to make this additional change, and hope to incorporate it into the 2015 standard.
- ➔ **There are no energy labels for clothes dryers, and thus no way for consumers to quantify or compare clothes dryer efficiency.** The labels consumers use to compare other appliance and electronics products, like ENERGY STAR and Energy Guide, do not apply to clothes dryers. The absence of dryer efficiency labeling results from the historic inability of the DOE test procedure to accurately measure dryer performance, of which the failure to test the ACT feature is one aspect.
- ➔ **Among clothes dryers on the market today, some are more efficient than others, even though they are not labeled as such.** The total energy required to dry the same laundry load varies by 20% to 33% among currently available standard clothes dryers. More efficient dryers have the potential to save 1 to 1.5 kWh per load, about \$60 per year, or nearly \$1,000 over the lifetime of the dryer – roughly equivalent to the purchase price of the dryer (Bendt). Because dryers are not subject to efficiency labels and existing test procedures do not accurately measure differences in energy use, it is difficult to distinguish the most efficient dryers from less efficient models.
- ➔ **Manufacturers vary in the extent to which they promote energy efficient features of dryers.** Whirlpool, the leading dryer manufacturer, allows customers to select “High Efficiency Dryers” as a category distinct from “Traditional Dryers” on its website, while GE does not promote efficiency on pages listing multiple products but does mention



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efficient features on product detail pages. Electrolux does not appear to promote energy efficient features of its dryers.

- ➔ **In promoting energy efficient features, manufacturers primarily cite ACT technology.** Whirlpool claims that its efficient models use a more accurate ACT system than standard models. Some manufacturers also promote models that use lower temperatures in certain cycles as energy saving, and some high-end models allow users to track the dryer’s energy use and inform users of the estimated energy use of various cycles they select.
- ➔ **There has never been an ENERGY STAR specification for clothes dryers, but the first specification is expected to be released within the next year.** In 2011, ENERGY STAR became actively engaged in scoping activities for the first clothes dryer specification. There are two key barriers to launching an ENERGY STAR dryer specification: 1) Both the current and revised (2015) DOE test procedures do not adequately differentiate efficiency levels between dryer models, as discussed above; and 2) ENERGY STAR Partners are unsure what baseline efficiency should be – the existing standard, the current 2015 standard, or the revised 2015 standard.
- ➔ **Product experts anticipate that development of an ENERGY STAR rating for clothes dryers will follow a two-step process:**
 - In 2012, release of a stringent ENERGY STAR standard that only Emerging Technology Award winners (expected to be heat pump dryers) will qualify for;
 - In 2013, release of a 2-tier ENERGY STAR standard; a Tier 1 rating for “conventional” ENERGY STAR dryers, and a Tier 2 “most efficient” rating for Emerging Technology dryers.

Product Types

- ➔ **There are three key clothes dryer types: vented, ventless (also called “condensing”) and heat pump.** Table 5.19, below, shows estimated installed base, baseline efficiency, and potential fuel sources for the three dryer types.
 - **Vented dryers** heat air from outside the dryer and blow it into the drum. When air inside the drum becomes saturated with moisture from the wet clothes the moist air is removed from the dryer through a flexible vent and blown outside the home or apartment building.
 - **Ventless dryers** use a heat exchanger to cool the hot, moist air and condense the resulting water vapor into a drainpipe. These dryers do not require a vent to the exterior of the structure and thus can be used in interior apartments, closets or other places where an exterior vent cannot be accommodated.



- **Heat pump dryers** use a heat pump to recycle the energy gained from condensation and heat the incoming air. Heat pump dryers are the most efficient but are not currently available for purchase in the U.S.

Table 5.19: Clothes Dryer Installed Base, Efficiency, and Fuel Sources

PRODUCT TYPE	ESTIMATED U.S. INSTALLED BASE	BASELINE EFFICIENCY (LBS/KWH)	FUEL SOURCE(S)	
			Gas	Electric
Vented	99%	2.67-3.01	X	X
Ventless (condensing)	1%	2.08-2.55 ⁹⁸		X
Heat pump	—	4.52		X

Source: ENERGY STAR 2011.

- ➔ **The vast majority of dryers in the U.S. require an exhaust vent.** Ventless dryers represent less than 1% of the market (Meyers). This differs from the European market, which has a far higher prevalence of condensing, ventless dryers and more compact models.

Heat Pump Dryers

- ➔ **Among all clothes dryer technologies, heat pump dryers are the most efficient.** Heat pump dryers use 40% less electricity than a conventional vented electric dryer and 50% less than a condensing dryer (SEDI).
- ➔ **Heat pump dryers are not available in the U.S. but represent about 4% of the European market.** The European countries with the largest market share of heat pump clothes dryers are Switzerland (15.6%) and Italy (11%) (Meyers). Market share in Europe is expected to grow in the next few years. Due to differences in consumer expectations between Europe and the U.S., product experts do not expect heat pump clothes dryers to make significant inroads into the U.S. dryer market without market interventions.
- ➔ **Heat pump dryers, while significantly more efficient than vented or ventless dryers face two key barriers to entry into the U.S. market:** 1) Average product cost is approximately twice that of a standard baseline electric vented dryer; and 2) Drying times are upwards of 30% longer.

⁹⁸ New baseline efficiency standards for ventless dryers become effective January 1, 2015. No standard currently exists.



- ➔ **Heat pump dryers will be one of the ENERGY STAR Emerging Technology Award categories in 2012.** Launched in 2011, the ENERGY STAR Emerging Technology Award is an annual award given to products that meet rigorous performance criteria in one or two select categories each year. The award raises the profile of innovative technologies that have the potential to significantly reduce greenhouse gas emissions once adopted, but do not yet meet key principles associated with the ENERGY STAR program, like being widely available or cost effective. As Emerging Technology products become mainstream the categories may become candidates for ENERGY STAR specification development.
- ➔ **Two key organizations are working to make heat pump dryers available in major U.S. markets.** The Super Efficient Dryer Initiative (SEDI) and the Collaborative Labeling & Appliance Standards Program (CLASP) are working, together with ENERGY STAR, to define a path for one or more dryers to qualify for the Emerging Technology Award. This will entail working with utilities to offer “substantial incentives” for these products.

Dryer Features

- ➔ **Clothes dryer features on the rise include larger capacity (up to 7 cu.ft.), high airflow (more air, lower temperature), electronic dry control sensors, and steam.** Manufacturers note that consumers are interested in features that lessen the impact drying has on clothing, such as lower temperature and shorter drying time. Steam is a rising feature on mid- to upper-end models. The benefits of steam are anti-wrinkling as well as “freshening,” which one manufacturer noted may enable clothes to be washed less often.
- ➔ **“Smart” technology is likely to be a feature in electric clothes dryers by 2015.** The expected application of smart technology in electric dryers differs from that of other home appliances, where load shifting is projected to be the norm. Dryers, however, are expected to use smart technology to power spinning reserves, an immediate, short-term decrease in demand. Dryers will achieve this by turning off the heating element for up to 10 minutes (but maintaining air flow and tumbling), a small modification to the typical cycle that is not expected to inconvenience users.

Sales

- ➔ **In 2010, 6.5 million clothes dryers were sold in the U.S.** This represents a decrease in sales over the past few years, largely due to the economic downturn (Appliance Magazine).

Installed Base

- ➔ **Almost 80% of U.S. households have a clothes dryer.** In PG&E and SCE service territories dryer saturation is slightly lower at 72%.



- ➔ **Most dryers in the U.S. are electric (80%).** The U.S. clothes dryer fuel mix has remained relatively stable over the past decade and is not expected to change. (ENERGY STAR 2011).
- ➔ **Clothes dryer fuel source differs significantly between SCE and PG&E service territories.** In SCE territory gas dryers predominate (74% of dryer households). In PG&E territory there are more electric dryers (63% of dryer households) (KEMA). While gas dryers may offer some benefits in terms of reduced greenhouse gas emissions and lower energy costs (Bendt), end-users rarely shift fuels.
- ➔ **DOE assumes an average lifetime of 16 years for clothes dryers, though estimates generally range from 12-16 years.** There is a wide distribution of clothes dryer age in U.S. households, as shown in Table 5.20.

Table 5.20: Age of Clothes Dryer Installed Base

DRYER AGE	U.S. HOUSEHOLDS	
	Number (Millions)	Percent
Less than 2 Years	11.9	13%
2 to 4 Years	21.4	24%
5 to 9 Years	30.1	33%
10 to 14 Years	16.2	18%
15 to 19 Years	6.2	7%
20 Years or More	4.5	5%

Source: DOE

Supply Chain

Manufacturers

Market Share

Clothes dryer manufacturing, like most appliance products, is highly consolidated. The same three brands that dominate the refrigerator market also hold the top positions for clothes dryer market share (Table 5.21). The leading brand, Whirlpool, has upwards of 70% of market share, while the top three, including GE and Electrolux, together maintain over 90% market share for both electric and gas clothes dryers (DOE).

DOE estimates there are 11 other manufacturers selling into the U.S. market. Although they represent only 10% of the market, their share grew steadily, increasing from 0% in 2003 to 6-11% in 2008 (DOE).



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Table 5.21: U.S. Clothes Dryer Manufacturer Market Share

MANUFACTURER	MARKET SHARE	
	Electric	Gas
Whirlpool/Maytag	70%	74%
GE	16%	10%
Electrolux	8%	5%
Others	6%	11%
Total	100%	100%

Source: DOE

Pricing

Table 5.22 shows estimated manufacturer and consumer cost for both standard and heat pump clothes dryers. Heat pump clothes dryers are not commercially available in the U.S. In estimating their retail cost, DOE assumes a higher level of production, and thus a lower price, than currently applies to heat pump clothes dryers available in the European market. Nonetheless, heat pump clothes dryers are estimated to be nearly twice as expensive, both to manufacture and at retail, as standard electric dryers.

Table 5.22: Average Product Costs and Estimated Retail Price of Standard Electric vs. Heat Pump Clothes Dryer (2008\$)

COST TYPE	STANDARD ELECTRIC	HEAT PUMP
Manufacturing production cost	\$222	\$481
Retail cost	\$481	\$833

Source: DOE

The high marginal cost of heat pump dryers presents a challenge to manufacturers and energy efficiency programs seeking to promote this technology. According to a 2010 paper by Lawrence Berkeley National Laboratory, “While heat pump clothes dryers are much more energy efficient than conventional electric resistance clothes dryers, the significant increase in product costs is not recouped through reduced operating expenses for most households” (Meyers et al.).

Distribution

As with refrigerators, nearly all dryers reach consumers through retailers. Table 5.23 shows the types of retail stores through which major appliances, including residential clothes washers, are sold.



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Table 5.23: Distribution Channels for Major U.S. Appliances

STORE TYPE	PERCENT OF APPLIANCES PURCHASED
Department store (Sears)	34.7%
Appliance store or consumer electronics store	30.9%
Home improvement store (Lowe's, Home Depot)	23.8%
Discount store (Wal-Mart, K-Mart)	2.0%
Membership warehouse club (Sam's, Costco)	1.8%
Other type of store	6.8%

Source: DOE

Opportunities and Barriers

The key opportunities for increasing the prevalence of efficient dryers in the marketplace center on developing test procedures and product specifications that effectively differentiate efficient products from inefficient ones. Table 5.24 summarizes these opportunities and the barriers they address.

Table 5.24: Clothes Dryer Opportunities and Barriers Related to Codes and Standards

BARRIERS	IOU PROGRAM OPPORTUNITIES
The current DOE test procedure cannot distinguish between more and less efficient clothes dryers. Under the test procedure, all dryers of the same type and size (for example, vented gas) appear to use similar amounts of energy.	Support the revision of the new 2015 DOE test procedure to reflect the importance of properly functioning automatic cycle termination
A lack of dryer efficiency labels means consumers cannot identify more efficient dryers, and may not be aware that dryer efficiency differs across models.	Contribute to development of an ENERGY STAR specification for clothes dryers

Once these barriers have been addressed, additional opportunities will exist for programs to increase the efficiency of dryers by working to increase the penetration of efficient features in standard gas and electric dryers, including:

- ➔ Auto termination sensing
- ➔ Improved insulation
- ➔ Modifications to air flow and heat input

Speeding the introduction of heat pump dryers into the U.S. market provides an opportunity to achieve additional energy savings. Heat pump dryers, which are the most efficient drying



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technology, are not currently available in the U.S. market. However, if and when heat pump dryers become available here they will likely face barriers to adoption including their first cost (about twice that of a standard electric dryer) and a longer cycle length.





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SECTION III: BCE FINDINGS

CHAPTER 6: PROGRAM EXPERIENCE REVIEW

CHAPTER 7: TECHNOLOGY AND MARKET REVIEW



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

SECTION III: BCE FINDINGS



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

6

PROGRAM EXPERIENCE REVIEW

This chapter covers findings from a program experience review of the Business and Consumer Electronics (BCE) Program. The program experience review was the first phase of the project and focused on understanding stakeholder experiences with the BCE Programs and programs from other utilities' attempts to reduce consumer electronics plug loads.⁹⁹ The purpose of this review was for the evaluators to understand what worked well and what did not work as effectively in this first generation of programs focused on consumer electronics plug loads.

This chapter includes:

- An overview of the California statewide BCE Program
- Findings from the BCE Program, including market progress, strengths, and challenges
- An overview of other U.S. plug-load programs
- Seven key findings regarding plug-load programs

OVERVIEW OF THE CALIFORNIA STATEWIDE BCE PROGRAM

The California statewide BCE Program is an energy-efficiency program targeting televisions, desktop computers, and monitors. The program provides per-unit incentives to midstream actors – retailers and distributors – to increase the stocking, promotion, and sales of qualified energy efficient products. The program also provides marketing materials to promote efficient products and sales associate training. The program sponsors also are contributing stakeholders to the U.S. EPA ENERGY STAR[®] program.

The BCE Program is part of a statewide portfolio, but each sponsor implements the program in its own geographic area. This section of the report will focus on programs implemented by Pacific Gas and Electric (PG&E) and Southern California Edison (SCE). San Diego Gas & Electric (SDG&E) also is a member of the California statewide BCE Program, but did not participate in this study.

⁹⁹ A plug-load product is an electrical device powered by a standard wall outlet.



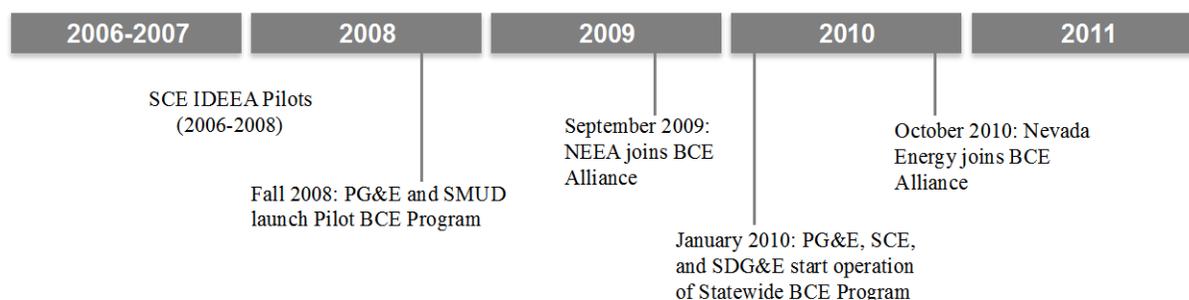
Program Background

The BCE Program model was designed to address rapidly growing energy consumption by consumer electronics plug loads. From 2006 to 2008, SCE ran pilot programs similar to the BCE Program model as part of the Innovative Designs for Energy Efficiency Activities (IDEEA) program.¹⁰⁰ In 2008, PG&E released a public study outlining potential program approaches to slow the growth of plug loads. This study led to a 2008 PG&E pilot of the BCE Program by PG&E and the Sacramento Municipal Utility District (SMUD).¹⁰¹

Interest in the program model used in PG&E's pilot program led other utilities and organizations in the region to collaborate with PG&E on a midstream plug-load program. These partners – PG&E, SMUD, the Northwest Energy Efficiency Alliance (NEEA), Nevada Energy, and SDG&E – are referred to as the BCE Alliance (Alliance). SCE chose not to join the Alliance because it wanted to have direct contact with retailers for strategic reasons and because the Alliance's cost allocation was based on the size of the utility – not on the relative size of the program – and was too high for the SCE program to absorb.

The BCE Program model also was adopted into the statewide residential investor-owned utility (IOU) portfolios for the 2010-2012 program cycle as the California Statewide BCE Program. The California utilities PG&E, SCE, and SDG&E implement the California Statewide BCE Program. Figure 6.1 provides a timeline showing the evolution of the Alliance and California Statewide BCE Program.

Figure 6.1: Evolution of BCE Alliance and Statewide BCE Program



¹⁰⁰ SCE Program Staff, C. Chen, and K. Randazzo. 2010. *2010-2012 Statewide Business and Consumer Electronics Program*. Rosemead, Calif.: Southern California Edison.

¹⁰¹ Pacific Gas and Electric Company. 2011. *Pacific Gas & Electric Company 2010-2012 Energy Efficiency Portfolio Program Implementation Plan California Statewide Program for Residential Energy Efficiency (PGE2100)*. San Francisco, Calif.: Pacific Gas and Electric Company.



Source: Interviews with PG&E and SCE program staff, Energy Market Innovations (EMI). 2011. *Consumer Electronics Television Initiative Market Progress Evaluation Report*. Prepared for the Northwest Energy Efficiency Alliance (NEEA): November 22, 2011. Portland, Oregon. http://neea.org/research/reports/E11-230_Combinedv2.pdf

Together, the residential populations within the territories served by the Alliance members and Statewide BCE Program sponsors represent approximately 15% of the national television market (Table 6.1). All of the programs share the same incentive structures and participation requirements, and members of the Alliance work as a group to leverage retailer relationships.

Table 6.1: BCE Alliance/Statewide BCE Program Sponsors' Residential Populations

SPONSOR	NUMBER OF CUSTOMERS (MILLIONS)
PG&E	15
SMUD	0.6
NEEA	11.5
SCE	14
SDG&E	3.3
NV Energy	2.4
Total for BCE Alliance	46.8
U.S. Population	311
Percentage of U.S. Customers Served	15.05%

Source: Pacific Gas & Electric, 2011b. "Dashboards." Excel spreadsheet.

The BCE Alliance

Although the program theory and implementation are broadly similar among the various program sponsors, there are some notable differences, as noted below. BCE Alliance program staff communicate frequently by holding conference calls several times a month.

- ➔ **SMUD:** As a public utility, SMUD does not have the same regulatory obligation as the IOUs. While SMUD program staff reported a high level of collaboration with the IOUs, their priorities differed from the IOUs in some respects. SMUD does not receive revenue benefits from energy efficiency investments, so the program staff are much less focused on attribution and claiming savings. SMUD staff reported that this gives them more flexibility in program operations.
- ➔ **Nevada Energy:** Nevada's program is typical of the BCE Program. Initial estimates of program savings for the first few months of program activity (Q4 2010) were exceptionally favorable. According to an interviewee, the program achieved a gross realization rate of "over 100%."



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- **NEEA:** NEEA is a utility-funded nonprofit promoting market transformation in the Pacific Northwest. Although it offers per-unit incentives like the other programs, it focuses on market transformation instead of per-unit savings, and so bases its savings and attribution on overall market share data. NEEA's cost-effectiveness and savings model relies on attribution estimates to parse program savings from general market and technological changes in the market share of efficient products. In a recent Market Progress Evaluation Report, this method was deemed non-transparent and not verifiable. There is significant evaluation risk to NEEA's ability to claim savings and its cost-effectiveness. NEEA stopped offering incentives for computers and monitors in 2011, due to low participation and savings.¹⁰²

Program Implementation, Activities, and Participation

Key BCE Program activities include retailer engagement (recruiting retailers, collecting data, providing promotional and marketing materials, and training sales associates), setting qualifying measure specifications, paying incentives to participants, and participating in the setting of ENERGY STAR television specifications, on which program measure qualifications are based. Sponsor staff implement some program elements, and several third-party implementers manage data, perform retailer and manufacturer outreach, and conduct baseline research.

Retailer Engagement

Retailer Recruitment and Participation

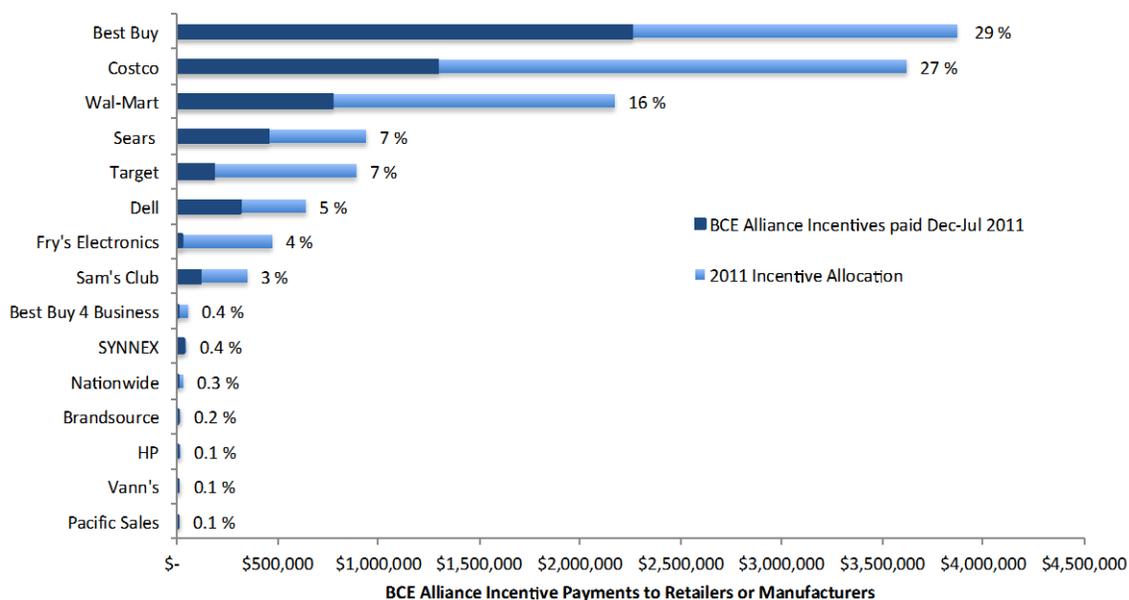
The BCE Program relies on effective relationships with retailers. The program recruits and contracts with retailers (and in some cases, manufacturers). It offers retailers incentives for the sale of qualifying products; in exchange, participating retailers provide sales and shipping data and allow the programs to place marketing materials in their stores and train their sales associates. Working as a group, the members of the BCE Alliance have pooled their resources and leverage to negotiate directly with the large, national electronics stores that represent the bulk of the consumer electronics market, as well as working with local and independent stores. The Alliance members initially contracted with QDI Strategies to conduct program outreach with retailers and manufacturers, and switched to Navitas Partners in January 2012. Figure 6.2 displays the incentives the BCE Alliance members paid to the largest participating retailers and

¹⁰² Energy Market Innovations (EMI). 2011. *Consumer Electronics Television Initiative Market Progress Evaluation Report*. Prepared for the Northwest Energy Efficiency Alliance: November 22, 2011. Portland, Oregon. http://neea.org/research/reports/E11-230_Combinedv2.pdf



manufacturers, and the percentage of the total program incentives allocated to each participant in 2011.

Figure 6.2: Combined BCE Alliance 2011 Incentive Allocations and Payments



Source: Pacific Gas & Electric, 2011b. "Dashboards." Excel spreadsheet Note: Does not include SCE incentive payment data.

Retailer Data Collection

To participate in the program, retailers must provide data on qualifying product sales to allow the program to track market progress and determine incentives. They also must provide historical sales data and sales data from stores outside the BCE territory so program sponsors and implementers can understand changes in stocking and shipping. Retailers submit sales data online to the data management firm, Energy Solutions, which cleans it and checks it against the ENERGY STAR-qualified products list to determine which products are eligible for incentives.

Retailer Marketing Activities

Participating retailers must display in-store point-of-purchase (POP) and marketing materials that promote efficient products. The program sponsors create and provide these materials and conduct periodic checks to ensure that efficient products are labeled and promotional material is displayed appropriately. The program also works with retailers to develop marketing campaigns. For example, PG&E created a promotional video that plays on televisions at Costco and Sears. PG&E also partnered with CNET to put pages on their website that highlighted efficient televisions, desktop PCs, and monitors. PG&E and SCE provide in-store kiosks at some retail locations with information about ENERGY STAR and the BCE Program.



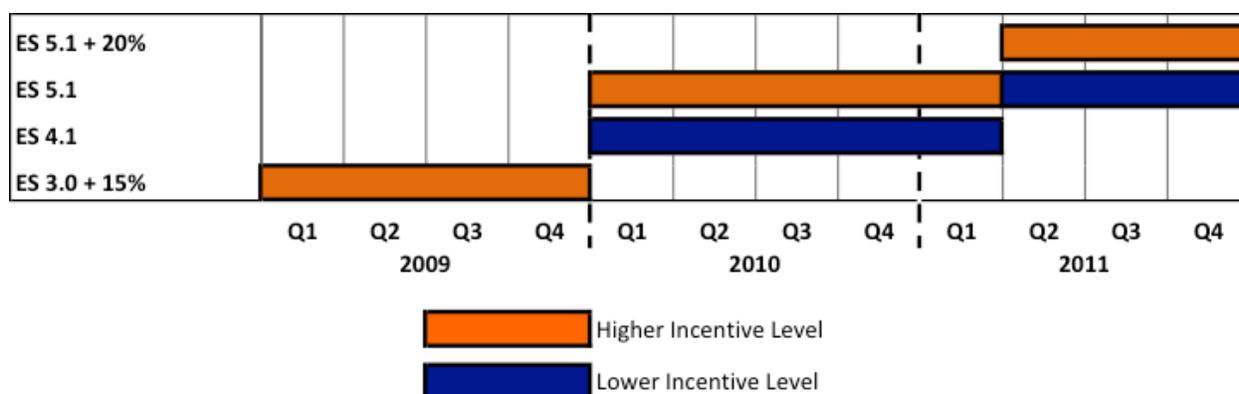
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Qualifying Products

Televisions, desktop computers, and monitors are eligible for incentives. The program theory is the same for each product. The program uses the ENERGY STAR product specifications to guide the measure qualifications.

In 2009, its first year, the BCE Program set a single qualification level for televisions: 15% more efficient than the ENERGY STAR 3.0 standard (ES 3.0 + 15%). In order to stay relevant in the rapidly changing consumer electronics market, in 2010 the program set two levels of qualification criteria, a *base* incentive level and an *aspirational* level, for which participants received a higher incentive. Figure 6.3 shows the efficiency criteria from 2009-2011.

Figure 6.3: BCE Program Television Specification Levels



Source: QDI Strategies, Inc. July, 2011. "Specification Setting Process." Memo to Brian Smith, PG&E.

At the outset of the 2010-2012 program cycle, the two levels of television specifications corresponded to ENERGY STAR 4 and ENERGY STAR 5. Recognizing that the television market rapidly was becoming more efficient, the BCE Program transitioned to more stringent efficiency standards on April 1, 2011. Program staff chose this date to conform to retail industry sales cycles, rather than the BCE Program year. The new lower tier was set at ENERGY STAR 5.1, and the higher tier at ENERGY STAR 5.1 + 20%. Incentive levels also were adjusted to better reflect actual per-unit energy savings.

Table 6.2 displays incentive levels for televisions in 2010 and 2011.



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Table 6.2: Television Incentives and Per-Unit kWh Savings, 2010-2011

SCREEN SIZE	EFFICIENCY TIER	Q1 2010 TO Q1 2011		Q2 2011 TO Q4 2011	
		Deemed Savings (kWh/Year)	Incentive	Deemed Savings (kWh/Year)	Incentive
10" to less than 36"	ES 4.1	68	\$10.00	N/A	N/A
	ES 5.1	102	\$25.00	104	\$6.00
	ES 5.1 + 20%*	102	\$25.00	113	\$10.00
36" to less than 50"	ES 4.1	187	\$10.00	N/A	N/A
	ES 5.1	241	\$25.00	222	\$15.00
	ES 5.1 + 20%*	241	\$25.00	251	\$25.00
50" or greater	ES 4.1	237	\$10.00	N/A	N/A
	ES 5.1	340	\$25.00	336	\$25.00
	ES 5.1 + 20%*	340	\$25.00	364	\$30.00

Sources: SCE. 2011c. "Request from EMI 10-18-2011." Excel spreadsheet.

* For Q1 2010 to Q1 2011, there were no program specifications for ES 5.1 + 20% televisions. As a result, the deemed savings and incentive amounts for ES 5.1 and ES 5.1 + 20% were the same for this period.

In Q2 2011, the program adjusted incentives based on screen size to recognize the increased savings and difficulty of meeting the new criteria for large screen sizes. The program also reduced per-unit incentives in the ENERGY STAR 5.1 tier to reflect the less stringent criteria that were adopted in 2011. This change applied only to televisions; savings and incentive levels for monitors and computers remained the same in 2010 and 2011 (Table 6.3).

Table 6.3: LCD Monitors and Desktop Computers -- Per-Unit kWh Savings and Incentives, 2010-2011

APPLIANCE	2010 & 2011		
	Efficiency Tier	Deemed Savings (kWh/Year)	Incentive
Monitors	ES 5 + 10%	22	\$6.50
Desktop Computers	ES 5.0	73	\$7.00

Source: Pacific Gas & Electric, 2011a. "Dashboards." Excel spreadsheet.

Incentive Payments and Per-Unit Savings

The BCE programs use retailer-provided sales data to track qualified sales and pay retailers a per-unit incentive for each qualifying product. Each program sponsor has its own approach to ensuring that its incentives affect its targeted customers. PG&E gives incentives for all units sold



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at store locations within its service territory. SCE requires customer ZIP code information to verify that customers live within the SCE service territory.

Participation in Setting ENERGY STAR Television Specifications

Alliance members are active stakeholders in setting ENERGY STAR television specifications, and have contributed to making ENERGY STAR specifications more rigorous. For example, PG&E, SMUD, and NEEA successfully urged the ENERGY STAR program to move up the effective date of the ENERGY STAR 5 standard for televisions.

FINDINGS FROM THE BCE PROGRAM EVALUATION

Summary

The BCE Program formed effective relationships with retailers, other program sponsors, and the national ENERGY STAR program. Since the inception of the BCE Program, the market share of energy efficient televisions sold in California has increased substantially. Program staff also have learned a great deal about the logistics of implementing a midstream program. Despite these successes, the program remains focused on televisions, and the midstream approach faces significant evaluation risks. A description of the market progress, as well as the key strengths and challenges of the BCE Program identified by this review, are listed below.

Methodology Overview

To characterize the experiences of the BCE and other plug-load programs, the research team reviewed program documentation, analyzed tracking data, reviewed primary and secondary research, and conducted in-depth stakeholder interviews. Stakeholders interviewed included:

- ➔ Program staff
- ➔ Other staff involved in relevant issues, such as retailer engagement or codes and standards
- ➔ Implementation contractor staff
- ➔ Staff from other sponsors with programs targeting plug loads
- ➔ Staff from other organizations that promote plug-load efficiency, such as the EPA ENERGY STAR[®] program and the Consortium for Energy Efficiency (CEE)

Primary data supplied by PG&E and SCE allowed the research team to accurately characterize the program. Key data received included:

- ➔ **PG&E:** The 2010-2012 Energy Efficiency Program Implementation Plan (PIP); and spreadsheets showing qualification levels, incentives, participating retailers, and qualifying units sold through the BCE Alliance



- ➔ **SCE:** The 2010-2012 Statewide BCE Program documentation; and spreadsheets showing qualification levels, incentives, participating retailers, and qualifying units sold through the SCE BCE Program.

The research team also conducted third-party research to characterize the broader market and compare programs to those offered in California. Key references include:

- ➔ Frank, M., J. Peters, and G. Hardy. May 2011. *An Overview of U.S. Residential Consumer Electronics Programs*. Energy Efficiency in Domestic Appliances and Lighting Conference. Copenhagen, Denmark.
- ➔ Consortium for Energy Efficiency (CEE). 2011. *Consumer Electronics Efficiency Program Summary*. Consortium for Energy Efficiency: Boston, Massachusetts.
- ➔ Energy Efficiency Program Sponsors. 2010. *ENERGY STAR Summary of Consumer Electronics Programs*.

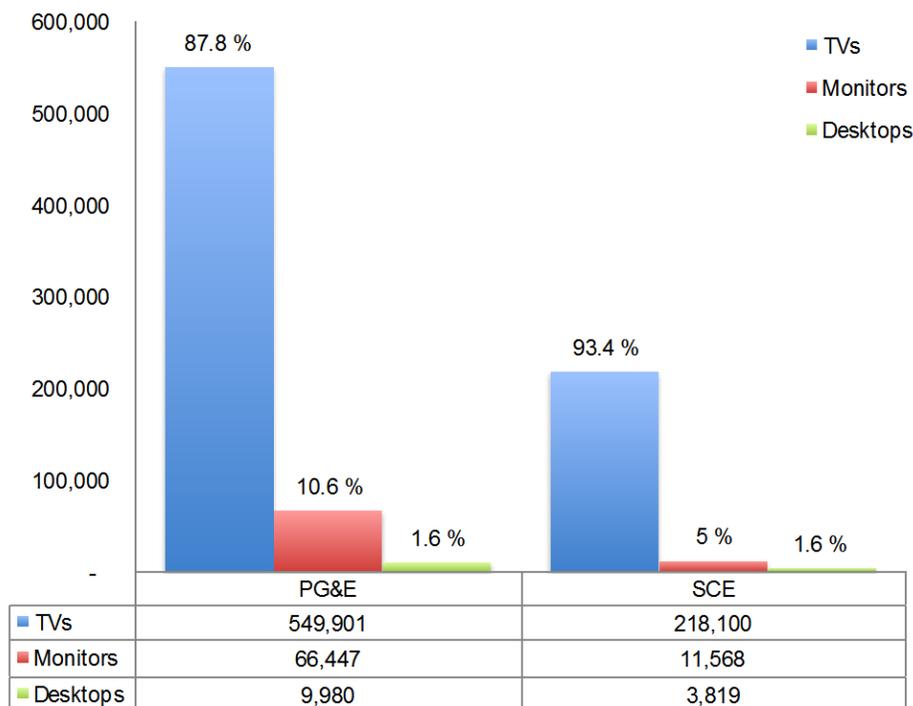
California BCE Program

Incented Measures

Televisions accounted for the bulk of incented measures in 2010. Figure 6.4 shows the volume of products incented at PG&E and SCE, by product type.



Figure 6.4: 2010 Qualifying Products Incented Through PG&E and SCE BCE Programs



Sources: Southern California Edison, 2011a. "CPUC Documentation Request" (Excel spreadsheet)., _____, 2011b. "Qualifying Units Sold" Excel spreadsheet., _____, 2011c. "Request from EMI 10-18-2011." Excel spreadsheet. _____, 2010. "PGE BCE Overview 2010" (Excel spreadsheet). 2010.

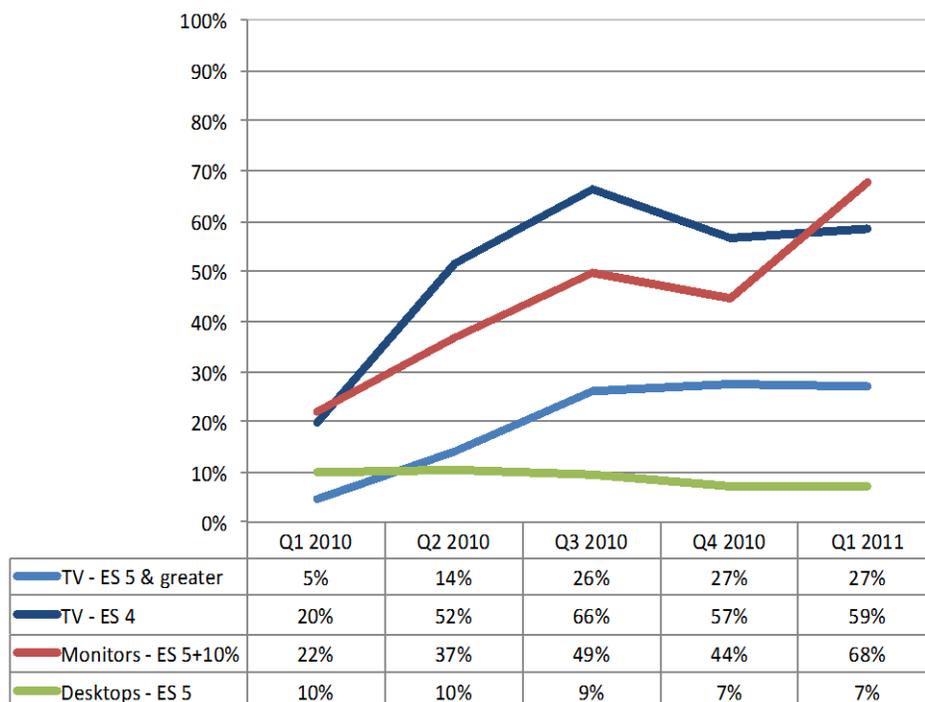
Market Progress

During the evaluation period, market shares of qualifying televisions and monitors in PG&E territory trended upward. For instance, the market share of ENERGY STAR 4 televisions increased from 20% in Q1 2010 to 59% in Q1 2011. During the same period, the share of ENERGY STAR 5 televisions moved from 5% to 27%. Monitors also became more efficient; the market share of ENERGY STAR 5+10% monitors increased, from 22% to 68%. On the other hand, the market share of ENERGY STAR 5 desktop computers declined from 10% to 7% over this period. Figure 6.5 illustrates these trends.



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Figure 6.5: Market Share of Qualifying Units in PG&E Service Territory, Q1 2010- Q1 2011



Source: Pacific Gas & Electric, 2011a. "Dashboards." Excel spreadsheet.. _____, 2010. "PGE BCE Overview 2010" Excel spreadsheet.

Program Strengths

The program experience review revealed many program strengths, including:

- ➔ **The BCE Program created strong, productive relationships with retailers.** The BCE Program engaged large national retailers such as Best Buy and Wal-Mart. The combined incentives, with consistent specification levels, have been a significant factor in getting retailers involved with the program. These relationships, which took considerable time and money to create, are a key asset of the BCE Program and can be leveraged for other product types and program strategies. One program implementer said, "Call Best Buy or Wal-Mart and try to get an appointment. Impossible. But they meet with us." Before the BCE Program, large retailers and utilities did not "speak the same language," but this evaluation revealed that, as a result of the programs, these retailers now understand and embrace energy efficiency programs. At the same time, utilities have gained invaluable knowledge about the retail and consumer electronics industry that have improved program design and execution.
- ➔ **The relationship between the BCE Alliance and ENERGY STAR has been valuable to both.** The ENERGY STAR program is a foundational element of the BCE Program, since the programs base their qualifying specifications on the ENERGY STAR test



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procedures and specifications. Additionally, the ENERGY STAR-qualified products list has been crucial to the process of identifying qualifying product sales. ENERGY STAR has also benefitted from the relationship. BCE Alliance sponsors have encouraged the ENERGY STAR program to be more ambitious and effective – for example, by announcing two specifications at once, to give manufacturers time to develop products to meet the new standards. This influence is a significant counterbalance to the manufacturers’ influence during the specification-setting process.

- ➔ **The market share of qualifying energy efficient televisions has increased at every efficiency tier.** For example, in PG&E service territory, the market share of televisions that met or exceeded the ENERGY STAR 4 standard went from 24% in Q1 2010 to 86% in Q1 2011. This rapid shift led the BCE Programs to raise qualification standards from ENERGY STAR 4 and ENERGY STAR 5 to ENERGY STAR 5 and ENERGY STAR 5+20% in April 2011.
- ➔ **The program and its data management contractor have collected large amounts of data and learned a great deal about effective data management and model matching.** An interviewee at Energy Solutions said their biggest challenge is the model-matching process, by which retailer data are matched to the ENERGY STAR-qualified products list. In previous periods, the match rate was about 30%, but had increased to more than 90% in September 2011. This is due to the development of sophisticated process and analysis techniques, and extensive work with retailers and manufacturers to understand industry standards.

Program Challenges

The program experience review also revealed a number of challenges that have been faced in the implementation of the BCE Programs.

- ➔ **The program remains television-focused.** Few monitors and very few desktop computers have been incented through the program. While the market share of ENERGY STAR 5+10% monitors has increased over the program period, the market share of efficient desktop computers has actually declined. The BCE Program has not yet gotten significant traction with computer manufacturers. There are at least two possible explanations. Participation of funders in the computer segment of the program was limited, and thus the total incentive pool available to induce manufacturers to participate was smaller. The program design may offer another explanation, in that it may have proved a better fit for the TV market than the computer market. As one program administrator suggested, “We made a one-size-fits-all program. We probably should have differed theory and design for each segment.”
- ➔ **Regulatory requirements for program updates and new product offerings are strict and may slow the program’s ability to adapt to market changes.** The Commission’s



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approval of work papers can take 18 months. BCE planners also work on “conditional approvals,” which reduces the certainty of program operations.

→ **As midstream program, the BCE Program faces evaluation risks.** As a result of these concerns, KEMA has been hired to conduct a statewide evaluability study for the program. Some of the evaluation risks stem from the following factors:

- **Relatively little customer touch.** Although the program does engage in some marketing, the lack of customer touch on the incentive side of the program may mean that it is difficult to attribute savings under a traditional evaluation framework. As one stakeholder noted, “This is not a downstream, direct customer attribution plan. This jeopardizes the way you may be evaluated.”
- **Poorly understood program theory.** IOU staff perceive that external stakeholders may not fully appreciate the program theory, and may not accept that the program targets retailers and manufacturers rather than the product’s end-user.
- **Unquantifiable influence.** The program sponsors have been influential stakeholders in the ENERGY STAR specification-setting process, which has driven the television market toward greater efficiency. But their work with ENERGY STAR is difficult to encapsulate and quantify. A PG&E stakeholder noted that there was a lack of clarity in the relationship between ENERGY STAR, the consumer electronics manufacturers, and the BCE Program sponsors.
- **No market baseline.** Though there have been increases in the market share of energy efficient televisions, there is no reliable counter-factual baseline projection to use as a comparison. PG&E engaged Opinion Dynamics Corporation (ODC) to conduct a market baseline, which was published in 2009.¹⁰³ The study established a point estimate of the baseline, but did not establish a counter-factual baseline for the measures incented by the program. A member of the SCE program staff characterized this as “our biggest challenge – seeing how much the market would have changed without us.” There are other powerful drivers of efficiency at play in the television market, such as a shift toward efficient LED backlighting and the significant influence of the ENERGY STAR program. Attribution risk is a central issue to the program and it is difficult to assess. As an implementation contractor put it, “TVs are now 50% more efficient. Do we get 100% or 0% credit? The answer is somewhere in-between.”

¹⁰³ Opinion Dynamics Corporation (ODC). 2009. *Statewide Business and Consumer Electronics Baseline Study*.



- ➔ **Although the program has made great strides in managing retailer data, data management and model matching remain difficult and expensive.**

OTHER CONSUMER ELECTRONICS PROGRAMS

This section provides a summary of key findings and insights about other programs targeting consumer electronics products. This summary is not intended to provide an exhaustive categorization of all program information.

Overview of Consumer Electronics Program Models

Frank, Peters, and Hardy identify four program models used to address consumer electronics products¹⁰⁴: *retailer*, *end-user*, *custom incentive*, and *education/marketing*.

- ➔ **Retailer Model:** The program pays incentives to midstream actors for every qualifying energy efficient product sold. This is the most common model for consumer electronics programs. The BCE Program uses this model.
- ➔ **End-User Model:** Similar to a traditional downstream model, the program pays incentives to customers that buy the qualified product through a mail-in rebate or in-store discount. This is an uncommon strategy for consumer electronics programs.
- ➔ **Custom Incentive Model:** The program works directly with manufacturers to determine a custom incentive structure. NYSERDA is the only organization using this model at this time.

A fourth program type does not have enough relevant program activity for consideration, but is described here for information.

- ➔ **Education/Marketing Model:** These programs pay no incentives, but promote the benefits of energy efficient products directly to customers. Activities include customer outreach, public relations events, and mass media advertising. These programs often are run by smaller utilities with limited budgets.

Table 6.4, below, summarizes the high-level theory, activities, successes, and challenges of each program type.

¹⁰⁴ Frank, M., Peters, J., and Hardy, G. May, 2011. *An Overview of U.S. Residential Consumer Electronics Programs*. Energy Efficiency in Domestic Appliances and Lighting. Copenhagen.



Table 6.4: Overview of Program Models

CHARACTERISTIC	MIDSTREAM	END-USER	CUSTOM INCENTIVE
Representative Programs	California Statewide BCE Program	Massachusetts ENERGY STAR Consumer Products Initiative	NYSERDA Energy Smart Products Program
Theory	Pay per-unit incentives to retailers for qualifying sales of consumer electronics, motivating them to stock and promote more energy efficient products	Increase sales of energy efficient products by offering rebates directly to customers	Buy down the price of smart power strips to retailers by paying customer incentives to manufacturers and cost-sharing marketing
Activities	Pay per-unit incentives to retailers and manufacturers for sales of qualifying products, set qualification criteria and baselines for products, provide in-store marketing materials and retailer training	Offer direct customer incentives (mail-in rebates or POP), distribute marketing materials, conduct retailer training	Solicit manufacturer proposals for custom incentives, pay custom incentives, cost-share with manufacturers for product promotions
Product Types	Televisions, desktop computers, monitors	ENERGY STAR desktop computers, monitors	Smart power strips
Successes	Strong retailer relationships with large retailers Coordination with ENERGY STAR	Savings attribution models in widespread use Less evaluation risk than midstream incentive program	Manufacturer participation Joint promotions of smart power strips
Challenges	Evaluation risks around savings attribution Difficulty working with computer manufacturers Requires a large amount of data processing	High free-ridership Incentive level minor in comparison to purchase price of product	Smart power strips lack market traction due to low consumer demand

Sources: Consortium for Energy Efficiency (CEE). 2011. *Consumer Electronics Efficiency Program Summary*. Consortium for Energy Efficiency: Boston, Massachusetts. Energy Efficiency Program Sponsors. 2010. *ENERGY STAR Summary of Consumer Electronics Programs*.

Review of Noteworthy Consumer Electronics Programs

This section highlights unique aspects of noteworthy consumer electronics and plug-load programs from each category above, and synthesizes these experiences into collective successes, challenges, and lessons learned.

- ➔ **Xcel Energy (Colorado):** Xcel Energy is discontinuing its pilot program before it can be evaluated, but tested several unorthodox variations in program design. They began with a *market lif*’ model, in which per-unit incentives are paid only on sales above baseline. Due to low participation and the difficulty of communicating the model to retailers, they



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moved to a more typical system of paying per-unit incentives on all qualifying energy efficient products sold. However, to account for the market baseline, they adjusted savings downward using a net-to-gross ratio for each product, equal to the penetration of that product in the overall market. Challenges included keeping marketing signage current in the face of rapidly changing product assortments and learning to work with retailers. Xcel's program had difficulty with cost-effectiveness because they assumed an \$80 incremental cost for an energy efficient television and treated the rebate itself as a program cost, rather than as a benefit to the customer.

- ➔ **Commonwealth Edison (Illinois):** Commonwealth Edison is notable as one of the few programs of this type that completed an impact evaluation. After completing a 2009-2010 pilot program of a midstream television incentive program, evaluators found a 22% increase in qualifying products at participating Best Buy stores. However, they were unable to establish any correlation between program activity and activity in the television market. Their evaluation contractor advised them that the program was likely to fail TRC tests, since in Illinois the incentive is considered a program cost and not a customer benefit.
- ➔ **DTE Energy (Michigan):** DTE Energy is a pilot with significant evaluation risk. Although DTE was granted a 0.9 net-to-gross by their regulators, their evaluators may reduce DTE's attribution further and therefore reduce the claimed savings significantly. This is another example of a program that is threatened by evaluation risk.
- ➔ **New York State Energy Research and Development Authority (NYSERDA):** Focusing on smart power strips, NYSERDA's Energy Smart Products Program is a buy-down program, similar to a drop-ship program. Program details are different for each manufacturer, since the incentives and activities are determined by a proposal process similar to an RFP. Generally, NYSERDA pays manufacturers to reduce the price of their products to retailers. The retailer is not obligated to change their price, and they do not co-brand their marketing materials with NYSERDA. The program also pays for a portion of in-store marketing on a cost-share basis, which is particularly important for smart power strips because of the low demand. The program is pending evaluation.

Experiences from Consumer Electronics Programs

Comparison interviews with people involved with other consumer electronics plug-load programs confirmed many of the key findings in the review of the California statewide BCE Program. Presented here are additional findings from these interviews.

- ➔ **Televisions have provided the bulk of program savings, but programs may need to look for new opportunities in reducing consumer electronics plug loads.** One BCE Alliance interviewee said, "I think there's a general industry consensus that we've probably pushed TVs too far already. It will be hard to get more out of it." This was echoed by others who were looking to measures such as set-top boxes for the next big



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plug-load offering. As television technology becomes more efficient, there is less potential for additional efficiency gains. This is a threat to the success of the BCE programs, since other measures have not gained significant traction. One interviewee believed that, “without TVs, there are not enough savings among other products to continue.”

- ➔ **It is difficult to develop a baseline for the fast-moving television market, and that baseline has a short shelf-life.** “The baseline moves non-stop. You’re always playing catch-up,” said one utility interviewee. This means that programs that rely heavily on market baselines to determine their impact are at considerable risk of having their savings questioned.
- ➔ **Assumptions about inputs to program cost-effectiveness calculations differ.** Both ComEd and Xcel Energy found that their programs could not pass cost tests with the assumptions they used: Xcel assumed an \$80 incremental cost for an efficient television; and both programs counted the incentive as a program cost. In California, the incentive is assumed to pass through to the customer, resulting in a more favorable TRC. One interviewee said that this is “the only way [for a midstream consumer electronics program] to make TRC.”
- ➔ **Combined program activity may alter the national market.** Concerted, coordinated program efforts and incentives are very important to program effectiveness and retail engagement. One implementer noted that “many of the retailers won’t partner with non-BCE utilities,” and one non-BCE utility said that Best Buy representatives said that the market shift was due to “the combination of different utilities.”
- ➔ **ENERGY STAR continues to move forward with new tools and strategies.** The program introduced a *Most Efficient* designation as a tool for utilities, so they can differentiate products without leaving the ENERGY STAR brand. To ensure coverage and relevance, there is a proposal to automatically recognize all products that are eligible without waiting for manufacturers to apply for ENERGY STAR recognition. ENERGY STAR will continue to revise specifications, set aggressive targets, and provide roadmaps to guide manufacturers.
- ➔ **Retailers need stability and confidence to develop plans based on utility programs.** One interviewee cautioned, “If retailers don’t have confidence the program is going to be around, they’re not going to make the changes.” A retail industry expert said, “longer term relationships are key. Retailers don’t work well when any program gets changed or stopped” when they expected it to continue.

SEVEN KEY FINDINGS FOR PLUG-LOAD PROGRAMS

The following key findings resulted from the review of the California Statewide BCE Program and other, similar consumer electronics plug-load programs:



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- ➔ **To date, plug-load programs have focused on televisions.** However, as the average energy consumption of televisions has decreased, the available per-unit savings also has decreased. This threatens the cost-effectiveness of television measures and, therefore, these programs. As a result, utilities are looking for new product opportunities in consumer electronics.
- ➔ **The rapidly changing baseline of television energy consumption creates a significant evaluation risk and difficulty in assessing attribution.** The baseline unit energy consumption (UEC) of televisions is difficult to assess because television UECs have been decreasing rapidly. The baseline challenge also makes it difficult to employ a *market lift* program model. The complexity of the market and its many actors also contribute to the difficulty in conclusively determining attribution of savings for utilities.
- ➔ **These programs target a national market of large retailers, which makes it difficult to have a local influence.** To influence local product offerings, programs must influence large retailers at the national level, where product assortment decisions are made. The combined influence of multiple utility programs may influence these national retailers' purchasing and stocking decisions regarding energy efficient televisions, but it is difficult to assess the extent of that influence (i.e., program attribution).
- ➔ **The current regulatory framework is built around a per-measure cost-effectiveness program model.** This framework limits the flexibility to add or remove measures to and from the program, which further reduces the program's ability to respond to market changes.
- ➔ **The BCE Program has effectively used ENERGY STAR as a program resource.** ENERGY STAR is a key resource for test procedures and the data these tests generate. In addition to leveraging ENERGY STAR data, the BCE Program has contributed support to make ENERGY STAR criteria more stringent.
- ➔ **The BCE Program has established valuable retailer relationships.** These relationships have yielded data that would have been difficult to obtain outside of the program. These data help program sponsors understand product manufacturing and retailing schedules and the importance of these cycles in program implementation. If sponsors wish to continue to have strong relationships with retailers for their plug-load programs, they must provide retailers a valid business case centered on a stable program.
- ➔ **Consumers tend not to understand plug-load-management products.** As a result, they can be hesitant to buy these products. In some cases, they may not know how to use these products to save energy, even if they do purchase them.



7

TECHNOLOGY AND MARKET REVIEW

This chapter provides findings from the analysis of residential consumer electronics plug-load products and consumer markets.

The research had three goals:

- ➔ Understand the current technical energy-savings opportunities for consumer electronics plug-load products.
- ➔ Understand the underlying trends that will influence the plug-load technologies and the residential market for consumer electronics plug-load products.
- ➔ Provide key findings relevant to the development of future program strategies for the post-2012 energy efficiency program administration planning and administration period(s).

The chapter contains four sections:

- ➔ An overview of consumer electronics plug-load products and markets covered by this research
- ➔ Technical energy efficiency opportunities and identified trends associated with the applicable technologies
- ➔ An analysis of consumer market trends
- ➔ Conclusions and a summary of the key findings from this research

The analysis in this chapter focuses on high-level findings from a secondary literature review of consumer electronics plug-load technologies and consumer markets. The findings may not apply to all plug-load technologies in the market; they are presented to represent the market in general. This information is intended to guide a comprehensive strategy to produce energy savings from consumer electronics plug loads after 2012. While most of the findings are high-level, specific data and examples for individual products have been included to support the analysis.



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PLUG-LOAD CATEGORY OVERVIEW

This section provides an overview of the consumer electronics plug-load products discussed in this study.

The California Energy Efficiency Strategic Plan (CEESP)¹⁰⁵ includes elements to reduce residential plug loads, particularly consumer electronics, which can contribute up to 90% of miscellaneous plug-load energy use.¹⁰⁶ This can be attributed to both the increased efficiencies of other household appliances and the growing number of electronic devices in homes. For example, the average home now has 24 devices,¹⁰⁷ compared to the 13 or 14 that were common in 1995,¹⁰⁸ and nearly every U.S. home has at least some consumer electronic product. According to the 2010 RASS survey, televisions are found in 96% of homes in the PG&E and SCE service territories.¹⁰⁹

Consumer electronics typically are used for entertainment, communications, or home office productivity. Table 7.1 categorizes consumer electronics products by function (e.g., display or audio), and shows products included in and excluded from this study.

Table 7.1: Consumer Electronics Products, by Category

PRODUCT CATEGORY	COVERED BY RESEARCH	EXCLUDED FROM RESEARCH
Displays	Televisions Internet-connected (smart) televisions Monitors	Digital signage
Audio	Receivers / home theatre Docking stations Powered television speakers	

¹⁰⁵ Engage 360 2011. The California Energy Efficiency Strategic Plan: January 2011 Update. January 2011.

¹⁰⁶ Foster Porter, S. Moorefield, L., & May-Ostendorp, P. 2006. *Final Field Research Report*. Prepared for the California Energy commission. October 31, 2006.

¹⁰⁷ CEA 2011a. "American Households Spend More Than \$1,100 Annually On Consumer Electronics, CEA Study Finds." (Press Release) May 23, 2011.
http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=12100.

¹⁰⁸ Research into Action 2010. *Electronics and Energy Efficiency: A Plug Load Characterization Study – SCE0284*. Prepared for Southern California Edison. January 29, 2010.

¹⁰⁹ KEMA 2010. *California Statewide Residential Appliance Saturation Study (RASS)*. October 13, 2010.



PRODUCT CATEGORY	COVERED BY RESEARCH	EXCLUDED FROM RESEARCH
Imaging	Printers (inkjet, laser, etc.) Multifunction devices (MFDs) Scanners Fax machines	Business-oriented devices
		Continued
Computers	Desktops Laptops Netbooks Home / media servers	Tablets Ultra portables Smart phones Data center equipment
Set-top boxes	Cable STB Satellite STB Digital video recorder (DVR) Internet protocol television (IPTV) / Over the top (OTT) Boxes	
Game consoles	Stationary game consoles	Portable gaming devices
Home network	Cable & DSL modems Wireless / wired routers Networked storage	Data center equipment
Media players	CD / DVD / Blu-Ray players	
Backup power	Uninterruptible power supplies (UPS)	Business-oriented devices Data center equipment
Plug load management	Smart power strips Remote outlets	Simple surge protectors

Consumer Sales Channels

Consumer electronics, particularly those products studied for this project, generally are available to residential customers through four main sales channels:

- ➔ **Brick-and-mortar retailers:** Consumers buy products at a retail establishment with demonstration products on the sales floor and sales associates to offer advice and guidance (e.g., Best Buy, Costco, Sears).
- ➔ **Online retailers:** Consumers order products online and receive them by mail. Online retailers include online-only retailers (e.g., *Amazon.com*, *Buy.com*), as well as online divisions of brick-and-mortar retailers (e.g., *BestBuy.com*, *Costco.com*).
- ➔ **Direct from manufacturer:** Manufacturers sell products directly to consumers via a website or retailer outlet. This option is available for most products, but is popular for



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computer manufacturers, where products are highly configurable and can be configured before shipment (e.g., Apple retail stores, *Apple.com*, *Dell.com*, *hp.com*).

- ➔ **Content service providers:** Products are provided or leased/rented by a third-party service provider. This is typical for companies adding connectivity services, such as Internet or cable television, that provide modems or set-top boxes (e.g., Comcast, DirectTV) to connect to this content.

Table 7.2 shows the sales channels for the consumer electronics products studied for this evaluation. In general, all of these products are available through the first three sales channels. While consumers typically get cable and satellite set-top boxes directly from service providers, they can buy some of these products, and IPTV set-top boxes, at brick-and-mortar stores. In addition, cable or DSL modems and routers are available via all four channels.

Table 7.2: Purchase Channels for Consumer Electronics Plug-Load Products, by Category

PRODUCT TYPE	RETAILERS		DIRECT FROM MANUFACTURER	CONTENT SERVICE PROVIDERS
	Brick-and-Mortar	Online		
Displays	X	X	X	
Audio	X	X	X	
Imaging	X	X	X	
Computers	X	X	X	
Set-top boxes				
Cable / satellite	X	X		X
IPTV	X	X	X	X
Game consoles	X	X	X	
Home network	X	X	X	X
Media players	X	X	X	
Back-up power	X	X	X	
Plug load management	X	X	X	

Source: Research into Action2010. Electronics and Energy Efficiency: A Plug Load Characterization Study – SCE0284.

One important aspect of manufacturers' direct sales is that manufacturers can control both the product offering and the distribution to consumers. Similarly, some online and brick-and-mortar retailers (e.g., Best Buy and Amazon) also privately label some products, which allows them to control both the product offerings and retail channel for those brands. This provides an important leverage point for midstream-focused incentive programs, as these retailers easily can influence the manufacturing specifications of their own brands.



Reported Places of Purchase for California Residents

The GPS of 928 homeowners and renters who reside in PG&E and SCE service territories found that 355 respondents purchased a television and 206 purchased a desktop computer over the previous two years. Nearly all respondents purchased their television from a retailer (93%) and most of these purchases were made at a brick-and-mortar retailer. The place of purchase for desktop computers was more diverse. Brick-and-mortar retailers still accounted for the majority of purchases (63%), but a nearly equal number of purchases were made at online retailers or direct from the manufacturer. Table 7.3 shows the weighted percent of respondents' reported places of purchase.¹¹⁰

Table 7.3: Reported Places of Purchase, TVs and Desktop Computers

PRODUCT TYPE	RETAILERS		DIRECT FROM MANUFACTURER	USED PRODUCT	CUSTOM BUILT	OTHER
	Brick-and-Mortar	Online				
TV	82%	11%	2%	4%	—	1%
Desktop Computers	63%	13%	10%	6%	3%	4%

Source: Research into Action 2012. General Household Population Study.

TECHNOLOGY OPPORTUNITIES AND TRENDS

This section covers the technical energy savings opportunities for the products listed in Table 7.2 and the trends that will influence each technology and savings potential for the post-2012 program cycles.

Technical Energy Savings Potential from New Product Sales

Table 7.4 shows annual unit energy consumption (UEC), estimated annual sales, and per-unit technical potential energy savings for a number of products for which data were available. The table also includes calculated values for annual dollar savings, total annual energy use, and total annual technical potential savings. The table includes a selection of products, rather than a comprehensive list of all consumer electronics products, in order to show how these values vary among products in the market.

¹¹⁰ Renters and younger respondents were slightly under-represented in the GPS sample. We applied post-stratification weights to the GPS survey sample to ensure that it appropriately represented the population in PG&E and SCE service territories.



It is important to note that this table summarizes total annual *technical* potential savings. An estimate of *achievable* savings would be lower. The magnitude of the difference would depend in part on the extent to which the market responded to the chosen intervention strategy for a specific product type.

Table 7.4: Summary of Technical Potential Savings

PRODUCT	ANNUAL UEC (kWh)	ESTIMATED ANNUAL SALES		ANNUAL PER-UNIT		TOTAL ANNUAL	
		All Sectors (California)*	Residential Sector (California)**	Technical Potential Energy Savings (kWh)	Dollar Savings (\$)	Energy Use (GWh)	Technical Potential Savings (GWh)
Televisions	160	4,320,000	2,428,999	108	\$15.12	691	467
Desktop computers	255	3,800,000	1,400,392	119	\$16.66	969	452
Monitors	83	6,900,000	—	49	\$6.86	573	338
Set-top boxes	197	3,500,000	—	49	\$6.86	690	172
Laptops	48	8,800,000	—	17	\$2.38	422	150
Game consoles	55	2,380,000	1,864,411	40	\$5.60	131	95
DVD/Blu-Ray	36	2,616,000	1,617,651	26	\$3.64	94	68
Laser printers	236	333,600	—	141	\$19.74	79	47
Cable /DSL modem	50	1,680,000	—	16	\$2.24	84	27
Multi-function devices	57	464,000	—	50	\$7.00	26	23
Wireless routers	42	1,032,000	—	14	\$1.96	43	14

Source: Sources and calculations are explained in Appendix C

* Total sales estimates are high-level sales for California and include both business and residential sector sales.

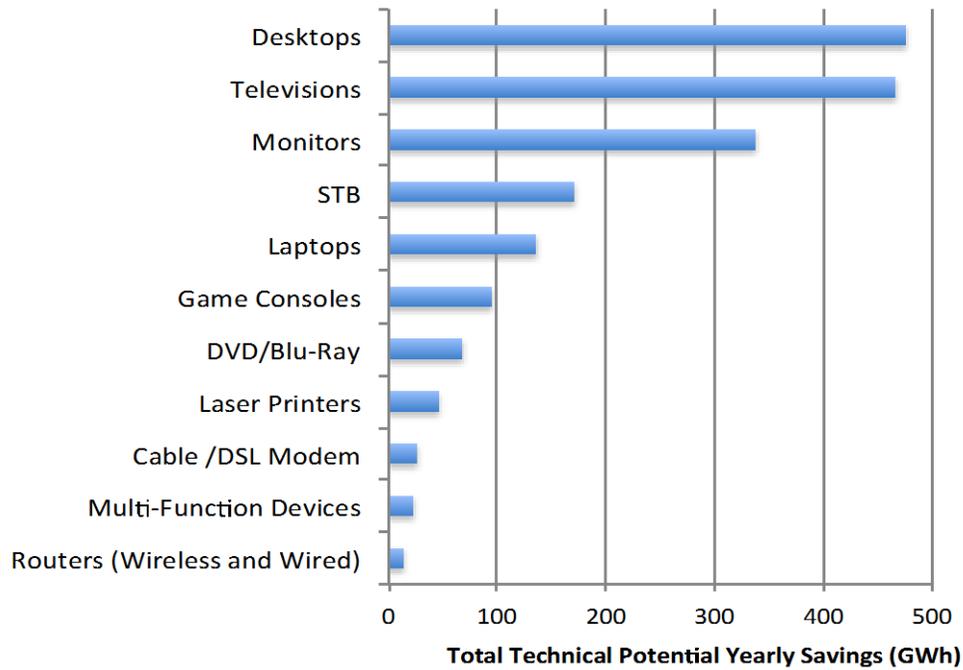
** Data from the 2012 GPS survey are used to estimate total residential sales.

Figure 7.1 compares the total annual technical potential savings across the products listed in Table 7.4. This figure illustrates one reason that most current consumer electronics programs are focused on desktop computers, televisions, and monitors, since they have the greatest technical potential savings. Although TVs and desktop computers have similar technical savings potential (467 GWh and 452 GWh respectively), TVs dominated BCE Program savings due to the higher rate of adoption of energy efficient televisions.



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Figure 7.1: Total Annual Technical Potential Savings of Consumer Electronics Products



Source: Table 7.4

As shown in Table 7.5, the technical potential savings from these products arise primarily from more efficient components and improved power management.

Table 7.5: Energy Savings Approaches for Technical Potential Savings Estimates

ENERGY SAVINGS APPROACH	EXAMPLES BY PRODUCT
More-efficient components	Backlights for monitors and televisions (e.g., LED, OLED) Processors for computers and other devices Power supplies for most devices Disk drives for computers and DVR set-top boxes Advanced toners for imaging
Improved power management	Deep sleep for set-top boxes Auto power down for game consoles Sleep for desktops Advanced port management for networking equipment Automatic brightness control for televisions

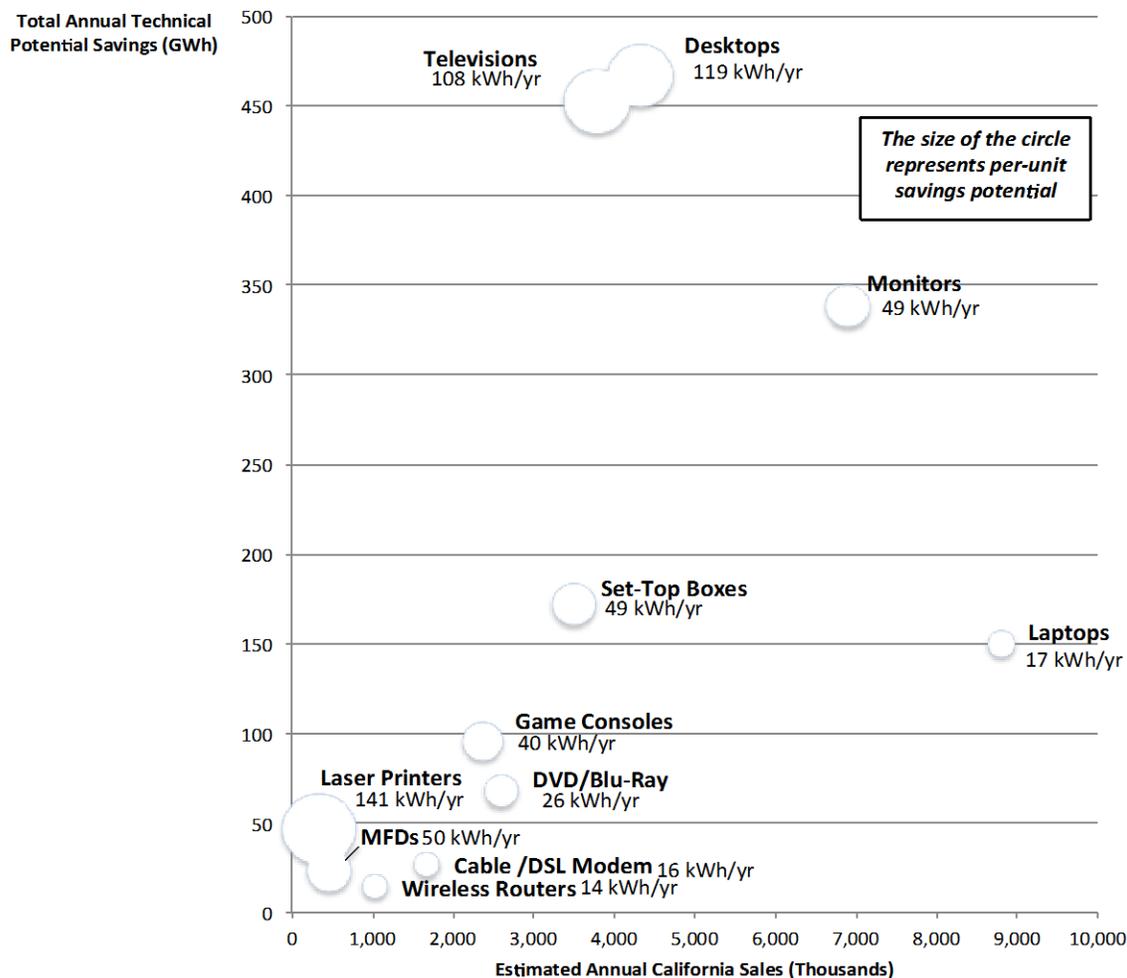
Source: LBNL 2011a. *Max Tech and Beyond: Maximizing Appliance and Equipment Efficiency by Design*. Lawrence Berkeley National Laboratory: Berkeley, California. (Report and accompanying tables) April 22, 2011.



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Figure 7.2 charts these data. The figure displays estimates of annual California unit sales on the x-axis and total annual technical potential savings on the y-axis, and uses markers that scale based on each product’s per-unit technical savings potential. Plotting these three parameters together shows which products offer promising savings opportunities. The figure again makes clear the higher savings potential of televisions, desktop computers, and monitors, and shows that set-top boxes and laptop computers have the next-highest technical savings potential.

Figure 7.2: Total Technical Potential Savings (GWh) Versus Annual Unit Sales



Source: Table 7.4

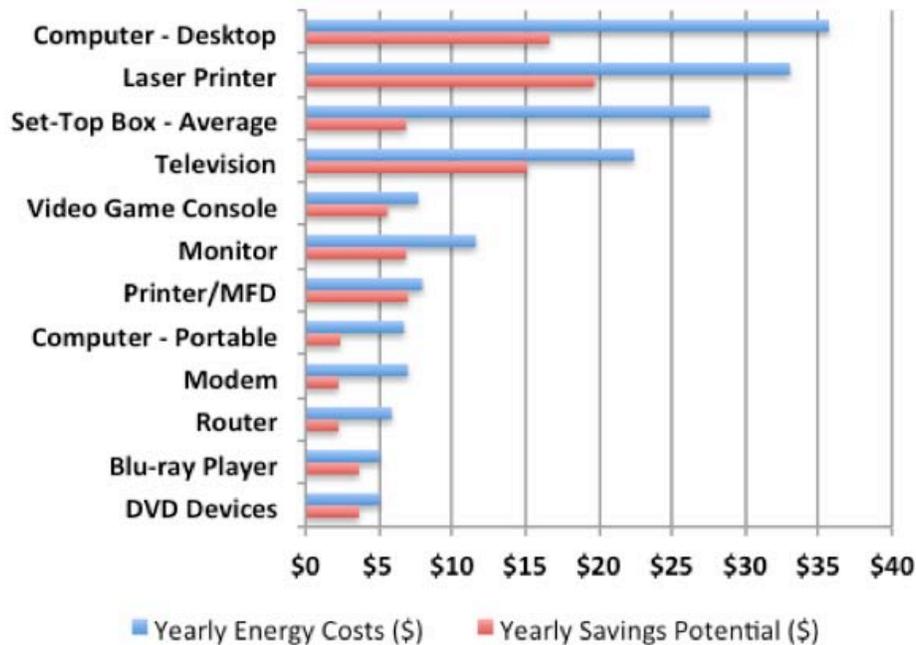
Figure 7.3 compares the energy use of each product to the potential savings. Savings in this figure are illustrated in monetary costs and savings to the end-user based on the average California residential rate in 2010. As the figure shows, although the potential savings from implementing energy efficient technology can be fairly large on a percentage basis, the dollar



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value of both the yearly energy consumption and the theoretical per-unit savings potential often is quite low. These savings are especially low when one considers the typical retail price of many of these products.

Figure 7.3: Per-Unit Energy Use and Theoretical Savings



Source: Table 0-3

Other Savings Potential

This research focused primarily on the energy savings potential of new sales of consumer electronics. Other opportunities for energy savings include the retirement of old, inefficient consumer electronics products, or in improving consumers' operation of their existing electronics products.

Set-top-boxes and televisions are products where the retirement of old devices could yield significant energy savings. For one, new models are more energy efficient than those produced five or more years ago. Also, the installed base of these devices is very high; approximately 70%



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of homes in the PG&E and SCE service territories have at least one cable or satellite set-top box and 96% have at least one television.¹¹¹

There are many other opportunities to save energy in existing consumer electronics products. Examples include: optimizing brightness settings on televisions, enabling power management on monitors and desktop computers, unplugging unused devices, and controlling unused devices with plug-load-management devices such as smart power strips.

Challenges to Achieving Energy Savings

Despite the many opportunities to increase the energy efficiency of consumer electronics products, a number of challenges affect their realization. These challenges include consumer usage behavior and settings during operation, and the effects of networked devices.

Many consumer electronics devices can be highly configurable, including many settings that affect their energy use. One example is power management settings for computers, monitors, and game consoles. While some of these devices (such as ENERGY STAR computers and monitors) are configured to default to low power settings after being idle for awhile, some users disable these settings to leave the product on continually.

Consumer behavior also can affect the energy use and savings of consumer electronics. For example, some people leave devices on a long time, even though they are not using them. In particular, some gamers will leave game consoles on so they can save their game to play later. There are little concrete data on this behavior,¹¹² which makes it difficult to estimate energy use and potential savings from more-efficient use of game consoles. Many consumers leave devices such as set-top boxes and networking equipment plugged in and running at all times, even though these products use almost full power, even when not in use. Many consumers with game consoles also use these high-powered devices to stream media over the Internet or watch DVDs, even though they may have other, more energy efficient options for these activities (e.g., smart televisions, IPTV boxes, DVD players).¹¹³

¹¹¹ KEMA. California Statewide Residential Appliance Saturation Study (RASS).

¹¹² Natural Resource Defense Council [NRDC] 2008. *Lowering the Cost of Play: Improving the Energy Efficiency of Video Game Consoles*. November 2008.

¹¹³ Research into Action [RIA] 2011a. *Energy savings Opportunities and Market Descriptions for Four Residential Consumer Electronics Products*.



Key Trends

The above characterizes current technical opportunities, but does not represent savings opportunities that will be achievable in the post-2012 program cycle. The UECs of many consumer electronics devices have declined as new products reach the market. Two examples of this are the measured downward trends in UECs for televisions and set-top boxes. This decline largely is driven by technological advances that are, in turn, driven by consumer preference and by pressure from multiple federal and region-specific energy efficiency programs and advocates (e.g., ENERGY STAR, utility-sponsored programs, etc.).

The changing UEC of products in the market is important, as this defines the baseline against which energy savings are measured. It also indicates the potential for additional energy savings. Therefore, it is likely that, as the UEC of a product drops, so will the per-unit technical potential energy savings.

Technology Trends

The research revealed a number of underlying technology trends in consumer electronics. This research suggests that technological advances are being driven by trends toward smaller form factor designs and by the prevalence of low-power technologies designed for mobile applications. These changes have increased power supply efficiency, reduced standby power, increased the use of LEDs, and improved power management and low-power settings.

➔ **Smaller form factors.** Many consumer electronics device manufacturers are designing products to be physically smaller, while maintaining the same level of functionality as older, larger units. Larger, inefficient products produce excess heat – which wastes energy. Smaller, more energy efficient products not only save energy, but operate more quietly, because they do not need powerful – and loud – cooling fans. Examples of trends toward smaller form factors include:

- Thinner flat screen televisions¹¹⁴
- Reduced size and power use of set-top boxes (Figure 7.4)
- Increased market share of mini-PCs.¹¹⁵

¹¹⁴ IMS Research 2011a. "IMS Research Identifies Key CE Trends for 2011." (Press Release) January 26, 2011. http://imsresearch.com/news-events/press-template.php?pr_id=1874

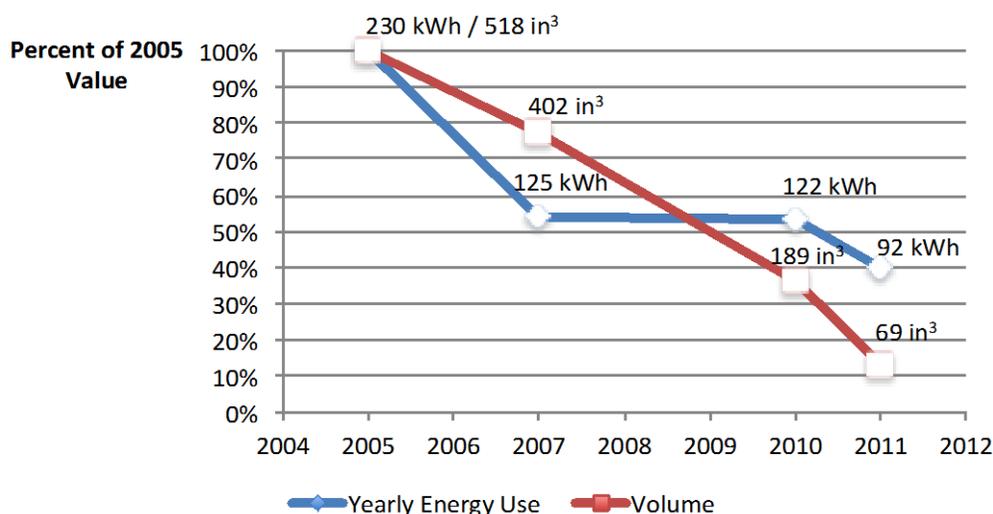
¹¹⁵ Research into Action 2011a. *Energy savings Opportunities and Market Descriptions for Four Residential Consumer Electronics Products.*



➔ **Increased mobility.** More-efficient technologies increase the life of the batteries in mobile devices. As sales of mobile devices rise, the cost of more efficient components can drop. As the price falls, these more efficient components can be integrated into non-mobile device designs. Examples include:

- LCD displays migrating from laptops to desktop monitors and televisions
- Efficient processors migrating from laptops to desktops.

Figure 7.4: UEC (kWh) of DirecTV High Definition Set-top Boxes



Source: DirectTV. 2011. "ENERGY STAR Partner Meeting Set-top Box Discussion." (Presentation from ENERGY STAR Partner Meeting) November 10, 2011. <http://www.energystar.gov/ia/partners/downloads/meetings/2011/How%20to%20Partner%20w%20ES%20to%20Promote%20STB.pdf>

➔ **Consolidation of capabilities.** New consumer electronics products include a variety of innovative capabilities and products with multiple functions, which quickly are replacing single-function devices. According to the Consumer Electronics Association (CEA), the number of devices per household has decreased from 25 to 24 from 2010 to 2011, in part because of this consolidated functionality.¹¹⁶ Examples include:

- Growing IPTV capability in televisions (IMS 2011a)

¹¹⁶ CEA 2011a. "American Households Spend More Than \$1,100 Annually."



- Game consoles used for DVD/Blu-Ray viewing¹¹⁷ or IPTV streaming¹¹⁸
- Ascendancy of multi-function devices (MFDs) in imaging equipment over single-function devices.¹¹⁹

➔ **Unclear incremental cost of more-energy efficient components or technologies.**

Increased energy efficiency often can be bundled with other features and benefits. It also can cost less to manufacture energy efficient products than less efficient options. As a result, it is difficult to identify the incremental cost of energy efficiency alone. In other cases, there is no or negative incremental cost. A recent Lawrence Berkeley National Laboratory (LBNL) report on televisions noted, “There are only a few technology categories where the relationship between efficiency improvement and corresponding incremental cost is clear.”¹²⁰ More specific examples of unclear incremental cost include:

- LED televisions providing and being sold based on improved performance, not energy efficiency
- Features such as smaller form factors (e.g., set-top boxes) and increased mobility (e.g., laptops) being bundled with energy efficiency

Usage Trends

Three trends in consumer product usage – *device mobility*, *content streaming*, and the *interconnection of devices* – are leading a shift toward more efficient consumer electronics.

- ➔ **Consumers using mobile devices.** There is a shift from devices that require an uninterrupted electrical connection, such as desktop computers, to much more mobile device, such as laptops, tablets, and smartphones. Figure 7.5 shows the declining market share of desktop computers. Tablets are predicted to outsell desktops by 2013.
- ➔ **Increase in IPTV capability and the streaming of media content.** More devices are including the ability to stream Internet content (e.g., music, video, television), which allows consumers to stream more content into their homes without relying on pay-TV services (e.g., cable and satellite). Supporting evidence of this trend includes:

¹¹⁷ Natural Resource Defense Council [NRDC] 2008. *Lowering the Cost of Play*.

¹¹⁸ RIA 2011a. *Energy Savings Opportunities*.

¹¹⁹ Ibid

¹²⁰ LBNL 2011b. *TV Energy Consumption Trends and Energy-Efficiency Improvement Options*. LBNL-5024E. Lawrence Berkeley National Laboratory: Berkeley, California. July 1, 2011. <http://www.superefficient.org/~media/Files/SEAD%20Televisions%20Technical%20Analysis.pdf>



- Growing IPTV capability in televisions¹²¹
- Access to streamed content through game consoles by 20% of consumers¹²²
- Predicted increases in consumers' use of IPTV over cable¹²³
- Ten percent of households said they were “likely” or “very likely” to cancel pay-TV service,¹²⁴ although it is unclear how these intentions will translate to actual cancellation of service.¹²⁵

¹²¹ IMS Research 2011a. “IMS Research Identifies Key CE Trends”

¹²² RIA 2011a. *Energy Savings Opportunities*.

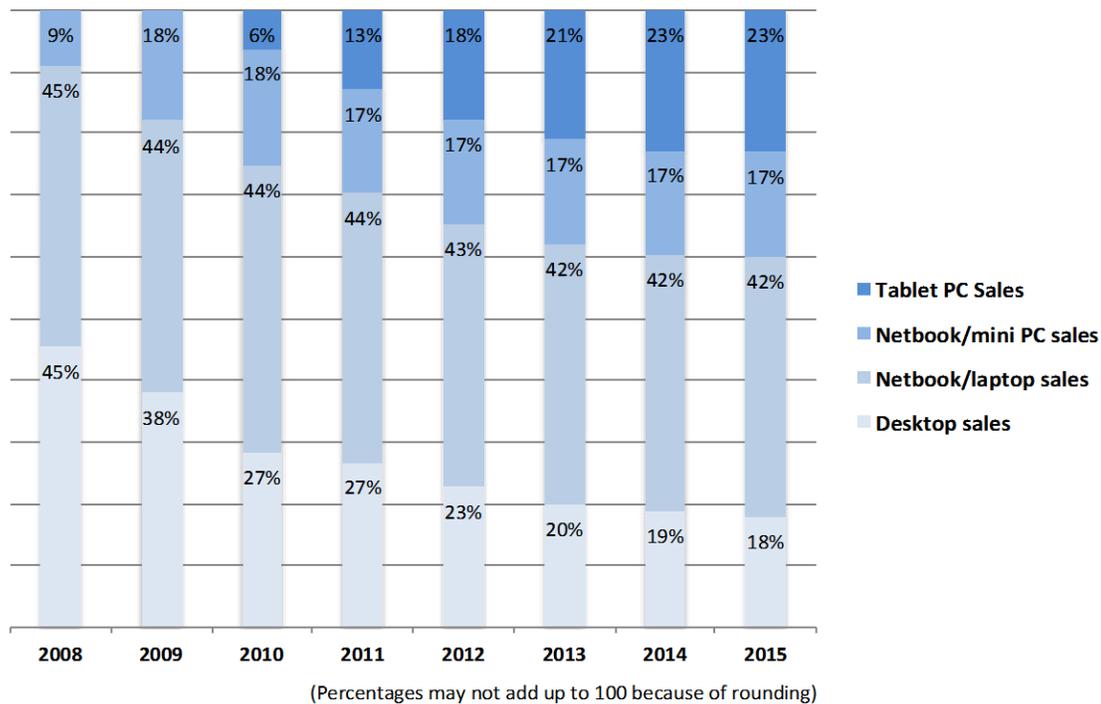
¹²³ AFP. “Streaming to overtake cable in 3-5 years: Netflix.” December 2011.
<http://www.google.com/hostednews/afp/article/ALeqM5jgzuhnaMZrczZqpMUH32at9I93uw?docId=CNG.afdd07c7dff397072b27a36860c352ca.6c1>

¹²⁴ CEA 2011b. “CEA Study: Consumers Are Tuning Out Over-the-Air TV.” (Press Release) May 31, 2011.
http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=12105

¹²⁵ RIA 2011a. *Energy Savings Opportunities*.



Figure 7.5: Share of US Consumer PC Sales By form Factor, 2008 to 2015



Source: TechCrunch. June 17, 2010. "Forrester Projects Tablets Will Outsell Netbooks By 2012, Desktops By 2013." Retrieved from: <http://techcrunch.com/2010/06/17/forrester-tablets-outsell-netbooks/>.

➔ **Increased interconnection of devices.** Recently, consumer electronics were stand-alone devices with direct (wired) connections to other devices and were controlled directly through an interface on the device or a remote control. Today, devices often are connected to create more complex systems for content delivery and control.¹²⁶ For example, new devices can distribute content wirelessly to a variety of devices in the home, and mobile devices (smartphones, tablet computers, etc.) can control these systems. This content can be streamed through home networks or directly between devices. The energy efficiency community is interested in how such products interact and the effect these systems have on plug loads. For example, the connection of particular devices can reduce efforts to use power management to save energy, because one active

¹²⁶ LBNL 2011c. "Trends and Opportunities in Networks and Consumer Electronics". (Presentation from ENERGY STAR Partner Meeting) November 10, 2011. http://www.energystar.gov/ia/partners/downloads/meetings/2011/Market%20Trends%20for%20CE_Brown.pdf



device can prevent another device in the network from powering down. For this reason, energy efficiency advocates, such as LBNL, are pressing for technical solutions to allow devices to remain active only when they actually are being used, even when they are connected to other active devices.¹²⁷ Consumer electronics manufacturers also are focusing on the potential for smart grid-connected devices to increase market-share over the next few years.¹²⁸

Figure 7.6 depicts several of the technology and usage trends described above, specifically those that relate to accessing information and entertainment content in the home. This figure shows the connections between devices, including wired connections (indicated by solid lines) and wireless connections (indicated by blue stratified lines). These lines connect the *content* users want to access (e.g., video, audio, information) to the *output* devices users use to experience this content (e.g., televisions/monitors, A/V equipment, printers). *Gateways* (e.g., set-top boxes and wireless routers) then relay and distribute this content. The figure illustrates three scenarios that depict some of these technologies and usage trends over time. The shrinking size of the illustrations mirrors the simplification and concentration of both products and networks.

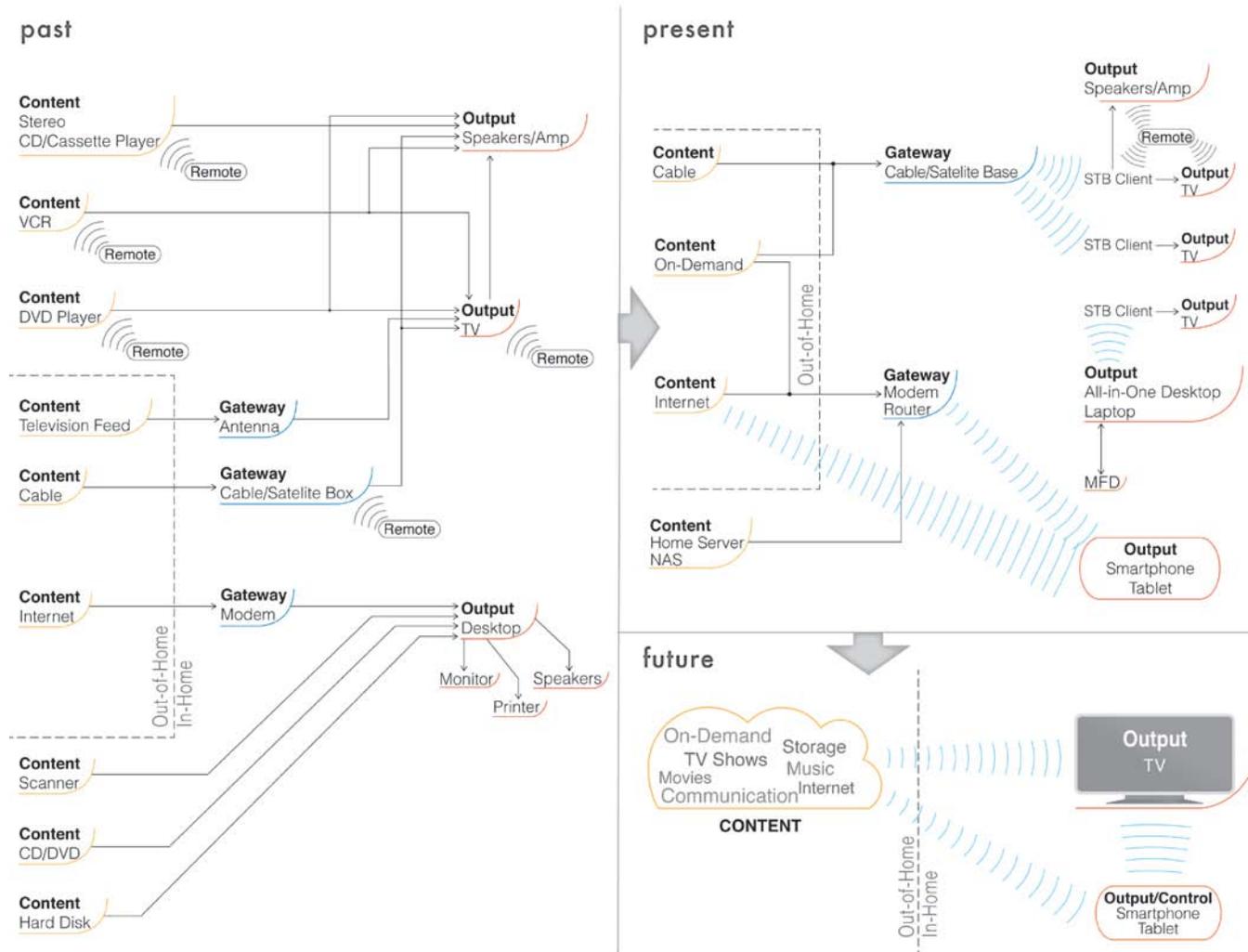
- ➔ **Past:** The left panel of the figure illustrates a direct connection from a number of single-function devices (e.g., VCR, DVD player, cable box) to a few select output devices (speakers, television, desktop computer).
- ➔ **Present:** The top right panel of the figure illustrates a current (or near future) model, in which device capabilities are more consolidated, or integrated, and users are using MFDs, all-in-one computers, and mobile devices (smartphones and tablets). Increasingly, these devices are inter-connected and able to move content to multiple devices (including multiple televisions) on wireless networks.
- ➔ **Future:** The bottom left panel of the figure illustrates a simplified and extreme example of the longer-term effect of these trends on how consumer electronics products might be used and integrated in the home. In this example, a television and smartphone/tablet serve as the primary sources for information and entertainment in the home, with most content accessed wirelessly from outside the home.

¹²⁷ LBNL 2011d. "Energy Efficient Digital Networks." (Webpage) 2011. <http://efficientnetworks.lbl.gov/>

¹²⁸ CNET 2011. "CES: Smart grid outshines green tech at CES." January 9, 2011. http://ces.cnet.com/8301-32254_1-20027935-283.html



Figure 7.6: The Changing Landscape of Consumer Electronics in the Home



Trends by Product

A review of selected individual products revealed a number of other key trends for some of the studied products (Table 7.6). The evaluation team selected products for this analysis based on available data and level of activity. Sales and UEC trends are mostly predictive inferences derived from multiple sources. The evaluation team excluded some products for further analysis because they could not identify strong or consistent trends. Where possible, the table includes a numerical indication of the trend and a reference to support the trend.

The analysis presented in Table 7.6 supports the broader trends in the industry discussed above. The notable findings are:

- ➔ The ENERGY STAR program is promoting energy efficiency on a national level for all of the products covered in this analysis.
- ➔ Most products have a predicted UEC drop due to changing form factors, technological advances, and the efforts of the ENERGY STAR program and the California Energy Commission (CEC). Game consoles have an unknown UEC trend, as the next generation of consoles has not been released.
- ➔ Product sales exhibit a mixed trend; some products are phasing out of the market, some will stabilize in the near future, and other product markets are growing.



Table 7.6: Trends in Sales and UEC for Selected Products

PRODUCT	TRENDS	NOTES	BASELINE ACTIVITY
Audio equipment	Sales ?	Unclear trend. Sales of MP3 docking stations are increasing. Powered speakers may be emerging as a popular television accessory.	The ENERGY STAR AV Equipment version 2.1 specification took effect in 2010; Tier 3 will take effect in March 2012.
	UEC ?	Unclear trend. Product has a low UEC. ENERGY STAR may push incremental gains.	CD players covered by the 2007 Title 20 specifications
Desktop computers	Sales ↘	Market share dropping compared to laptops and tablets	ENERGY STAR Version 6 expected in late 2011
	UEC ↘	Shrinking form factors and migration of laptop technologies into desktops continually increase energy efficiency. ENERGY STAR and proposed codes continue to drive the market.	"Non-expandable" desktops (e.g., small form factor and all-in-ones) covered by TopTen USA Title 20 proposal is under consideration.
DVD / Blu-ray players	Sales ↘	The number of physical disc buyers has decreased by 22 million since 2009.	The ENERGY STAR AV Equipment version 2.1 specification took effect in 2010, with Tier 3 to take effect in March 2012.
	UEC ?	Unclear trend. Product has a low UEC. ENERGY STAR may continue to drive the market.	DVD players/recorders covered under the 2006 Title 20 specification
Game consoles	Sales ↗	Sales expected to grow, with new generation of consoles entering the market as early as 2012.	ENERGY STAR developing manufacturer recognition program to launch in 2012. Program will recognize manufacturers that meet specification levels.
	UEC ?	Unclear trend. New generation will be more powerful, but consoles are becoming more efficient. Unclear if power management will improve or what the effect of the ENERGY STAR recognition program will be.	
Laptop computers	Sales ↗	Market share increasing relative to desktops.	ENERGY STAR Version 6 expected in late 2011
	UEC ↘	Better batteries and smaller, more powerful CPUs that emit less heat continue to drive down energy consumption, along with implementation of LED-backlit LCDs and solid-state hard drives. ENERGY STAR and proposed codes continue to drive market.	Title 20 proposal under consideration

Continued

PRODUCT	TRENDS	NOTES	BASELINE ACTIVITY
Monitors	Sales ?	Unclear trend	Version 6 ENERGY STAR Specification expected to take effect at the end of 2012 Covered by TopTen USA Title 20 proposal is under consideration.
	UEC ↘	LED adoption, ENERGY STAR, and proposed codes continue to drive the market.	
Multi-function devices	Sales ↗	MFDs replacing single-function devices such as printers, scanners, and fax machines.	ENERGY STAR Version 2 expected to take effect in Q3 2012
	UEC ↘	ENERGY STAR continues to drive the market.	
Network Equipment (Modems and Routers)	Sales —	Sales of network equipment expected to flatten.	New ENERGY STAR specification under development. Title 20 proposal is under consideration Active DOE standard development
	UEC ?	Low UEC. ENERGY STAR and proposed codes may push incremental gains.	
Set-top Boxes	Sales ↘	Set-top box shipments to advanced markets are expected to drop 5% -10%.	ENERGY STAR has generated a partner agreement with service providers and the Version 4 specification is expected to take effect in 2013. Title 20 proposal is under consideration. Active DOE standard development
	UEC ↘	Manufacturers are responding to the new ENERGY STAR specification for savings of 30%. ENERGY STAR and proposed codes will continue to drive the market.	
Televisions	Sales —	Saturation of flat panels is high; sales expected to level. Increase in sales of large televisions and smart televisions.	New ENERGY STAR Version 6 expected in 2012 Title 20 proposal under consideration Active DOE standard development
	UEC ↘	UEC has been steadily dropping since 2006. LED backlights, ENERGY STAR and proposed codes will continue to drive the market.	
Ups	Sales ↗	Residential and small business markets growing	New ENERGY STAR specification expected to take effect in April 2012 Title 20 proposal under consideration
	UEC ↘	New ENERGY STAR specification may drive market customers are motivated to save energy. UPS systems are integrating smart power management features, merging a traditional UPS and a smart power strip.	

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MARKET ANALYSIS

This section describes influences on energy efficiency in the consumer electronics market, including voluntary specifications, mandatory standards, manufacturers, and retailers.

Efficiency Intervention Types

There are many market interventions acting on the consumer electronics market that are external to the BCE Program. It is important to understand these interventions and their attempted influence on the markets in which these products are sold. This section reviews both the *intervention point* in the market (where in the supply chain the intervention is applied by the market actor) and *point of influence* in the market (where in the market this influence is felt), because these two are not always the same. For example, in an upstream markdown program, the intervention is applied through manufacturers, but is aimed at influencing customers to buy products that are energy efficient.

Market Intervention Point

Market interventions are intended to target one or more points in the product supply chain. These interventions typically are defined as “upstream,” “midstream,” and “downstream.”

- ➔ **Upstream:** Upstream market interventions target product manufacturers. Examples include financial incentives for more efficient components or “golden carrot” approaches for highly efficient new models.
- ➔ **Midstream:** Midstream market interventions target the distributors (retailers or service providers) that ultimately sell the products to consumers. BCE uses this model – it pays incentives to retailers to influence them to stock energy efficient models.
- ➔ **Downstream:** Downstream market interventions target the consumers who buy and use the products. For example, downstream programs may offer consumer-focused rebates or discounts for energy efficient products and home energy reports in order to change consumers’ behavior to decrease their energy use at home.

Points of Influence

The points of influence of the various market interventions summarized above can be categorized as follows:

- ➔ **National sales:** Influences that affect the availability and sales of products relatively equally across the country. Examples include the ENERGY STAR program and BCE Program incentives targeted at national retailers. In addition, national DOE standards would also affect national sales.



- ➔ **Regional sales:** Influences that affect the availability and sales of products for a particular multi-state region (e.g., the Northwest, the Midwest, etc.), state, or local region (e.g., utility service territory). Examples of these are downstream customer rebates for which only customers within a specific area or service territory are eligible. In addition, state standards (such as the Title 20 standards in California) directly affect only sales in California.
- ➔ **Consumer usage:** Influences that extend into the home and change the way customers configure or use these products. Examples include marketing programs targeted at consumer usage, home energy audits that may provide usage tips, or home energy reports that attempt to address usage by providing information to consumers on their energy usage compared to other similar households.

Table 7.7 provides a high-level overview of market interventions according to these definitions. In some cases (e.g., incentives to retailers), the market intervention can exert influence at different points in the product supply chain; these are listed more than once in the table.

Table 7.7: Market Intervention and Points of Influence

INFLUENCE ON THE MARKET	ACTING POINT IN THE MARKET		
	Ups tream	Mids tream	Downs tream
National sales	ENERGY STAR product specifications	Incentives to national retailers	National marketing campaigns
	National and state standards	Retailer and content providers' purchase guidelines and goals	Other energy efficient specifications (e.g., TopTen USA)
	Incentives to manufacturers	Retailer POS marketing	
Regional sales	State standards	Incentives to local/regional retailers	Incentives to consumers
	Incentives to manufacturers		
Consumer usage	ENERGY STAR information requirements for user manuals, etc.	Retailer in-home set-up and calibration services	Consumer marketing and educational campaigns
			Home energy audits
			Home energy reports

Consumer Electronics Market Influences

Table 7.8 summarizes the types of market influence in the consumer electronics market and the organizations that sponsor these efforts.



Table 7.8: Summary of Consumer Electronics Market Influences

MARKET INFLUENCE	DESCRIPTION	RESPONSIBLE MARKET ACTOR(S)
ENERGY STAR product specifications	Technical specifications for manufacturers to use the ENERGY STAR logo	U.S. EPA
Other product specifications	Other energy efficiency specifications for products (e.g., TopTen USA)	Various sponsors
ENERGY STAR user information requirements	Specifications for publication of ENERGY STAR information in product manuals	U.S. EPA
National marketing campaigns	Nationwide consumer-focused energy efficiency information and marketing materials	U.S. EPA, and other organizations (e.g., CNET.com, National Resources Defense Council (NRDC))
National standards	Mandatory energy efficiency requirements for products sold in the U.S.	U.S. DOE
California State Standards (Title 20)	Mandatory energy efficiency requirements for products sold in California	California Energy Commission
Incentives to manufacturers	Incentives for energy efficient products	BCE Alliance members
Incentives to national and regional retailers	Incentives to stock and sell energy efficient models	BCE Alliance members and other utilities
Point-of-sale (POS) marketing	Marketing materials included in the store or on product pages to influence the purchase of energy efficient models	Retailers and BCE Program sponsors and other utilities
Regional marketing	Marketing to influence the purchase of energy efficient models in a region	BCE Programs and other utilities, and regional advocacy organizations
Purchase guidelines and goals for retailers and content providers	Corporate goals and commitments for some retailers and service providers to sell a certain percentage of energy efficient products	Retailers and content providers
Incentives direct to customers	End-user incentives to influence the purchase of a more energy efficient model	Other utilities
Retailer product set-up and calibration programs	Product set-up and calibration services that can affect energy consumption	Retailers

Table 7.9 summarizes voluntary efficiency specifications and mandatory efficiency standards by product. The figure shows current criteria and criteria under development in bold. This table shows that ENERGY STAR is actively engaged with all of these products and is working to develop new criteria that will take effect one to three years after the current criteria expire. EPA also has created a new *Most Efficient* designation for televisions. In addition, California's Title 20 already has or is considering criteria for seven of the nine product types highlighted in this figure.



Table 7.9: Summary of Specifications and Standards

PRODUCT TYPE	CATEGORIES	ENERGY STAR	OTHER
Audio equipment and disc players	Home theater, audio docks, powered speakers, DVD/Blu-Ray	2.1 (2010) 3.0 (2012)	Title 20 (2006 for DVD, 2007 for CD)
Computers	Desktops and notebooks	5.0 (2009) 6.0 (2011)	TopTen (Desktops), Title 20
Game consoles		Manufacturer Recognition Program (2012)	Title 20
Monitors		V5.0 (2009) 6.0 (2012)	TopTen, Title 20
Imaging	Printers, scanners, fax, MFDs	V1.0 (2009) V2.0 (2012)	
Network equipment	Modems and routers	Test Procedure (2012)	Title 20, DOE
Televisions		V5.0 (2011), V6.0 (2012) , Most Efficient (2011, 2012)	TopTen, FTC Label, Title 20, DOE
Uninterruptible power supplies		V1.0 (2012)	Title 20
Set-top boxes	Cable, satellite, OTT, DVR/non-DVR	Partner agreement (2011), V3.0 (2011), V4.0 (2013)	Title 20, DOE

Note: Specifications and standards in bold are under development.

Sources: U.S. EPA 2011. Product development pages for select products. Accessed at <http://www.energystar.gov/productdevelopment/> on ____date

U.S. Department of Energy (DOE). 2012. "Appliances & Commercial Equipment Standards: Televisions." http://www1.eere.energy.gov/buildings/appliance_standards/residential/tv_sets.html

California Energy Commission. 2009. Appliance Efficiency Rulemaking Staff Report. California Energy Commission: Sacramento, California. Retrieved from http://www1.eere.energy.gov/buildings/appliance_standards/residential/tv_sets.html.

TopTen USA. Website. <http://www.toptenusa.org/>

Other programs and standards are active in the consumer electronics arena, such as TopTen USA for computers, monitors and televisions. The Department of Energy (DOE) also is considering standards for network equipment, televisions, and set-top boxes. The Federal Trade Commission (FTC) has mandated energy labels for all televisions manufactured after May 10, 2011. While the magnitude of the effect of these efforts is unclear, they are increasing pressure on manufacturers and retailers to improve the energy efficiency of their products.

ENERGY STAR

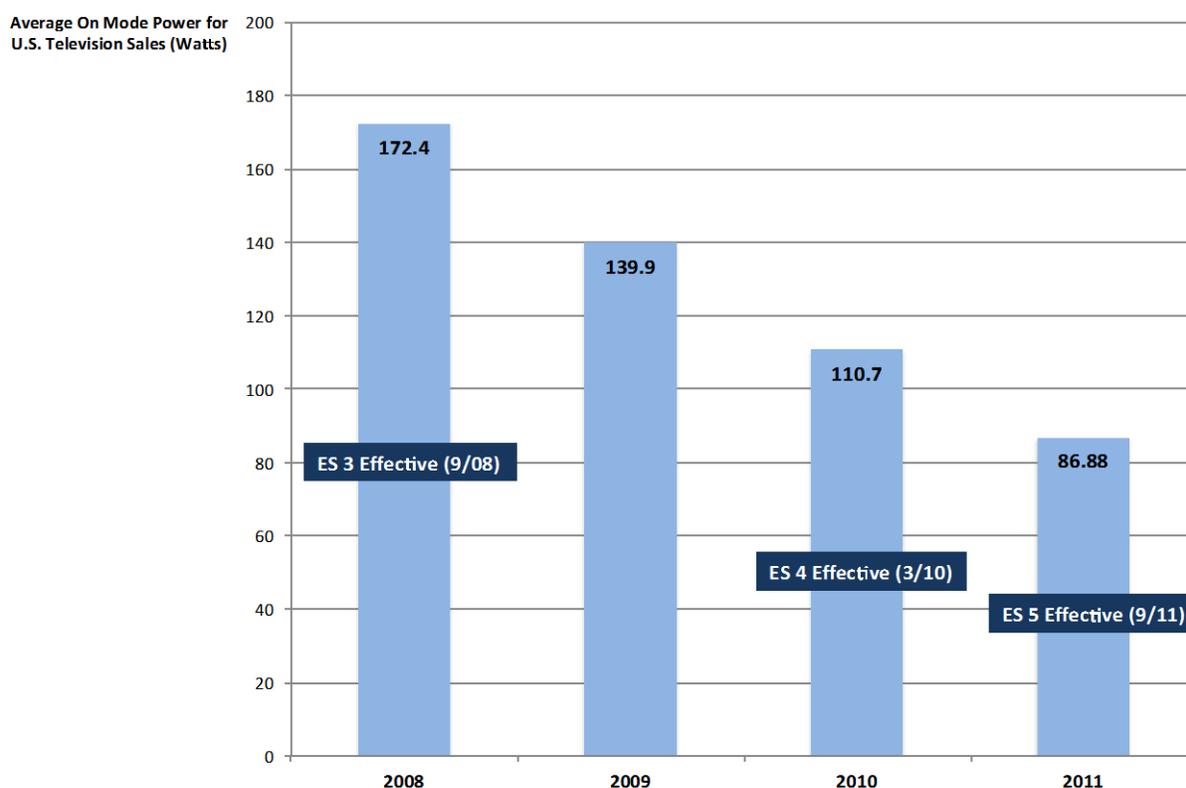
The ENERGY STAR program has focused on consumer electronics since it began addressing desktop computers in 1992. Since then, ENERGY STAR has added specifications for most of the product types covered under this research, and created the ENERGY STAR *Most Efficient* designation, which stipulates specification levels exceeding the standard ENERGY STAR levels.



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While ENERGY STAR initially focused on standby power and power management, efforts since 2005 have focused on *on-mode* power consumption. The EPA has had to start revising specifications more frequently to attempt to stay ahead of the market, as the power use of some of these products has been decreasing rapidly. Figure 7.7 shows an example of this: the decrease in the yearly average *on mode* power consumption for televisions since 2008 and the effective dates of new ENERGY STAR specifications. While recent trends, such as the sales of large screens and smart televisions, may boost television power consumption, past trends have shown that overall efficiency gains have compensated for increases in functionality to continue to drive down the energy consumed by these products.

Figure 7.7: Average On Mode Power Consumption (Watts) for U.S. Television Sales (2008-2011)



Source: PG&E data provided 4/18/2012.

ENERGY STAR has a target market penetration rate of 25% of products on the market when a new specification takes effect. As this qualification rate increases, the EPA works to revise the specification to make it more stringent. As indicated in Table 7.9, the EPA is revising specifications that are expected to take effect before the next program cycle. Current market penetration rates for many of these products are high, and these will be expected to drop once the new specifications take effect. However, the starting market penetration rate can be higher than the target 25% for this market, because some electronics technologies and markets move quickly.

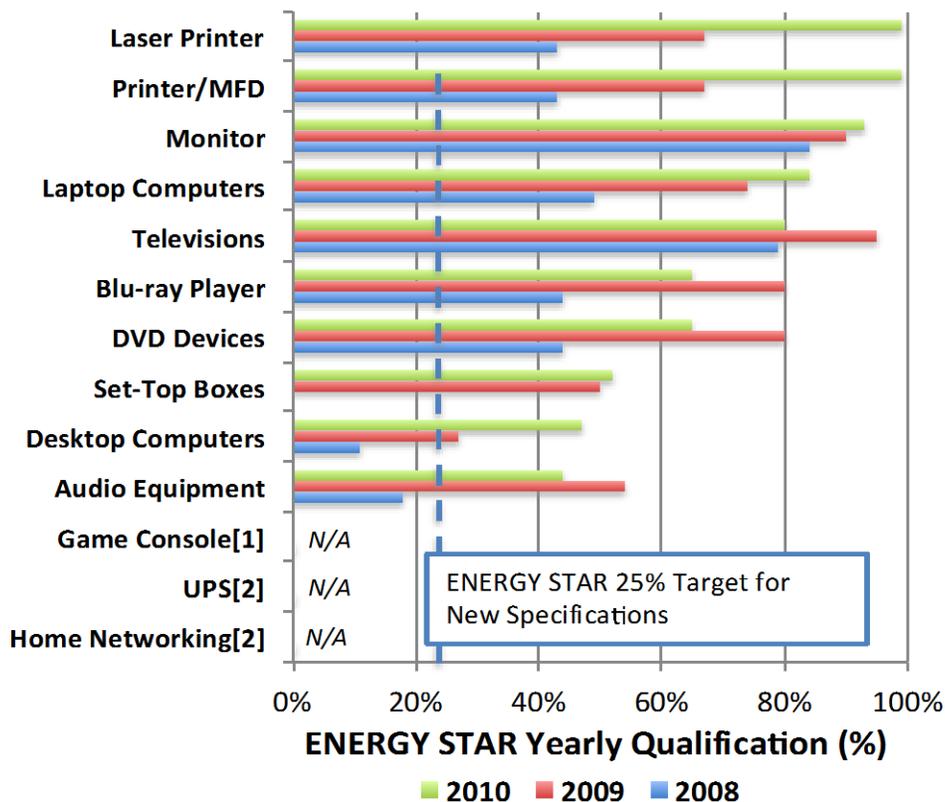


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Qualification rates are expected to increase as natural technology changes and manufacturers’ responses to the specifications reduce product UECs.

Figure 7.8 illustrates the market penetration rates of many ENERGY STAR consumer electronics products for the calendar years 2008 to 2010 (the last year for which data were available). Penetration of some products rises steadily over the three years, while others increase and then decline due to implementation of a new specification. The majority of these products have high penetration rates (well over 50%) in 2009 and 2010. This indicates that the specification is not highlighting the top of the market, but instead includes the majority of models on the market. This is despite the fact that new specifications for most of these products took effect in this time period. This figure displays the challenges ENERGY STAR faces to keep up with rapid technological changes in this market.

Figure 7.8: ENERGY STAR Penetration Rates (2008 – 2010)



Sources: U.S. EPA 2010. ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2010 Summary. 2010. http://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2010_USD_Summary_Report.pdf
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California Title 20

The new California Title 20 proposals for consumer electronics products, which were published in October 2011, are of particular importance to program design in California. These proposals include documents for computers, displays (e.g., monitors), game consoles, set-top boxes, and small networking equipment. The California IOUs, manufacturers, and retailers helped develop the standards. Table 7.10 displays a summary of these proposed standards.

Table 7.10: Summary of Title 20 Specifications

PRODUCT TYPE	PROPOSED STANDARD
Set-top box and small networking equipment	Based on savings from requiring a 5W deep sleep when not in use Small network equipment efforts would help establish an ENERGY STAR test procedure for these products.
Game consoles	Based on a two-tier standard (2014 and 2016) for video game consoles, including auto-power-down requirements and power limits for modes other than <i>active game play</i> Would be based on a draft test procedure available from ENERGY STAR
Computers	Based on total energy consumption (TEC) requirements, power management enabling, and power supply efficiency for desktops and notebooks.
Monitors	Based on maximum active and sleep power requirements that are 40% more stringent than ENERGY STAR 5.1 active levels.

Source: California Energy Commission 2011a. *Title 20 proposals*.

Manufacturers and Retailers

The main consumer electronics market actors are the manufacturers that produce the products and the retailers that typically sell the product to the end-user. These market actors drive innovation through the typical retailer cycles to the market.

Manufacturer Product Innovations

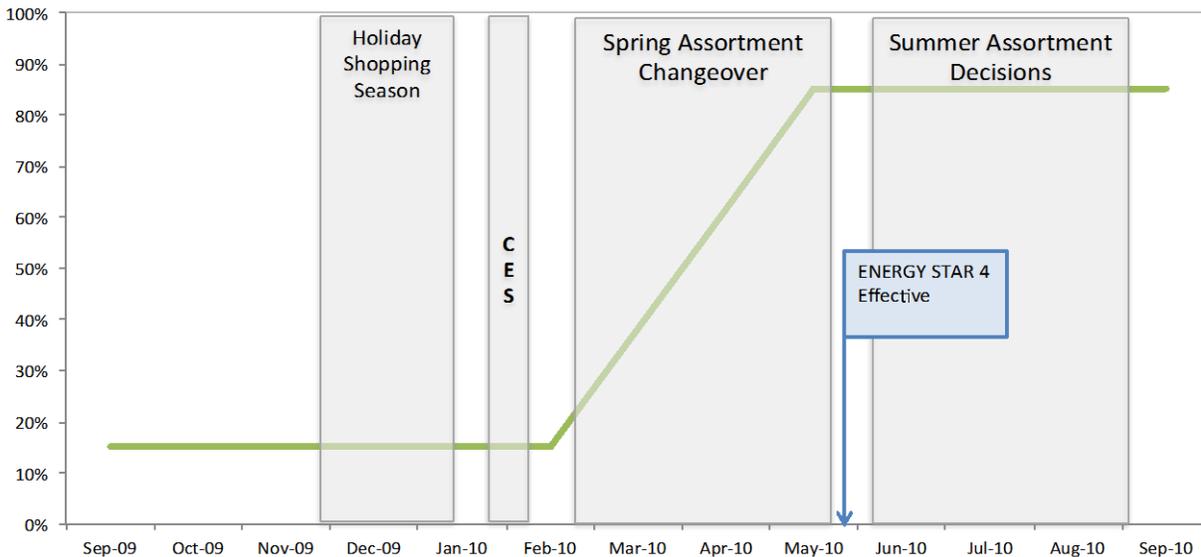
The development and release of new technologies into the market can result from competition between product manufacturers to develop the most cutting-edge products that respond to detailed consumer market research. Manufacturers often present new products at trade shows, such as the yearly Consumer Electronics Show (CES) in early January, or through public press releases or company events.

Retail Cycle

Many consumer electronics products have a short retail changeover cycle; the available models for retailers can turn over in as few as 6 to 12 months. This cycle can lead to the rapid adoption of new technologies and therefore a high penetration of models that meet energy efficiency specifications or standards. Figure 7.9 provides an example for televisions, taken from a 2011 evaluation of the NEEA Television Initiative.



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Figure 7.9: Change in ENERGY STAR 4 Market Penetration for 2010 Assortment Changeover

Source: EMI 2011. Consumer Electronics Television Initiative Market Progress Evaluation Report.

Note: These data have been smoothed to demonstrate the dramatic increase in average market share from late 2009/early 2010 to the summer of 2010.

There is a complete changeover of television models every spring. The figure shows the dramatic effect of the retail changeover cycle for televisions on the penetration rate of televisions that met the ENERGY STAR 4 specification from fall 2009 to fall 2010. The market share of ENERGY STAR 4 televisions rose from approximately 15% to approximately 85% between February and May 2010.

Customer Purchasing Trends

It is important to characterize the trends in the consumer electronics product markets to explicate how Californians will acquire these products through the end of the next program cycle. The research revealed the broad trends described below. The net result of these trends is a shift in how consumers buy these products. While the market share of big-box national retail chains has increased in the past at the expense of smaller regional chains and privately owned stores, the floor space for consumer electronics at these big-box stores is declining due to increases in online shopping. Besides purchasing products online, consumers are also using the Internet to



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research these products, including browsing for products on mobile devices while at a brick-and-mortar location.

- ➔ **Growth in online shopping.** While consumers still prefer to use brick-and-mortar retailers to buy major, end-use-specific appliances (e.g., refrigerators), they feel more comfortable buying lower-cost items without browsing in a physical location.¹²⁹ E-commerce is an important sales channel for consumer electronics, since 20% to 34% of consumers reported being “very” or “extremely likely” to buy various consumer electronics online.¹³⁰ U.S. online retail is forecast to experience a 10% compound annual growth rate (CAGR) from 2010 to 2015.¹³¹
- ➔ **Shrinking consumer electronics floor space.** Brick-and-mortar stores such as Wal-Mart and Best Buy are reducing floor space for consumer electronics. This has been attributed to: products becoming much smaller, increasing e-commerce, declining sales of CDs and DVDs, and the narrow profit margins for consumer electronics.¹³²
- ➔ **Multi-approach shopping.** Consumers increasingly are using a combination of online shopping and physical store visits to identify which products they want to buy. For example, 78% of consumers use at least two channels to browse, research, and make purchases, and 30% of consumers said they use at least three channels for a single purchase.¹³³ Approximately 20% of consumers also used smartphones while shopping in physical stores to help inform their purchase decision.¹³⁴ This decreases the influence sales associates at physical store locations have on the product purchases.

¹²⁹ Consumer Reports. “Buying appliances - 25,000 readers help you find the real deals.” August 2009. <http://www.consumerreports.org/cro/magazine-archive/august-2009/appliances/where-to-buy-appliances/overview/buying-appliances-ov.htm>

¹³⁰ NPD Group 2011a. “E-commerce and Consumer Electronics: Online Shopping & Purchasing” report. September 15, 2011. https://www.npd.com/wps/portal/npd/us/news/pressreleases/pr_110915

¹³¹ Forrester. US Online Retail Forecast, 2010 to 2015. (Report Excerpt) February 28, 2011. http://www.forrester.com/rb/Research/us_online_retail_forecast%2C_2010_to_2015/q/id/58596/t/2

¹³² Bloomberg. “Wal-Mart Plans to Reduce Space for Electronics in Stores.” April 12, 2011. <http://www.bloomberg.com/news/2011-04-12/wal-mart-plans-to-reduce-space-for-electronics-in-stores.html>
LA Times. “Best Buy to downsize brick-and-mortar footprint”. June 23, 2011. <http://articles.latimes.com/2011/jun/23/business/la-fi-best-buy-bigbox-20110622>

¹³³ ATG. “Cross-Channel Commerce: The Consumer View.” March 2010. <http://www.bme.eu.com/media/white%20papers/BMEU/atg-cross-channel-survey.pdf>

¹³⁴ NPD Group 2011b. “Online for Consumer Electronics: Online Shopping & Purchasing” (Presentation from ENERGY STAR Partner Meeting). November 2011.

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- **Growth in warehouse clubs and supercenters.** These retailers have shown a 4% growth in the last five years at the expense of other retailers. This growth is driven by consumer demand for one-stop shops and is projected to lead to consolidation and fewer enterprises.¹³⁵

Supply Chain Characteristics

In addition to trends in how retailers buy these products, a few key trends affect the supply chains of these products, as summarized below.

- **Sales are dominated by big-box national retail chains.** For example, NEEA estimated that its television initiative was able to cover over 80% of the television retail market in the Northwest by targeting just six national retailers.¹³⁶ This is significant because large retailers typically make purchasing decisions on a national basis. As a result, any regional inventory decisions are constrained by corporate purchasing decisions, and primarily are limited to assortment decisions based more on store size and local consumer demographics, and not energy efficiency.
- **Reduced inventory-to-sales ratio.** Inventory-to-sales ratios have decreased over the last 20 years due to improved supply chains and technology.¹³⁷ Manufacturers and retailers hold less inventory and retailers increasingly use a “just-in-time” inventory strategy: ordering new, replacement products when a product is sold.
- **Manufacturers and distributors can be motivated to manufacture and stock ENERGY STAR-qualified products.** Manufacturers and distributors (e.g., retailers and service providers) seem to track ENERGY STAR qualification of their products and sometimes have corporate targets for achieving ENERGY STAR qualification. For example, manufacturer interviews performed for the evaluation of the NEEA Television Initiative found that manufacturers wanted as many models as possible to be ENERGY STAR-qualified. One retailer also said their corporate policy is to stock all ENERGY

<http://www.energystar.gov/ia/partners/downloads/meetings/2011/Online%20for%20Consumer%20Electronics.pdf>

¹³⁵ IBISWorld. “Warehouse Clubs & Supercenters in the US: Market Research Report.” (Report Excerpt) October 2011. <http://www.ibisworld.com/industry/default.aspx?indid=1092>

¹³⁶ EMI 2011. *Consumer Electronics Television Initiative Market Progress Evaluation Report*.

¹³⁷ Manufacturing and Technology eJournal. “Four Key Supply Chain Trends to Monitor in 2011.” May 25, 2011. <http://www.mfrtech.com/articles/14577.html>



STAR products.¹³⁸ In another example, manufacturers interviewed for the SCE market characterization study indicated that all or almost all of the products they would produce would meet the ENERGY STAR Tier 1 standard and that, despite technical challenges, they aimed to produce products to meet the Tier 2 standard when it comes into effect.¹³⁹ This trend was reinforced by a set-top box supplier that has a corporate goal to supply ENERGY STAR boxes to all of their customers.

- ➔ **Equipment installed in the home by service providers varies widely by provider and region.** Some providers install whatever equipment they have in stock (e.g., wireless routers, cable modems, set-top boxes), while others allow customers to request specific products.¹⁴⁰ Also, service providers cut across many different regions. For instance, Time Warner is active in parts of New England, Southern California, and the South, but is less active in the Midwest and Plains states. Cablevision is active in the New York metro area, but has little presence elsewhere. Satellite providers Dish Network and Direct TV are available throughout the continental U.S. and make up 20% of the pay-TV market.¹⁴¹ This disaggregation can confound regional outreach efforts by state-level organizations or utilities.

Summary of Findings

This section reviews some of the important high-level findings from this research into the consumer electronics plug-load technologies and markets. It is important to note that, while these findings generally are applicable to the consumer electronics market as a whole, individual products have unique markets and barriers. As a result, these findings are not necessarily applicable to *all* individual products researched for this evaluation. In addition, these *individual* findings are not necessarily unique to consumer electronics plug-load products alone, and may also be relevant to the end-use-specific plug-load products traditionally covered by the HEER program. However, it is the confluence of these findings on the whole for the consumer electronics market that makes these markets unique.

¹³⁸ EMI 2011. *Consumer Electronics Television Initiative Market Progress Evaluation Report*.

¹³⁹ Research into Action 2010. *Electronics and Energy Efficiency: A Plug Load Characterization Study*.

¹⁴⁰ Popular Science. "Your Set-Top Box Is Murdering Your Electric Bill. Here's What You Can Do." July 1, 2011. <http://www.popsci.com/gadgets/article/2011-06/least-electric-bill-murdering-dvrs-every-provider>

NRDC 2011a. *Better Viewing, Lower Energy Bills, and Less Pollution: Improving the Efficiency of Television Set-Top Boxes*. June 13, 2011. <http://www.nrdc.org/energy/settopboxes.asp>

¹⁴¹ MediaBiz. "MediaCensus 2011 – Cable Provider Footprints". January 2011. http://www.mediabiz.com/media/content/Top10_Cable_Footprints.pdf



- **Consumer electronics technology is changing rapidly.** There is a high level of innovation and technological advancement in consumer electronics. More devices are available all the time and new products have additional functionality. Many technical advances reduce energy consumption of equivalent models year-over-year. Many factors drive these advances, including:
- Manufacturers' release of new features and updated models
 - Increased voluntary specifications and standards for consumer electronics
 - Short retail cycles, from just six months to a year for some product types
 - Pursuit of smaller form factors, which require more efficient components for adequate heat dissipation in a smaller device
 - Increase of portable devices and more efficient components, from portable form factors to plug-load products.
- **A distinct energy efficient option can be difficult to identify and may not exist in some cases.** ENERGY STAR specification criteria often struggle to keep up with the pace of innovation and ENERGY STAR specifications can quickly become too lenient to serve as a product differentiator. Additionally, energy savings for products can be highly dependent on consumer behavior or usage settings, and the move toward more networked consumer electronics in the home can make it challenging to isolate energy savings and consumption on a product-by-product basis.
- **The incremental costs of energy efficient products can be difficult to identify or may not exist.** Because reduced energy consumption can be a by-product of new technology with improved capabilities (e.g., LED televisions), smaller form factors (e.g., set-top-boxes), or increased mobility (e.g., laptop computers), there often is no definitive way to identify the incremental cost of an energy efficient feature alone compared to a “standard” product. In addition, some energy efficient products may even cost less to manufacture than the less efficient option.
- **There are a number of powerful external drivers of energy efficiency in the consumer electronics market.** ENERGY STAR, state and federal standards, and corporate sustainability goals and commitments all contribute substantially to reduced UEC across the consumer electronics market. Two examples are: DirecTV's commitment to supply its customers only with ENERGY STAR receivers and some retailers' commitment to sell a high proportion of ENERGY STAR products.
- **Many energy efficient consumer electronics have small per-unit savings.** This makes the value proposition difficult for consumers. Because the incremental cost savings of many energy efficient consumer electronics are so small, these savings will not be compelling to consumers, even if they are aware of them. The small savings also make it difficult for utilities to run cost-effective programs for these products.



- **The consumer electronics retail market is in flux.** There is a trend toward purchasing consumer electronics from national retailers. Additionally, more consumers are buying electronics from online retailers instead of brick-and-mortar stores. Growing national markets make it increasingly difficult for utilities to affect only the local market with midstream programs, as they essentially must influence the entire national market to impact local markets.

CONCLUSIONS

The BCE Program experience review (Chapter 6), and this technology and market review, resulted in six primary conclusions. Each of these conclusions and their implications on future program designs for the post-2012 program cycle of utility programs for these markets are discussed below.

1. The BCE Program Has Established Valuable Retailer Relationships.

The BCE Program has been very successful in creating valuable relationships with retailers through the payment of incentives to these important market actors. This has enabled a high level of retailer engagement in marketing activities. In addition, retailers have supplied useful market data that would not have been available otherwise. These data provide program administrators a much clearer understanding of what is happening in the market.

Retailer engagement also allows program sponsors to leverage their relationship with retailers to provide marketing directly to customers. As noted above, this is an important avenue for current and future marketing to customers in the local service territory. Retailers' positive engagement with BCE also has potentially helped other programs, such as HEER, engage with these retailers.

2. It is Difficult to Show a Local Influence When Targeting a National Market.

The BCE Program model is focused on large national retailers. This allows the program to target a large percentage of the market by engaging relatively few retailers, which helps increase the cost-effectiveness of program delivery. However, these retailers make their assortment decisions on a national scale. This weakens the BCE Program's influence, even though California is a large market (representing 12% of the total U.S. market) and when combined with the other BCE Alliance partners, the program has the potential to reach roughly 15% of the U.S. market.

The focus on national retailers also makes it more difficult to attribute savings to the program, since any shift toward energy efficient products will appear at the national scale and will be less detectable in California alone. Complicating this is the fact that many other market actors also affect the national market. The television market is the best example of this challenge; many external market actors contribute to the downward trend in television UECs across the country. These actors include: the ENERGY STAR program, the CEC, the DOE, the FTC, and TopTen USA. Given these issues, discerning the program's impacts on the market will require a complex attribution model.



3. Consumer Electronics Are Becoming Increasingly Energy efficient.

Many consumer electronics products are becoming more energy efficient, regardless of utility-sponsored energy efficiency programs. There are numerous drivers of this change. ENERGY STAR and other federal and state standards have motivated manufacturers to design products that consume less energy. Manufacturers introduce new features and technology every year, and retailers accommodate and accelerate rapid innovation with a retail cycle that can turn over their entire stock in as little as six months to a year. These cycles drive a rapid uptake of new energy efficient technologies, which has reduced the per-unit energy use of many of these products; that is likely to continue, with or without utility intervention.

These trends beg the question of whether utility intervention is needed for the long-term transformation of this market, as there appears to be few *long-term* barriers to the manufacturing and sale of more energy efficient products. Though there are a number of short-term energy savings opportunities in consumer electronics, today's policy focus and rapid innovation will continue to drive energy efficiency over the long term.

4. Product-Focused Program Designs May Not Be Widely Applicable.

Product-focused program designs typically have focused on technologies with slow market adoption because of a clear first-cost barrier. To overcome this barrier, programs typically provide per-unit incentives for the sale of energy efficient models to accelerate their adoption in the market. While the BCE Program model is a new type of product-focused program, it still has attempted to accelerate adoption with per-unit incentives, although aimed at retailers instead of end-users.

Typically, these product-based programs depend on a number of factors to be effective:

- ➔ A stable market with slow adoption of new technologies
- ➔ Long-term energy savings with significant economic value to the customer
- ➔ Clearly differentiated energy efficient product options
- ➔ Incremental up-front cost as a barrier to adoption
- ➔ Creation of influence through local retail markets.

The main findings from this research show that these factors generally do not apply to consumer electronics. Thus, traditional product-based program designs may be ineffective and subject to a large evaluation risk.

The biggest risk in the continued pursuit of the midstream product-focused approach is the need for a robust and clear market baseline for the non-intervention case. Because of the speed at which many of these technologies and markets move, by the time an adequate non-intervention baseline is developed and passed, it may already be out of date due to shifting market conditions.



For instance, the lack of a clear market baseline for televisions has created a large amount of evaluation risk for the BCE Program because the market is so innovative. The challenge is exacerbated because the BCE programs have exerted such significant external interventions and are only being evaluated for the first time in California, following the first full three-year program cycle. The lack of a clear baseline and attribution case creates uncertainty about the program's influence and the ex-post net savings each utility can claim.

The California BCE Program model seeks long-term transformation of the market toward greater energy efficiency.¹⁴² Despite this, the program is being evaluated under the state's current regulatory framework, which requires the kind of evaluation normally conducted for a more typical short-term resource allocation program. A move toward a more holistic market transformation program design and evaluation framework, rather than a focus on standardized per-unit energy-savings values (from the California DEER database), may allow utilities to add important value to the transformation of these markets without being limited by short-term resource acquisition program goals and evaluation.

5. Targeted Product-Specific Opportunities Are Still Available.

Although this study has concluded that product-focused program approaches and per-unit-savings-based evaluation create barriers to the creation of effective programs for consumer electronics on the whole, there are product-specific opportunities in this market.

Utilities that consider that option must focus on opportunities with identified and distinct market barriers that can be overcome with a utility program, or where the utility can play a clear role in accelerating the adoption of energy efficient technologies. If utilities seek to hasten market adoption of a technology that already is gaining traction in the market (e.g., LED televisions), they must have a clear attribution path for claiming the acceleration of an already moving market. In addition, utilities must be able to move quickly in and out of product-focused programs as barriers are identified and addressed

6. The Current Regulatory Framework Creates Barriers for Programs.

California's regulatory framework makes it difficult for programs to adapt to the fast-paced consumer electronics markets. The current framework focuses on showing the cost-effectiveness of particular products. To get a new measure approved, IOUs must submit detailed work papers about the measure's anticipated savings and cost-effectiveness. Review of these work papers can

¹⁴² SCE Program Staff, Chen, C., Randazzo, K. 2010-2012 Statewide Business and Consumer Electronics Program.



take up to 18 months and may result in conditional approval or the requirement that proposers conduct additional research. During that review process, the proposed measure can become outdated.

Also, consumer electronics programs are hard to evaluate because the market changes so quickly. This makes it very difficult to establish the market baseline for each product or counterfactual, both of which are essential to the assessment of program impacts and attribution. The current approach is to evaluate programs only approximately every three years, at the end of each program cycle. This creates a large evaluation risk for the utilities and the regulators. This has been the case for the California Statewide BCE Program, as the program ran for a full three-year program cycle and it is unclear what savings the program will be able to claim.

The method of pre-approving individual products based on their cost-effectiveness makes it challenging to develop program approaches that can adapt to rapidly changing markets such as consumer electronics. In addition, the difficulty of evaluating programs in such dynamic markets with so many market actors creates an evaluation risk that can prevent program designers from attempting to address consumer electronics plug loads with programs targeting consumer electronics.





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SECTION IV: PROGRAM DESIGN RECOMMENDATIONS

CHAPTER 8: OVERVIEW



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

SECTION IV: PROGRAM DESIGN RECOMMENDATIONS



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE

8

HEER AND BCE PROGRAM DESIGN RECOMMENDATIONS

The recommendations in this section follow from the HEER and BCE research tasks. There are three sets of recommendations. Table 8.1 lists each subsection of the program design recommendations and its author.

Table 8.1: Organization of the Program Design Recommendations Chapter and Authors

SUBSECTION	AUTHOR
Strategic recommendations	Research Into Action and EMI
HEER-specific recommendations	Research Into Action
BCE-specific recommendations	EMI

STRATEGIC RECOMMENDATIONS

The high-level recommendations for both the HEER and BCE Programs are to:

1. **Create a holistic, flexible program with the goal of market transformation.** Address residential plug loads as a category and develop programs that target an overall reduction in plug loads. This means a program that can change its intervention strategy or measures quickly to respond to changing market conditions. It may also require an evaluation framework that assesses the overall reduction in plug loads due to multiple measures, instead of focusing on a per-product/per-measure evaluation framework.
2. **When designing programs, keep two key points in mind:**
 - a. **Target incentives to address specific barriers.** Incentives can accomplish many purposes, depending on how they are deployed. Programs should design incentives based on a systematic study of barriers.
 - b. **Maintain retailer relationships.** Retailers are a key player in the supply chain for most plug load products. Thus, programs should seek to build long-term relationships with retailers and design program elements with the retailer’s business case in mind.
3. **Design intervention strategies on a product-by-product basis.** The approach to each product should be based on a careful assessment of the unique market barriers and an up-to-date supply chain characterization. Intervention strategies developed in this manner will likely lead to interventions at multiple points in the overall plug-load products supply chain.



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4. **Use experimental design to test new strategies and implementation approaches.** Small-scale pilots should be used to evaluate intervention strategies for effectiveness. Effective models can be expanded, ineffective models can be terminated. This may be particularly useful when existing market data do not strongly indicate a single approach.
5. **Create a program “roadmap” to guide ongoing adjustment of program activities.** At the outset of each program cycle, develop a program “roadmap” that specifies when the program will check in with market conditions and sets criteria for adjusting program activities. This should include the timing, approach, and criteria for: altering measure specifications; changing intervention strategies based on shifts in barriers; adding new measures; and exiting old measures.

HEER-SPECIFIC RECOMMENDATIONS

The following recommendations follow from the HEER process evaluation and market characterization and are specific to each of the products studied: refrigerators, water heaters, pool pumps, and clothes dryers. The research team made every effort to be systematic in moving from process evaluation and market findings to program design recommendations. Appendix B contains a detailed description of the methodology used to develop these recommendations.

Three Types of Recommendations

The program design recommendations for each product follow a hierarchical structure that includes three types of recommendations for each product: a *goal*, *strategies*, and *activities*.

- ➔ **The goal** is a high-level program objective intended to guide program design and help program administrators select activities and market progress indicators. The goal for each product type responds to the specific market barriers (or lack of barriers) for the product.
- ➔ **Strategies** are ways to achieve the goal. Strategies are broadly based on findings from the process evaluation and market characterization, including barriers, leverage points, and an assessment of other successful program models. There are no doubt other strategies than those listed here that could be used to achieve each goal.
- ➔ **Activities** are specific, implementable actions that occur during a program and which are designed to accomplish the strategies and goal pertaining to each product type. There are many potential activities for each strategy presented here.

Summary of Program Design Strategies

Table 8.2 summarizes the program design strategies and the products to which they apply.



Table 8.2: Overview of Program Design Strategies by Product

STRATEGIES	PRODUCT			
	Refrigerators	Water Heaters	Pool Pumps	Clothes Dryers
Use carefully targeted incentives to increase sales, availability, and awareness; reduce incremental cost	X	X		X
Investigate new incentive approach if process findings indicate potential for attribution risk	X		X	
Conduct retailer/installer training	X	X		X
Fund retailer co-op marketing	X	X		X
Conduct pilots to test implementation approaches	X		X	
Investigate new opportunities			X	X
Engage in policy/codes/standards development				X

Blue X: Strategy recommended for this product.

Un-shaded X: Strategy not explicitly mentioned, but could apply to product.

Gray: Strategy may apply to clothes dryers after codes and standards development is complete.

Below, the goal, strategies, and activities for each product are discussed in detail.

Refrigerators

Goal

The suggested goal for refrigerators is: **Increase sales of the most efficient refrigerators.**

Market penetration of ENERGY STAR refrigerators is at 50%, despite the widespread availability of ENERGY STAR-qualified refrigerators (70% to 90% of models at all but the lowest price points) and high awareness of SCE's HEER program rebates (78% of the population).

The key barriers to an increase in market share of the most efficient refrigerators are:

- ➔ Lack of efficiency as a key criterion in purchase decisions
- ➔ First-cost, especially at low price-points
- ➔ End-users who are not aware of ENERGY STAR



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Strategies and Activities

Table 8.3 shows the three strategies for refrigerators, intended to help the HEER program achieve the goal of increasing sales of the most efficient models. The activities follow.

Table 8.3: Overview of Refrigerator Strategies by Barrier

STRATEGY	BARRIER		
	Energy Efficient Not Key Criteria	First Cost	End-User Awareness
Use incentives to reduce incremental cost and increase availability		X	
Improve retailers' ability to educate end-users	X		
Increase retailer marketing	X		X

Strategy 1: Use incentives to reduce the incremental cost and increase the availability of efficient products.

Activity 1.1 Base incentive design on the incremental cost and/or availability of qualified models, relative to configuration and price point.

Incremental cost and availability of efficient refrigerators may differ by price point, and perhaps by configuration and other qualities. Conduct a systematic study to determine at which price points/configurations there is low availability and/or high incremental cost differences, then design incentives to target products with the lowest availability and/or the highest incremental costs.

Supporting Evidence:

- ➔ In the current program evaluation, the most common reason for not buying an efficient refrigerator was first cost, cited by 57% of respondents. Retailers also reported cost as the most common barrier.
- ➔ Anecdotal research shows that the highest incremental cost of efficient products, and lowest availability, is at the lowest price points.
- ➔ Understanding the differences in the availability and incremental cost of efficient refrigerators will help target incentives where they are needed most and result in increased attribution.

Activity 1.2 Consider a limited-time incentive.

Rather than offering a year-round incentive, consider a limited-time incentive.



Supporting Evidence:

- ➔ Limited-duration incentives follow the market’s own approach to increasing sales.
- ➔ Limited duration incentives are likely to result in increased attribution. Additionally, this activity opens the door to new evaluation approaches by identifying a baseline against which to compare sales of incented models.

Activity 1.3 Use experimental design pilots to identify the best implementation approach.

This study did not identify a single activity with overwhelming chances of success in increasing sales, attribution, or transforming the refrigerator market. As such, programs could use pilots, using a rigorous experimental design, to identify the best implementation approach. For example, pilots could test the amount of incentives, the timing and duration of their offer, and/or the implementation approach (for example, retailers vs. manufacturers).

Supporting Evidence:

- ➔ An evidence-based approach to comparing implementation models will likely result in a more successful program design, with higher attribution and cost-effectiveness.

Strategy 2: Improve retailers’ ability to educate end-users about qualified products.***Activity 2.1 Expand current retailer outreach efforts to include a formalized training program for store managers and sales associates, focused on identifying qualifying products and selling energy efficiency benefits to the end-user.******Supporting Evidence:***

- ➔ Both the previous and current evaluations show that efficiency is not a high priority among end-users. In this evaluation, 2% of refrigerator purchasers chose their model because of its efficiency, compared with 46% who chose it because it was the right size, color, or had the features they wanted.
- ➔ Retailers have significant influence over the purchase decision. A retailer’s ability to “sell” efficiency benefits may be effective at increasing the sales of efficient products in cases where there is no incremental cost difference.
- ➔ Improving a retailer’s abilities to sell the program may result in increased attribution. In the face of large purchase costs (over \$1,000), education and retailer training are more strongly indicated as program intervention strategies than a relatively small incentive (\$50).



Strategy 3: Increase retailer marketing of qualified products.

Activity 3.1 *Establish a cooperative marketing fund for retailers.*

To increase end-user awareness (one of the key barriers identified in the market characterization), establish a cooperative marketing fund, particularly for small retailers.

Considerations:

- ➔ **Build on other programs.** Review best practices among other cooperative marketing programs. Consider including an “open-ended” option that allows retailers to propose their own promotions. Building on what has already been done in this area will be important to success. See Section II: Market Characterization for a description of NYSERDA’s program.
- ➔ **Ensure cross-platform consistency.** Consistency across platforms is crucial: end-users are consulting multiple sources before they make a purchase. Thus, it is important that end-users see consistent messages across all of the platforms they consult. A cooperative marketing campaign should include messaging guidelines to make sure the retailer materials are consistent with other efficiency messages.

Supporting Evidence:

- ➔ Cooperative marketing is a proven way to increase end-user awareness and sales. NYSERDA’s program is a successful model.
- ➔ Cooperative marketing leverages retailers’ marketing expertise, and builds relationships between the program and retailers.
- ➔ Cooperative marketing targets hard-to-reach local and regional stores.
- ➔ Cooperative marketing can be useful if end-user incentives are offered for a limited time, giving programs a year-round offering for retailers.
- ➔ Linking cooperative funding with sales data reporting requirements can help the program attribute and claim savings, as well as get the sales information needed to track market trends and create more effectively targeted incentives.

Water Heaters

Goal

The suggested goal for water heaters is: **Increase availability, awareness, and sales of efficient products.**

Market penetration of efficient water heaters is 10% to 20%. Efficient products are manufactured by all major supply chain players and there are a variety of different technology options. The low



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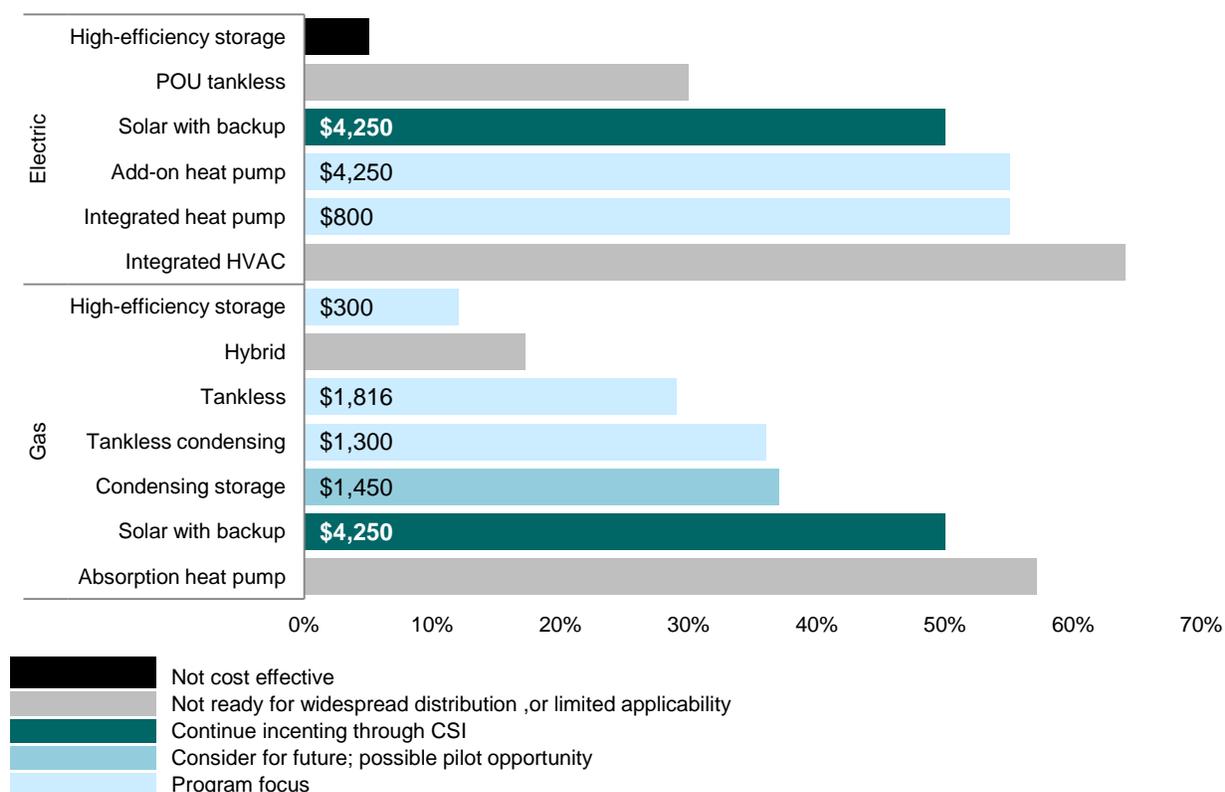
penetration of efficient water heaters results from several barriers, which occur at multiple points in the supply chain:

- ➔ Low availability at retail/wholesale
- ➔ High first cost, including installation cost
- ➔ Low importance of energy efficiency in consumer decision-making
- ➔ Lack of installer/retailer knowledge of efficient products
- ➔ Lack of end-user awareness

Focus Technologies

This study reviewed thirteen efficient water heater technologies and recommends focusing program efforts on three of them: *high efficiency gas storage*, *electric heat pump*, and *gas tankless*. Figure 8.1 shows the savings potential, incremental cost, and recommendation status for all 13 technologies, followed by a more detailed explanation of why they are or are not recommended for inclusion.

Figure 8.1: Water Heater Savings Potential, Incremental Cost, Suitability for Program Inclusion



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Water heater technologies not recommended for program inclusion

Not cost effective:

- ➔ **High-efficiency electric resistance storage.** The savings provided by electric resistance water heaters, at 3% to 4%, are likely not cost-effective as they cannot justify an incentive large enough to effectively target the first cost barrier.

Not ready for widespread distribution, or limited applicability:

- ➔ **POU electric tankless.** A niche market, this product is included here only because it may be part of the 2012 ENERGY STAR specifications. Suitable applications and savings are difficult to identify and quantify.
- ➔ **Integrated HVAC.** Because of their status as an emerging technology (although some pilots have been completed), and limited usefulness in the replacement market, this technology is not recommended for program inclusion at this time. However, program administrators could consider integrated HVAC water heater technology as part of a new homes pilot or a whole home retrofit program.
- ➔ **Hybrid gas.** This technology is not recommended due the lack of a test method for products between two and 20 gallons and because of questionable savings, according to market actors. Condensing hybrid technology may yield greater savings, but test method issues have yet to be resolved.
- ➔ **Absorption heat pump.** This technology is not yet commercially available.

Continue incenting through the California Solar Incentive (CSI):

- ➔ **Solar hot water heaters** (with either gas or electric backup) are already covered by incentive programs.

Consider for post-2015 programs:

- ➔ **Condensing storage.** Although commercial class units are available in capacities suitable for residential use and some programs incent these products, the commercial class units do not meet the more stringent safety standards for residential class water heaters. More research is needed; this product should be considered for the 2015 program, but has limited potential for the 2013-2014 program outside of sponsoring or conducting a pilot program.

Water heater technologies recommended for program inclusion:

- ➔ **High-efficiency storage gas water heaters.** Some sources say that non-condensing ENERGY STAR gas storage water heaters may not be cost effective but others have said they could serve as a stopgap until other products become more available, more tested,



and less expensive. Water heaters provide a lot of potential savings for utilities. While this product won't be the most cost effective of the portfolio, it will allow utilities to build relationships with installers, wholesalers, retailers, and other market actors, to transition to focusing on offering incentives for the most efficient products in the 2015+ time horizon. Furthermore, as many as 30% of homes may not be suited to the advanced products included here. Many homes are limited to traditional gas or electric storage water heaters unless they undertake costly renovations due to increased space requirements, unit location, venting, drain, or power supply issues. ACEEE estimates that only 50% of electric water heaters are suitable for replacement with a heat pump water heater.

Both of the technologies below are alternatives to the typical storage water heater. Both have high incremental installed cost, but also high savings potential and demonstrated success in water heater programs.

- ➔ **Integrated heat pump water heaters and add-on units.** Heat pump water heater incentives could also include add-on units, pending ENERGY STAR final 2012 criteria. These units could allow contractors to more easily sell heat pump water heaters in emergency replacement situations.
- ➔ **Tankless and tankless condensing gas water heaters.** Market actors indicate that condensing tankless water heaters will become the standard, because of reduced venting requirements.

Strategies and Activities

Table 8.4 shows the three strategies for water heaters, intended to help the HEER program achieve the goal of increasing availability, awareness, and sales of the most efficient models. The activities follow.

Table 8.4: Overview of Water Heater Strategies by Barrier

STRATEGY	BARRIER				
	Availability Low	First Cost	Energy Efficient Not Key Criteria	Installer/Retailer Knowledge	End-User Awareness
Use incentives to reduce incremental cost and increase availability	X	X			
Increase awareness and sales of products with low penetration		X			X
Improve retailer/installer ability to sell & install			X	X	



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Strategy 1: Use incentives to reduce incremental cost and increase the availability of efficient gas storage water heaters.***Activity 1.1 Substantially increase the end-user incentive.******Supporting Evidence:***

- ➔ The current incentive amount of \$30-\$50 is too low to affect end-user decision-making or to significantly reduce the incremental cost of efficient gas storage water heaters, which can exceed \$300.
- ➔ Of the 55 programs that promote ENERGY STAR-qualified products, the average gas storage water heater incentive is \$200 (the most common is \$75, which includes some utilities that incent below the 2010 ENERGY STAR minimum efficiency of EF ~0.67).
- ➔ A program design that reduces the first cost barrier is particularly important in California, given that the NOx requirement means that efficient units often require an electric hookup, increasing installed cost and further increasing the first cost to buyers.
- ➔ Increasing the incentive amount may also lead to increased attribution.

Activity 1.2 Offer a retailer/installer incentive.

Provide an incentive to retailers and installers to more directly encourage retailers to stock efficient water heaters, and installers to recommend them and carry them on their trucks.

Supporting Evidence:

- ➔ Despite the prevalence of end-user incentives, stocking of efficient water heaters at retail and wholesale is limited. In big box home improvement stores, many efficient models are available by special order only.
- ➔ Similarly, plumbers (who affect as many as 60% of water heater purchases) tend to stock units for which there is the biggest demand and wholesalers stock units for which there is a demand among plumbers.
- ➔ In emergency replacement situations, which make up a majority of water heater replacements, the lack of immediately availability efficient units may be a significant barrier to increasing sales of efficient water heaters.

Activity 1.3 Offer an incentive year-round due to emergency replacement.

For this product type, a limited-duration incentive is not recommended.



Supporting Evidence:

- ➔ More than 67% of water heater replacements are unplanned – that is, due to unexpected the failure of an existing unit. Thus, a limited-time incentive is unlikely to meet the needs of consumers, who do not typically plan a water heater replacement.

Strategy 2: Increase awareness and sales of gas tankless and heat pump water heaters.

These two efficient products have low market penetration.

Activity 2.1 Offer an end-user incentive; consider a limited-time option.***Considerations:***

- ➔ ***Incentive amount.*** Offer incentives sufficient to influence decision-making, but not to eliminate first cost. When setting the incentive amount, consider the context: the high importance of non-energy benefits of tankless water heaters and short payback periods for heat pump water heaters. The most common incentive amounts across programs are \$150 to \$200. As an alternative, explore financing options like on-bill financing as another way to approach the first-cost barrier.
- ➔ ***Incentive duration.*** Consider limited time incentives to increase uptake and planned replacement. There is anecdotal evidence that both heat pump and tankless gas water heater installations are planned, rather than emergency, replacements. Therefore, a limited time incentive might increase attribution and awareness more effectively than a year-round incentive.

Supporting Evidence:

- ➔ Nationally, both product types have low to very low market penetration and often require significant upgrades to permit installation. Marginal cost is high, yet products offer significant energy savings.
- ➔ Tankless water heaters are marketed as “endless hot water,” a non-energy benefit significant to some buyers, so energy efficiency may not be a key purchase criterion for all end-users.

Activity 2.2 Develop specialized marketing and educational materials to promote gas tankless and heat pump water heaters.***Supporting Evidence:***

- ➔ These technologies are relatively unfamiliar to end-users and the installation requirements limit their applicability in emergency replacement situations. As a result, marketing will be important to raise awareness among end-users who may want to research their options before their water heater fails.



- ➔ Marketing these incentives will also be important in increasing attribution.

Strategy 3: Improve retailer and installer ability to sell and install qualified products.

Activity 3.1 Implement retailer and installer trainings on selling the benefits of efficient products and identifying suitable applications; also train retailers to install and maintain the products.

Supporting Evidence:

- ➔ While pre-purchase Internet research is growing, retailers and installers still play an important role in influencing water heater purchases. Sixty percent of water heater purchases are influenced by a plumber, according to the process evaluation findings. Similarly, 15% of water heater purchasers said that a retailer or contractor recommendation was the main reason for purchasing, compared with only 2% of refrigerator purchasers.
- ➔ A key barrier to the installation of advanced water heater technologies is installer reluctance to promote them because they are unfamiliar. Some installers are wary of promoting technologies that may be out of their comfort zone, lead to call-backs, present installation challenges, or result in customer dissatisfaction. Training installers to recognize suitable installations and providing installation assistance and resources is important to overcoming this barrier.

Considerations:

- ➔ Training could be based on the well-regarded pool pump training.
- ➔ Identify and consider partnerships with existing training organizations or utilities that could help facilitate training development.

Activity 3.2 Implement incentives in combination with retailer/installer training.

Activity 3.3 Develop tools to help retailers and installers.

A tool similar to the popular online Pentair pool pump calculator could help end-users understand the financial benefits of an efficient water heater purchase.

Pool Pumps

Goal

The suggested goal for pool pumps is: **Increase program effectiveness.**

Pool pumps generate high per-measure savings compared to other products like refrigerators or clothes washers. Efficient pumps also have many benefits to end-users, including a short



payback period. Program data suggest the HEER programs are reaching a much smaller percent of sales than, for example, refrigerator or clothes washer incentives. However, the fact that variable speed pumps are already outselling dual speed pumps suggests potential attribution risk.

Strategies and Activities

Table 8.5 shows the three strategies for pool pumps, intended to help the HEER program achieve the goal of increasing program effectiveness. The activities follow.

Table 8.5: Overview of Pool Pump Strategies by Barrier

STRATEGY	BARRIER		
	First Cost	End-User Awareness	Lack Of Code Enforcement
Test new incentive strategies to mitigate attribution risk	X	X	
Alert CEC to potential Title 20 compliance issue			X
Explore other pool system savings opportunities			

Strategy 1: Test new incentive strategies to mitigate attribution risk

Program administrators should use small-scale pilots to evaluate the extent to which incentives drive purchase of variable speed pumps over dual speed pumps. These pilots should use an experimental design approach to test the sales impact of eliminating: all incentives; only end-user incentives; and only mid-stream incentives while keeping all other program elements intact.

Activity 1.1 Consider eliminating all incentives, eliminating only the end-user incentive, or only the midstream incentive.

Evidence from the program evaluation and market characterization suggests incentives may not be driving the purchase of variable speed pumps over dual speed pumps, an attribution risk.

Supporting Evidence:

- ➔ Contractors primarily use energy savings to market variable speed pumps, not rebates. Participants primarily report purchasing variable speed pumps for energy savings; few cited rebates as their main reason for purchase.
- ➔ Process results indicate that contractors may not be motivated by rebates. Furthermore, they are skeptical about their rebates: they arrive slowly and sometimes not at all.



- The incremental cost of variable speed pumps over two speed pumps may not be high, when upgrading from a single speed pump. While variable speed pumps typically include all controls, two speed pumps require the additional purchase of a timer.

Activity 1.2 Use experimental design pilots to test the cost-effectiveness and sales impact of new strategies.

Manipulating one element per pilot, while keeping all other program elements intact, will allow the program to isolate the effect of the program element on pool pump sales and cost-effectiveness.

Activity 1.3 Monitor pool pump sales.

Outreach to major distributors and large retailers may be one way to monitor the number of pumps by type sold in various territories. Alternatively, market data is available for purchase.

Supporting Evidence:

- Monitoring pump sales, both incented and non-incented, will be key to successfully evaluating the need for incentives.
- If the pilots use limited time incentives, it will be important to ensure sufficient baseline data are available to control for seasonal differences in sales. If pilots offer incentives in some areas rather than others, it will be necessary to ensure sales data has the level of granularity necessary to observe impacts and that the areas selected do not vary in ways that would influence pump sales.
- Monitoring pool pump sales will also allow programs to adapt to future changes in the market. Facing requirements like Title 20 in more states, pump and motor manufacturers are producing two-speed pumps with more efficient motors and integrated controls. These innovations have the potential to make two-speed pumps a more attractive alternative to variable speed. As they become more widely available, it will be important to monitor the market penetration of variable speed pumps relative to two-speed to determine if further program intervention is necessary.
- Even if pilot results indicate that incentives are not necessary, continue monitoring the market for advances in dual speed pumps and market penetration trends. There will be a potential for lost opportunity when homeowners start replacing two-speed pumps: the incremental cost of replacing a two-speed pump with a variable speed pump is relatively higher than when replacing a single-speed pump, because the homeowner already owns the two-speed control system.

Strategy 2: Alert the CEC to the potential Title 20 compliance issue.

The findings of this study suggest a potential Title 20 noncompliance problem.



Supporting Evidence:

- ➔ Pump and motor manufacturers and pool contractors interviewed for this study say noncompliance with Title 20 is a problem.
- ➔ Contractor reports of single-speed pump sales are somewhat higher than expected, given estimates of the prevalence of pools with pump motors below 1 HP (and thus not covered by Title 20).
- ➔ Title 20 does not limit the availability of single-speed pumps, which are still permitted for applications not covered by code
- ➔ No mechanism exists to ensure that pool pump retrofits comply with Title 20.

Strategy 3: Explore other pool system savings opportunities

A variety of energy savings opportunities exist in the pool system, in addition to replacing large single- and dual-speed pumps with variable speed alternatives. Program administrators should investigate these opportunities, including two that are related to the filtration pump:

- ➔ **Pumps smaller than one horsepower:** These smaller filtration pumps make up a notable portion of the market (between 25% to 33% of pools in PG&E and SCE territory); but, because they are not covered by Title 20, baseline is still single speed. According to manufacturer savings calculators, replacing one of these smaller pumps with a variable speed pump could result in 75% to 80% energy savings.
- ➔ **Motor replacement:** Pool owners may address as many as half of the pool pump failures that occur annually in North America by replacing only the motor rather than the whole pump. While motor replacement is subject to Title 20 requirements similar to pump replacement, variable speed replacement motors have come to the market more recently than variable speed pumps and are less widely available.

Clothes Dryers

Goal

The suggested goal for clothes dryers is: **Establish the foundation for including dryers in the HEER program.**

Before clothes dryers can be considered for inclusion in the HEER program, there are three key barriers that must be overcome:

- ➔ The failure of the current DOE test procedure to discriminate efficient dryers from inefficient ones
- ➔ The lack of efficiency labeling for dryers in the U.S.



- The lack of availability of the most efficient dryer technology, heat pump dryers, in the U.S. market

Strategies and Activities

Table 8.6 shows the two strategies for clothes dryers, intended to help the HEER program achieve the goal of establishing the foundation for including dryers in the HEER program. The activities follow.

Table 8.6: Overview of Clothes Dryer Strategies by Barrier

STRATEGY	BARRIER		
	Indistinguishable Efficiency	Lack of Energy Efficient Labeling	Energy Efficient Products Not Available in U.S.
Support development of new dryer test procedure and efficiency label	X	X	
Add heat pump clothes dryers as a measure using established strategies and processes			X

Strategy 1: Support the development of a new DOE dryer test procedure and efficiency label.

DOE is currently developing a new test procedure for dryers in conjunction with the increased minimum energy efficiency standards that will take effect in 2015. Program administrators should become involved in this process and work with DOE to ensure that the revised test procedure accounts for differences in the accuracy of automatic cycle termination features to adequately differentiate between efficient and inefficient dryers.

Once an effective test procedure is in place, program administrators can work with ENERGY STAR to create specifications that recognize efficient dryers. Utilities should work with the CPUC to explore the ability to claim credit for these efforts.

This work is further supported by a finding from the general population survey of California residents, which suggests that consumers are prepared to respond to the inclusion of dryers in the HEER program. Despite the near total lack of publicly available information on clothes dryer efficiency, 97% of consumers understand that the efficiency of clothes dryers varies.

Supporting Evidence:

- DOE's existing test procedure effectively prohibits discriminating between dryer efficiency levels and thus the development of an efficiency label. Enabling the systematic identification and labeling of efficient dryers is a critical first step in the ultimate goal of increasing the market penetration of efficient dryers.



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- ➔ Interviewees indicated that public utility support of this work would be immensely helpful, as would some funding for research.

Strategy 2: Add heat pump clothes dryers as a measure using established program strategies and processes.

Heat pump dryers will be ENERGY STAR's first foray into the dryer market, with an *Emerging Technology Award* in 2012. It is expected that heat pump dryers will be available in the U.S. by 2013, and that at least one of those models will have received the Emerging Technology award. This awareness will enable the HEER program to leverage the ENERGY STAR brand in promoting this measure. However, implementing this measure will be contingent on when the award is announced, and U.S. market availability.

Steps:

1. Identify measures based on results of ENERGY STAR *Emerging Technologies Award*, and advice from SEDI and CLASP.
2. Verify savings estimates.
3. Design promotion based on existing program approaches, such as Water Heater Strategy 2, above, to use an incentive and marketing to increase awareness of this innovative product.

Supporting Evidence:

- ➔ Heat pump dryers use 40% less electricity than a conventional vented electric dryer. However, product experts do not expect heat pump dryers to make significant inroads into the U.S. market without market interventions. Program administrators will need to design strategies, both to overcome the high up-front costs of heat pump dryers and to build consumer acceptance of the longer drying times that heat pump dryers require.
- ➔ The addition of dryers to the 2013-2014 program would facilitate increases in end-user awareness of the differences in dryer efficiency, in preparation for the inclusion of more dryer types in future program years. In 2015, once the clothes dryer test procedure has been revised and when, presumably, there is an ENERGY STAR specification for dryers, the programs would be in an excellent position to include this measure, and could do so in a way that relied on ENERGY STAR and was technology neutral.

BCE-SPECIFIC RECOMMENDATIONS

As identified in this report, the naturally occurring drivers for energy efficiency within this market are quite strong. When combined with the effects of the national ENERGY STAR program, the rate of change in these markets is quite rapid. For many products, there may be few barriers to energy efficiency and the many market actors that influence the market may be able to drive



the market. In these cases, utility intervention may not be warranted. In other cases, where other market actors' (e.g., ENERGY STAR) programs are limited in scope, there may be opportunities where utilities are uniquely positioned to help drive the market. If so, utilities may be able to develop effective product-focused resource allocation programs targeted at specific market barriers; such programs must provide a clear path to allow evaluators to determine program savings.

Despite the difficulties in developing a program approach that is compatible with the existing regulatory framework in California, the evaluation team has identified an approach that could work within this market. An overview of this approach, as well as more specific program recommendations, is provided below.

1. Focus on Reducing Overall Plug Load EUI

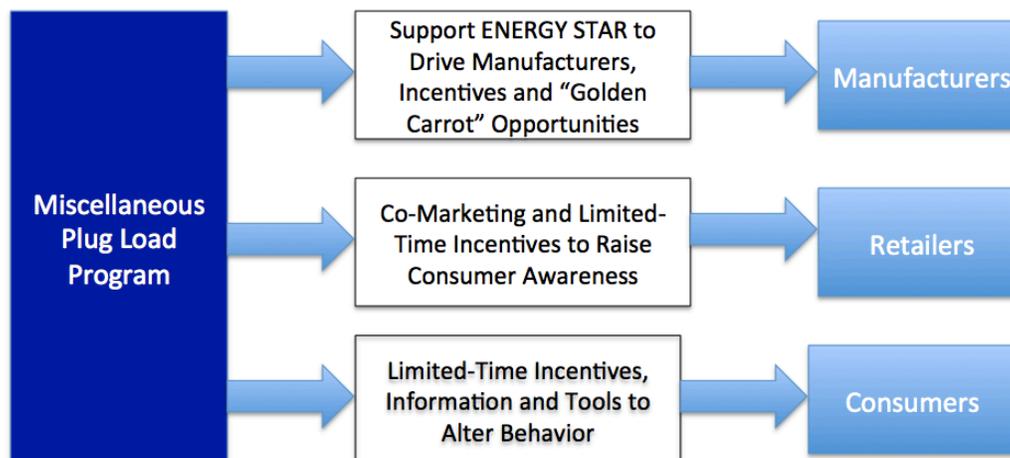
First, such a program effort may need to focus on reducing the *overall energy use intensity* (EUI) of miscellaneous plug loads. Program designers could develop a forecast of miscellaneous plug load use in California that disaggregates these loads from the other large loads in typical households as then uses this forecast as a basis for the measurement of program impacts. This forecast could be based on an efficiency metric similar to Energy Use Intensity (EUI), based on energy usage (kWh) per household, per occupant, per square foot, or some relevant unit of measurement that is linked to energy consumed by this end use. Although difficult to create, such a forecast should be more accurate and reliable than baselines forecast for individual products. The EUI associated with miscellaneous plug loads, as a class of end uses, is likely to much more stable (*i.e.*, less subject to dramatic changes than specific products such as televisions). Once a forecast of miscellaneous plug load energy use is established, targets could then be set to shape this curve in California, either to slow the rate of growth in energy use among this class of end uses or even to lower its intensity over time.

2. Utilize a Holistic Market Transformation Approach to Decrease the Miscellaneous Plug Load EUI

The evaluation team recommends that the BCE Program take a long-term market transformation approach to addressing miscellaneous plug loads as a broad category, rather than continuing to focus on product-specific programs. This approach requires moving program strategies away from short-term resource acquisition and cost-effectiveness, and focusing instead on overcoming longer-term barriers to this market as a whole. Such an approach could include the selection of more flexible measures and the simultaneous targeting of multiple points in the supply chain (e.g., manufacturers, retailers, and consumers). Figure 8.1 illustrates an example of such a multi-focused approach.



Figure 8.2. Example Multi-focused Miscellaneous Plug Load Program



2a. Upstream Barriers and Opportunities

Barriers at the upstream level include design costs to incorporate energy efficiency and competition for attention between energy efficiency and other product features. Program initiatives targeted at this upstream market will be useful as a means of helping achieve overall reductions in the miscellaneous end use EUI. Strategies for that *may be considered* for addressing these barriers include:

- ➔ **Supporting new and revised ENERGY STAR specification development.** Utilities play an important role in support of new and revised ENERGY STAR specifications. BCE sponsors helped accelerate the effective date for Version 5 for televisions and supported more-stringent specification levels. Many new specifications are under development or revision. Utilities can play an important role by supporting efforts to increase the stringency of these specifications.
- ➔ **Incenting upstream EE design opportunities.** Utilities also might investigate very targeted opportunities at the midstream (retailer) or upstream (manufacturer) levels. These could include “Golden Carrot” opportunities – prizes for manufacturers that increase a product’s energy efficiency significantly, or incentives for particular components or technologies with slow market adoption.

2b. Midstream Barriers and Opportunities

Energy efficiency as an attribute among miscellaneous plug load products will still need to compete for attention among all of the other products and features that exist in this market. These initiatives will likely need to be very flexible in order to respond to changing product designs and innovation that is likely to continue driving energy efficiency. These targeted



midstream market efforts will continue to be useful as a means of helping achieve overall reductions in the miscellaneous end use EUI.

- ➔ **Maintain existing retailer relationships.** Any program targeted at consumer electronics or miscellaneous plug loads will need to continue to engage the midstream market. This is because (1) business and consumer electronics retailers are an essential avenue for marketing programs to a utility's customers and (2) retailers have access to customer purchase data that may provide critical insights into market transformation effects. To help maintain this engagement absent specific product-based incentives, programs might consider offering a suite of co-marketing and limited-time incentives for targeted new products, or a customer rewards program for energy efficient products.
- ➔ **Providing midstream marketing, including incentives.** Utilities are an important channel for energy efficiency program deployment, in part because of their relationships with various market actors and their customers. For example, retailer partnerships, such as those developed through the BCE and HEER programs, are critical for marketing programs and products to customers. When a clear energy efficient option is available, utilities are in a unique position to market it to their customers. Utilities can use traditional point-of-sale (POS) marketing materials, online marketing, and short-term incentives as marketing support for retailers, or continue to explore other innovative marketing techniques. Clear energy efficient options may be available for products:
 - For which a *new* ENERGY STAR specification has been finalized or has become effective
 - That meet the *stricter* ENERGY STAR Most Efficient or TopTen USA specifications
 - That are new or involve technologies *not yet covered* by the BCE Programs
- ➔ **Incenting creative retail strategies.** Utilities also could consider offering requests for proposals (RFP) to retailers and manufactures about how to increase the sale of energy efficient products in the utilities' service territories. One identified area of interest for utilities is targeted incentives for very large televisions, many of which cannot meet current and future energy efficiency specifications, and which have the potential to achieve very large energy savings through energy-conscious design.

2c. Downstream Barriers and Opportunities

Despite the naturally occurring efficiency gains in new products sold to consumers, barriers remain at the consumer level. First, there may be reluctance to enabling or taking advantage of efficiency-enabling settings among products that are already installed in consumer households. Second, there may be specific products where consumer understanding is limited or where the economic value is not clear. As such, utilities may wish to target these opportunities as a means of helping achieve overall reductions in the miscellaneous end use EUI.



- **Focus on the installed base of products and device usage.** Current approaches, such as the BCE Program model, focus on the sale of new, more energy efficient equipment. However, there is a large opportunity to affect the energy use of devices that already are in use, including newer, more energy efficient units and older, less efficient devices. Opportunities include:
- Enabling power management for desktops and monitors
 - Enabling auto power down on game consoles
 - Optimizing television settings for increased efficiency
 - Installing plug-load-management devices.
- **Providing targeted and limited-time incentives to overcome specific barriers.** Some programs still use incentives to address long-term barriers that can be overcome by offering monetary incentives to the right market actor. This evaluation did not identify any clear incentive opportunities within the consumer electronics segment, although direct incentives may still have a role in overcoming barriers related to incremental cost and customer knowledge that may otherwise delay uptake of some plug-load-management products, such as advanced power strips. For example, NYSERDA's buy-down program for these devices is considered effective, although it has not been formally evaluated.
- **Focus on consumer awareness and behavior.** This approach could also focus on changing consumer attitudes about miscellaneous plug loads in general, instead of the per-product opportunities that often are too small to compel people to take a particular action or change a specific behavior. This could include measures intended to reduce household miscellaneous plug loads, such as plug load energy audits, in-home energy monitors, plug load management devices, or a rewards program that continually provides positive feedback to customers who work to reduce their plug load-related energy use.

3. Work with regulators to establish an evaluation framework to support a more holistic market transformation program.

Because the approach described herein does not fit easily into the current regulatory environment – an environment that focuses on DEER values and short-term cost-effectiveness for product measures – the current regulatory environment does not allow for the flexibility and long-term thinking that may be needed to address this market. PG&E, SCE, and the CPUC already have started to consider changes to the regulatory paradigm for longer-term market transformation programs. These activities should be continued, including working with regulators to create a regulatory framework that meets the needs of both regulators and program administrators, shares risk more evenly between the parties, and allows innovative approaches to move this market toward greater energy efficiency over the long run.



4. Continue planning how a holistic market transformation approach for plug loads will be integrated with other programs

As the work on this study began, the HEER and BCE programs were operated as distinct programmatic initiatives; now, in part as a result of the research conducted in this evaluation, the proposed 2013-24 Efficiency Portfolio includes an integrated *Statewide Plug Load and Appliance Program*. As statewide efforts move toward achieving sustained long-term energy reductions in the residential sector, miscellaneous plug loads are likely to continue being addressed within programs that are focused on whole customer needs rather than specific technologies and measures. At the same time, other programs and initiatives – commercial programs, third-party initiatives, ENERGY STAR – are likely to also impact miscellaneous plug loads. The opportunity to achieve broad market transformation within these markets by coordinating efforts is substantial – raising awareness about the importance of energy efficiency, cross-marketing programs, and influencing customers to take action.



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APPENDICES

**APPENDIX A: HEER PROCESS EVALUATION
METHODOLOGY**

**APPENDIX B: HEER MARKET CHARACTERIZATION
METHODOLOGY**

APPENDIX C: BCE REVIEWS METHODOLOGY



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PROGRAM & TECHNOLOGY REVIEW OF TWO RESIDENTIAL PRODUCT PROGRAMS: HEER AND BCE



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HEER PROCESS EVALUATION METHODOLOGY

SAMPLING STRATEGY AND PLAN

Retailers

The utilities provided dissimilar list frames. SCE provided a list of retailers that SCE uses to contact retailers for POS marketing information. PG&E provided retailer names associated with all measures rebated and city. No phone numbers were associated with the retailer.¹⁴³

For both PG&E and SCE data, we broke down stores on this list by the total number of stores with different addresses or cities, yielding a categorization of large, mid-size, and small stores. Examples of large stores include big box stores such as Best Buy, Lowe's, and Home Depot. Mid-size stores tended to be regionally based stores with two to five locations (such as Howard's Appliance or Dearden's). Small stores consisted of local stores with only one location. Table A.1 and Table A.2 show the SCE and PG&E retailer sampling plans, respectively.

Table A.1: SCE Retailer Sampling Plan

STORE TYPE	# AVAILABLE	SAMPLE	RESPONSE RATE
Large	295	40	14%
Mid-size	81	30	37%
Small	48	20	42%
Total	424	90	21%

¹⁴³ For the PG&E dataset, we gathered phone numbers for retailer names in a given city via Google or other online yellow pages.



Table A.2: PG&E Retailer Sampling Plan

STORE TYPE	# AVAILABLE	SAMPLE	RESPONSE RATE
Large	257	30	12%
Mid-size	196	30	15%
Small	846	30	4%
Total	1,299	90	7%

Pool Pump Contractors

For both SCE and PG&E pool pump contractor samples, we segmented the list of individual companies receiving pool pump incentives by using the Fed Tax ID for accuracy. We then summed up the number of incentives each company received and divided the number of incentives received for each company by the total to get a proportion of the total incentives given. Within the SCE territory, Leslie's pool stores received the highest percentage of incentives (17.4%). This was dramatically lower than the 66% reported in the '06-'08 evaluation. We separated Leslie's from the remainder of the pool pump contractor dataset since we consider them a separate stratum. We recalculated proportions of sales excluding Leslie's for all other companies.¹⁴⁴ We then segmented the companies into the following strata: companies selling 2% or more in stratum two, companies selling 1% to 2% of pool pumps rebated in stratum three, companies selling less than 1% of rebated pool pumps but more than .3% in stratum four, and companies selling less than .3% of rebated pool pumps in stratum five. Table A.3 and Table A.4 show the sampling plans for SCE and PG&E, respectively.

To calculate response rates we counted the phone numbers for each company, however, some companies have multiple phone numbers. Some multiple phone numbers indicate chains while others indicate typos or old phone numbers. We counted each phone number from a chain as a separate contact but consolidated phone number counts for those numbers that were typos or old phone numbers. This resulted in a sampling plan with the required response rate for each stratum.

¹⁴⁴ The retailer Leslie's is not present in PG&E data, so this step was not taken for the PG&E dataset.



Table A.3: SCE Pool Pump Contractor Sampling Plan

STRATUM	# OF INCENTIVES	% OF INCENTIVES BY STRATA	RANGE	PROPOSED SAMPLE	AVAILABLE CONTACTS	RESPONSE RATE
5	293 and 105	17%	Leslie's	6	18	33%
4	39 to 103	25%	Over 2%*	6	17	35%
3	19 to 37	18%	2% > X >= 1%*	6	16	38%
2	6 to 18	21%	1% > X >= .3*	6	53	11%
1	2 to 5	19%	.3% > X*	6	160	4%
Total		100%		30	264	11%

* We recalculated the ranges excluding Leslie's sales data.

Table A.4: PG&E Pool Pump Contractor Sampling Plan

STRATUM	# OF INCENTIVES	% OF INCENTIVES BY STRATA	RANGE	PROPOSED SAMPLE	AVAILABLE CONTACTS	RESPONSE RATE
4	30 to 150	41%	Over 2%	6	12	50%
3	16 to 29	19%	2% > X >= 1%	6	13	46%
2	5 to 15	26%	1% > X >= .3	6	45	13%
1	1 to 4	15%	.3% > X	6	125	5%
Total		100%		24	195	12%

Participants

For both PG&E and SCE participant samples, we calculated population proportions for each delivery type (available and not available). We created a proportional sample with a sample of 100 for each delivery type (mail, online and POS). The proportional sample was inconsistent with the goal of comparing measures (e.g. refrigerators to air conditioners), since the majority of interviews would be focused on refrigerators (89%). In order to allow enough power¹⁴⁵ to compare between measure type (especially measure type by delivery type interactions) we recalculated samples using a balanced sample method. We maintained a sample of forty per

¹⁴⁵ Having enough "power" means that we will be able to see differences between groups with the sample size we choose if those differences are real.



measure wherever possible.¹⁴⁶ Table A.5 shows the number of rebates with available contacts for SCE, and Table A.6 shows the number of rebates with available contacts for PG&E.

Table A.5: Distribution of SCE Rebated Appliances from September 2009 to July 2011 for Participant Sampling Plan

MAIL-IN						
Product	Available	Percent	Completes Needed	Required Resp. Rate	Target Resp. Rate	# for Call List
Refrigerator	57,238	90%	10	0.02%	14%	70
Room A/C	1,328	2%	30	2.26%	14%	210
Evaporative Cooler	913	1%	30	3.29%	14%	210
Pool Pump	3,574	6%	30	0.84%	14%	210
Whole House Fan	397	1%	0	-	-	-
Water Heater	46	0%	0	-	-	-
Total	63,496	100%	100	0.16%	14%	700
ONLINE						
Product	Available	Percent	Completes Needed	Required Resp. Rate	Target Resp. Rate	# for Call List
Refrigerator	11,469	83%	20	0.17%	14%	140
Room A/C	440	3%	30	6.82%	14%	210
Evaporative Cooler	76	1%	10	13.16%	14%	70
Pool Pump	1,500	11%	40	2.67%	14%	280
Whole House Fan	323	2%	0	-	-	-
Water Heater	4	0%	0	-	-	-
Total	13,812	100%	100	0.74%	14%	700

¹⁴⁶ Note that this goal was not possible for evaporative coolers with an online delivery method, or all measures but refrigerator with a POS delivery method for SCE and not possible for pool pumps for PG&E.



POS						
Product	Available	Percent	Completes Needed	Required Resp. Rate	Target Resp. Rate	# for Call List
Refrigerator	1,183	62%	100	8.45%	14%	700
Room A/C	0	0%	0	-	-	-
Evaporative Cooler	0	0%	0	-	-	-
Pool Pump	0	0%	0	-	-	-
Whole House Fan	739	38%	0	-	-	-
Water Heater	0	0%	0	-	-	-
Total	1,922	100%	100	8.45%	14%	700
TOTAL						
Product	Available	Percent	Completes Needed	Required Resp. Rate	Target Resp. Rate	# for Call List
Refrigerator	69,890	88%	130	0.19%	14%	910
Room A/C	1,768	2%	60	3.39%	14%	420
Evaporative Cooler	989	1%	40	4.04%	14%	280
Pool Pump	5,074	6%	70	1.38%	14%	490
Whole House Fan	1,459	2%	0	-	-	-
Water Heater	50	0%	0	-	-	-
Total	79,230	100%	300	0.39%	14%	2,100

* SCE did not select starred products for evaluation

Table A.6: Distribution of PG&E Rebated Appliances from October 2009 to October 2011 for Participant Sampling Plan

MAIL-IN						
Product	Available	Percent	100 Per Del. Type	Required Resp. Rate	Target Resp. Rate	# for Call List
Electric Water Heater	74	0%	5	6.80%	14%	35
Gas Water Heater	3,601	2%	15	0.40%	14%	105
Pool Pump	3,903	2%	40	1.00%	14%	280
Room A/C	1,208	1%	20	1.70%	14%	140
Whole House Fan	2,281	1%	20	0.90%	14%	140
Clothes Washer*	131,139	66%	0	-	-	-
Dishwasher*	57,368	29%	0	-	-	-
Total	199,574	100%	100	0.90%	14%	700



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ONLINE						
Product	Available	Percent	100 Per Del. Type	Required Resp. Rate	Target Resp. Rate	# for Call List
Electric Water Heater	69	0%	5	7.20%	14%	35
Gas Water Heater	2,273	5%	25	1.10%	14%	175
Pool Pump	4	0%	0	-	-	-
Room A/C	1,118	2%	35	3.10%	14%	245
Whole House Fan	1,229	2%	35	2.80%	14%	245
Clothes Washer*	27,837	56%	0	-	-	-
Dishwasher*	17,337	35%	0	-	-	-
Total	49,867	100%	100	2.10%	14%	700
COMBINED						
Product	Available	Percent	100 Per Del. Type	Required Resp. Rate	Target Resp. Rate	# for Call List
Electric Water Heater	143	0%	10	7.00%	14%	70
Gas Water Heater	5,873	2%	40	0.70%	14%	280
Pool Pump	3,907	2%	40	1.00%	14%	280
Room A/C	2,326	1%	55	2.40%	14%	385
Whole House Fan	3,510	1%	55	1.60%	14%	385
Clothes Washer*	158,976	64%	0	-	-	-
Dishwasher*	74,705	30%	0	-	-	-
Total	249,440	100%	200	1.30%	14%	1400

* PG&E did not select starred products for evaluation

DATA COLLECTION

Retailer Survey

We conducted telephone surveys with retailers who participated in the PG&E or SCE HEER program from 2009-2010. California Survey Research Services surveyed 153 retailers from PG&E (74) and SCE (79) territories. SCE gave Research Into Action a list of 424 individual retailer contacts (see Table A.7 for details). Contacts were not linked with HEER rebates so we were unable to target retailers by measure. PG&E rebate data included the name of the retailer but did not include associated phone numbers. We searched for phone numbers associated with the retailer name and city, finishing with a list of 1,299 retailers in PG&E territory. About 20% of the list had incorrect phone numbers (245 out of a total of 1,299).



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At each location, the survey administrators requested to speak to the person most knowledgeable about the HEER Program and the associated rebates.

Retailer surveys lasted about fifteen minutes.

Table A.7: Summary of Retailer Survey Disposition

DISPOSITION	SMALL		MEDIUM		LARGE	
	PG&E	SCE	PG&E	SCE	PG&E	SCE
Completed	20	20	21	25	33	34
Refused				62		
List Errors	Wrong Number/Person		273			
	Fax/Modem/Line Problems		6			
	Disconnected Number		35			
Screened Out	Not Qualified		34			
Not Dialed	Cell Phone, Duplicate, Quota Met		1,160			
Total List			1,723			

Pool Pump Contractor Survey

Research Into Action surveyed 55 pool pump contractors in PG&E and SCE territories. We called 79 contacts in PG&E territory, 24 completed the survey, 6 were bad numbers, 10 were duplicate companies and one participant reported that most customers were in SMUD not PG&E territory. We called 65 contacts in SCE territory, 31 completed the survey, three were bad numbers, and three were duplicate companies (see Table A.8).

Pool pump contractor surveys lasted about twenty minutes.

Table A.8: Summary of Pool Pump Survey Disposition

DISPOSITION	TOTAL
Completed	24
Refused	2
List Errors	Wrong Number/Person
	6
Not Screened	Call Back: Appointment or Unspecified
	48
Not Dialed	Cell Phone, Duplicate, Quota Met
	54
Total List	134



Participant Survey

Research Into Action surveyed 507 HEER participants (PG&E=205 and SCE=302), who had received a rebate for a HEER qualifying appliance, in January of 2012 (see Table A.9). Participant surveys lasted about fifteen minutes.

Table A.9: Summary of Participant Survey Disposition

DISPOSITION		TOTAL
Completed		507
Refused		752
List Errors		154
Not Contacted		1,069
Not Screened	Call Back: Appointment or Unspecified	550
Not Dialed	Cell Phone, Duplicate, Quota Met	1,018
Total List		4,050



SCE POS RETAILER STORE LIST

Action Maytag	Driskell's
Albee's Appliances	Duke & Slims TV Inc
Appliance Showroom	Empire Maytag
Appliances Unlimited	Famsa
Arrow Appliance Inc	Franks Appliance
Azusa Sales	Friedmans Appliance
Barber Appliance	Fry's
Barretts Appliance	Gordon's Electric
Barron's Furniture & Appliances	Harlow's Kitchen Concepts
Bay Cities Appliances	Hartshorn TV & Appliance
Bellflower-Lakewood Appliance	Home Appliance
Best Buy	Home Depot
Cagle's Appliance Center	Howard's Appliance
Canby's Inc	J & M Appliance
Carlsons	Johnnie's Appliance
Carter's Appliance	Kiva Kitchen & Bath
Caston's TV & Appliance	Kmart
Chet's Appliance	L & D Appliance Corp
CTS Appliance Co	La Curacao
Dearden's	Le Bon Appliances
Dirksen's Appliance	Lemoore Hardware



Liberty Appliance	Sears Home Town Dealer
Lowe's	Snyder Diamond
Michael's Superstore	Spears South Bay Appliances
OSH	Standards of Excellence
Pacific Sales	Superco Home Theater and Appliance
Pasadena Kitchens and Maytag	Tabbert's TV & Appliances
Reid's Appliance	The Great Indoors
Renwes Sales	Townsend's Appliance
Ruddy's Appliance	Uerner's
Saddleback Appliance	Valley TV
Sears	Warehouse Discount Center
Sears Appliance Outlet Stores	Wenger Furniture & Appliance



HEER CONTRACTOR SURVEY GUIDE

The following document is the HEER survey guide for pool pump contractors. This survey is intended to generate an understanding of the pool pump contractor experience, response to program processes, and satisfaction with the program. The research team has taken steps to assure that the resulting data can be compared to the previous 2006/2008 evaluation (see Table A.10 after the survey questions).

Interviewee Name:

Date:

Interviewer:

I1a. [If contact available] Hi, my name is _____ calling from Research Into Action on behalf of [Insert utility: Southern California Edison/ PG&E]. May I please speak to _____?

Contact available: Skip to I2

Contact currently unavailable: arrange call back

I1b. [If no contact available] I'd like to speak with the person at your company installs pool pumps in [insert utility] territory. What is that person's name?

Contact available: Skip to I2

Contact currently unavailable: arrange call back

I2. Hi, my name is _____ calling from _____ on behalf of [Insert utility: Southern California Edison/ PG&E]. [Insert utility] is conducting an evaluation of the [SCE: Home Energy Efficiency Rebate Program, the HEER Program/PG&E's residential rebate program]. We are speaking to retailers and contractors who have sold and installed pool pumps, which qualify for incentives under this program. Your input will help us improve the program and your responses will be anonymous.

This will take about ____ minutes. Is this a good time?

[IF SCE: I will refer to the program as "HEER" (pronounced "here") from now on]

1. Do you sell pool pumps in addition to installing them?
 - a. Sales only
 - b. Installations only
 - c. Sales AND installations
 - d. Don't know [Thank and terminate]



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- e. Refused [Thanks and terminate]
2. About how many pool pumps and pool pump motors does your company sell and/or install in a year?
 - a. Number: _____
 - b. Don't know
 - c. Refused
3. About what percent of your pool pump or motor installations are residential? [Versus commercial]
Percent residential: _____%
4. How many full time employees does your company have? [If necessary: at this location]
Number: _____
5. How many part time employees does your company have? [If necessary: at this location]
Number: _____
6. What percentage of your sales and/or installations fit into the following pool pump types?
 - a. 1 speed motors (note: 1 speed motors do not comply with current Title 20 requirements in the State of California – we just want to see how many contractors might still support this technology) _____ percentage?
 - b. Two or more speed motors: _____percentage?
 - c. Variable speed motors: _____percentage?
 - d. Refused
7. Before this interview, had you heard of [SCE: the HEER Program/P&G&E: P&G&E's pool pump rebates]? [If needed: This program offers rebates for energy-efficient equipment such as pool pumps. There are separate rebates offered to both contractors and customers]
 - a. Yes [Skip to Q4]
 - b. No
 - c. Don't know
 - d. Refused
8. [IF NO] Is there someone else who is familiar with the rebate program? [If no, thank and terminate]



[At this point, we have screened out any unqualified respondents]

9. How did you find out about [SCE: the HEER Program/PG&E: PG&E's] pool pump rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- a. Utility mailing/brochures
 - b. Utility website
 - c. Utility meeting
 - d. Utility email
 - e. Utility phone call
 - f. Information from equipment manufacturer/retailer
 - g. Training by equipment manufacturer
 - h. Trade conference/trade association
 - i. Word-of-mouth/industry colleague
 - j. Other, specify:
 - k. Don't know
 - l. Refused

Equipment and Rebates

- A1. Next, I have some questions about the pool pumps you sell. Has your company actively promoted these the utility pool pump rebates over the past year?
- a. Yes [Display if display A3 if Not =YES]
 - b. No
 - c. Don't know
 - d. Refused
- A3. Why haven't you been more active in promoting these rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- a. The rebates are too small to bother with
 - b. The rebates are too much hassle to process
 - c. Cost of the pool pump required to fulfill the rebate program specifications



- d. The rebates don't affect sales
 - e. Our marketing budget is too small
 - f. We don't promote energy efficient pool pumps
 - g. Other, specify: _____
 - h. Don't know
 - i. Refused
- A4. Is the current rebate level enough to motivate customers to choose a variable speed pool pump?
- a. Yes
 - b. No [Skip to A6]
 - c. Don't know [Skip to A6]
 - d. Refused [Skip to A6]
- A5. [If A4 ≠ Yes] What rebate level would be needed to generate more consumer interest in variable speed pool pumps?
- Specify: _\$ _____
- Don't know
- Refused
- A6. What is the average price difference between variable speed pool pumps and other comparable pool pumps?
- Specify: \$ _____
- Don't know
- Refused
- A7. Is the current contractor rebate level enough to motivate your company to sell and/or install a variable speed pool pump?
- a. Yes
 - b. No [Skip to A8]
 - c. Don't know [Skip to A8]
 - d. Refused [Skip to A8]



- A8. What rebate level would be needed to motivate your company to sell and/or install variable speed pool pumps?
- Specify: _\$ _____
- Don't know
- Refused
- A9. What do you say or explain to a customer in order to get them to purchase a variable speed pool pumps? [Note to interviewer: The alternative is a single, dual, or even three speed pool pump. The difference is that variable speed pool pumps constantly adjust to the most efficient speed][Choose all that apply]
- a. Same as single or dual pool pumps
 - b. Promote based on energy savings
 - c. Promote based on available rebates
 - d. Don't have a strategy/case by case
 - e. Other, specify: _____
 - f. Don't know
- A10. What is your best estimate of the percentage of pool pumps that you sold over the past year that were variable speed?
- [RECORD RESPONSE] _____ %
- Don't know
- Refused
- A11. Is there anything preventing the sale of variable speed pool pumps?
- a. High cost of a variable speed pool pump for the customer
 - b. Difficult for a customer to correctly set the program for a variable speed pool pump
 - c. Lack of ease of installation
 - d. Requires a larger number of (more frequent) service visits to keep the pump correctly programmed for effective operation
 - e. Other - please specify: _____
 - f. No



- g. Don't know
 - h. Refused
- A12. Do you conduct energy efficiency audits of the pool pump systems as part of your general maintenance offering or when you are assessing the appropriate replacement of pool pump equipment? (Note to interviewer: EE audit for a pool pump system can include: measurement of flow rate/amount; calculation of the amount of energy used by a pool pump system; number of hours per day that a pool pump system operates; assessing the efficiency of a pool pump system output of energy vs. input of energy, against system manufacturer specifications)
- a. Yes
 - b. No
 - c. Don't know
 - d. Refused

Installation

- B1. When you install the variable speed pool pump at the customer's home what time of day and for how many hours to do you set the pump to run at a low speed?
- a. Number of hours _____
 - b. Time of day ____
 - c. Varies by individual pool/household
 - d. As needed
 - e. Don't know
- B2. When you install the variable speed pool pump at the customer's home what time of day and for how many hours to do you set the pump to run at high speed for the cleaning cycle?
- a. Number of hours _____
 - b. Varies by individual pool/household
 - c. As needed
 - d. Don't know
- B3. Do you explain to the homeowner how to set the controller?



- a. Yes
 - b. No
 - c. Don't know
- B4. Are there any concepts or ideas that are especially difficult to explain to customers?
- a. Yes, please specify:
 - b. No
 - c. Don't know
- B5. Do you take any steps to make sure that homeowners leave the programming how it is set during the installation[If needed: to avoid callbacks?]?
- a. Yes, return visit(s) to maintain the settings
 - b. Yes, explain to the homeowner not to change the settings
 - c. Yes, other: _____
 - d. No
 - e. Don't know
 - f. Refused
- B6. For an average sized pool [If needed: 400 cubic feet] how many hours do you program the pump – running at high speed - to run in order to accomplish turn-over of the water volume of the pool ?
- Record number of hours:
- B7. With about what percent of your customers do you discuss how to manage the energy use of their pool pumps?
- a. Record percent of customers :____%
 - b. Don't know
 - c. Refused
- B8. What percentage of your customers is concerned with/complain about their electricity bills in terms of the energy required to run their pool pump?
- a. Record percent of customers :____%
 - b. Don't know



- c. Refused
- B9. Do you tell customers how variable speed pool pumps work differently than standard (single, dual, or tri speed) pool pumps?
- a. Yes,
 - b. No
 - c. Don't know
- B10. In your opinion, would it be a good idea to offer a rebate for replacing just the motor in a pool pump? [If necessary, instead of the entire pool pump].
- a. Yes
 - b. No
 - c. Don't know [Skip to B9]
- B11. Why do you say that?
-
- B12. Do you sell robotic pool cleaners?
- a. Yes
 - b. No [Skip to B16]
- B13. In your opinion, are robotic pool cleaners a viable substitute to suction cleaning systems?
- a. Yes
 - b. No
 - c. Don't know [Skip to B16]
- B14. What are the benefits of robotic pool cleaners as compared to suction cleaning systems?
- B15. What are the limitations of robotic pool cleaners as compared to suction cleaning systems?
- B16. Do you ever utilize the opportunity to offer the customer a “rebate on the spot” by having the customer assign their rebate over to you, and then immediately reducing your bill by that customer rebate amount?
- a. Yes
 - b. No



- c. Don't know
- B17. Do you ever use [Insert utility] marketing materials to communicate information about variable speed pool pumps to your customers?
- a. Yes
- b. No [Skip to general questions]
- c. Don't know
- B18. How effective are these marketing materials? Please use a scale of 1 to 5 where 5 indicates it would be "very effective" and 1 indicates it would be "not at all effective."
- 1 Not at all effective
- 2
- 3
- 4
- 5 very effective
- Don't know
- Refused
- B19. What have been some of your most effective strategies for promoting energy efficient pool pumps? _____

General Questions

- F1. Now, I'd like you to think about [insert utility] marketing and consumer education efforts. Using a scale of 1 to 5, where 5 means "very satisfied" and 1 means "not at all satisfied", how satisfied have you been with the way that the utilities market their rebates for energy efficient pool pumps to home owners?
- 1 not at all satisfied
- 2
- 3
- 4
- 5 very satisfied
- Don't know



Refused

F2. Have you looked at the utility website for the pool pump rebates?

- a. Yes
- b. No [Skip to F4]
- c. Don't know [Skip to F4]
- d. Refused [Skip to F4]

F3. Using a scale of 1 to 5, where 5= "very satisfied" and 1 = "very dissatisfied," how satisfied have you been with the way the utility website explains the rebates for pool pumps?

- 1 not at all satisfied
- 2
- 3
- 4
- 5 very satisfied

Not applicable

Don't know

Refused

F4. Is the equipment that qualifies for the rebates usually available?

- a. Yes
- b. No
- c. Don't know
- d. Refused

Optional comments:

F5. I'd like to know how satisfied you have been with the types of customer rebates the utility offers. First, does your company have experience with the:

- a. Mail-in rebates (yes/no)
- b. Online rebates (yes/no) (PG&E does not offer)



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- c. Point of sale(PG&E does not offer)
 - d. Don't know [Skip to F10]
- F6. How satisfied have you been with the mail in/ online rebates? [Ask each type for which the respondent answered "yes" in F5] Please use a scale where 1 means "not at all satisfied" and 5 means "very satisfied"
- 1 not at all satisfied
 - 2
 - 3
 - 4
 - 5 very satisfied
- Don't know
- Refused
- F7. [If F5 includes mail-in or online] Did your company fill out any mail-in or online rebate applications on behalf of your customers in the last year?
- a. Mail-in
 - b. Online
 - c. Both
 - d. Don't know
 - e. Refused
- F8. [If F5 includes mail-in] Did you find the mail-in rebate forms to be reasonable in terms of length and level of detail?
- a. Yes
 - b. No, why?_____
 - c. Don't know
 - d. Refused
- F9. [If F5 includes online] Did you find the online rebate forms to be reasonable in terms of length and level of detail?
- a. Yes



- b. No, why? _____
 - c. Don't know
 - d. Refused
- F10. Have you interacted with any utility program staff or other representatives of the utility?
- a. Utility staff (unspecified) Utility Telephone call-in center/Smarter Energy Line
 - b. Utility staff who support the program
 - c. OSS staff [SCE]
 - d. Some representative, don't know who
 - e. Other, specify: _____
 - f. None [Skip to F12]
 - g. Don't know
- F11. Using a scale of 1 to 5, where 1 = "very dissatisfied" and 5= "very satisfied," how satisfied have you been with your interactions?
- 1 not at all satisfied
 - 2
 - 3
 - 4
 - 5 very satisfied
- Don't know
- Refused
- F12. Are you aware of any training or education offered in the past by the utilities regarding energy efficient pool pumps? (Note: last pool contractor training in PG&E territory by manufacturers was nearly two years ago)
- a. Yes, which? _____
 - b. No
 - c. Don't know
 - d. Refused



- F13. Have you, or anyone else at your company, participated in any of the utility provided trainings or educational events?
- Yes, self
 - Yes, other person at company
 - No
 - Don't know
 - Refused
- F14. [If F13= A] Did this training help you promote energy efficient pool pumps or motors?
- Yes
 - No
 - Don't know
 - Refused
- F15. Would you be interested in participating/attending additional training sessions that could be offered by the Utility?
- Yes, specify: _____
 - No
 - Don't know
 - Refused
- F16. Are you satisfied with the pool pump rebate program offered by your utility?
- Yes [Skip to F18]
 - No
 - Don't know
- F17. [If no] Why are you not satisfied?
- F18. Do you have any suggestions for how to improve the California Home Energy Efficiency Rebate Program?
- [RECORD RESPONSE]_____



Question	Year	
	'06-'08	2011
Does your company sell pool pumps in addition to installing them?		X
About how many pool pumps and pool pump motors does your company sell in a year?	X	X
Before this interview, had you heard of [SCE: the HEER Program/PG&E: PG&E's pool pump rebates		X
[IF NO] Is there someone else who is familiar with the rebate program?		X
How did you find out about [SCE: the HEER Program/PG&E: PG&E's]pool pump rebates?		X
Equipment and Rebates		
Next, I have some questions about the pool pumps you sell. Has your company actively promoted these the utility pool pump rebates over the past year?	X	X
Why haven't you been more active in promoting these rebates?		X
Is the current rebate level enough to motivate customers to choose a variable speed pool pump?	X	X
What is the average price difference between variable speed pool pumps and other comparable pool pumps?	X	X
What is your marketing strategy for variable speed pool pumps?		X
What is your best estimate of the percentage of pool pumps that you sold over the past year that were variable speed?		X
Is there anything preventing the sale of variable speed pool pumps?		X
Before this interview, were you aware that [utility] offers rebates to contractors like yourself who install qualifying heat pump motors?	X	X

Question	Year	
	'06-'08	2011
Installation		
When you install the pool pump at the customer's home, what time of day do you set the pump to run?	X	X
Do you explain to the homeowner how to set the controller?		X
Are there any concepts or ideas that are especially difficult to explain to customers?		X
For an average sized pool [If needed: 400 cubic feet] how long do you tell customers to run the pool pump?		X
During about what percent of your visits do you discuss how to manage the energy use of the pool pumps?		X
Do you tell customers how variable speed pool pumps work differently than standard (single, dual, or tri speed) pool pumps?		X
In your opinion, would it be a good idea to offer a rebate for replacing just the motor in a pool pump? [If necessary, instead of the entire pool pump].		X
Why do you say that?		X
Do you sell robotic pool cleaners?		X
In your opinion, are robotic pool cleaners a viable substitute to suction cleaning systems?		X
Do you ever use [Insert utility] marketing materials to communicate information about variable speed pool pumps to your customers?		X
How effective are these marketing materials? Please use a scale of 1 to 5 where 5 indicates it would be "very effective" and 1 indicates it would be "not at all effective."		X

Question	Year	
	'06-'08	2011
What have been some of the most effective strategies for promoting energy efficient pool pumps?	X	X
General Questions		
Now, I'd like you to think about [insert utility] marketing and consumer education efforts. Using a scale of 1 to 5, where 5 means "very satisfied" and 1 means "not at all satisfied", how satisfied have you been with the way that the utilities market their rebates for energy efficient pool pumps to home owners?	X	X
Have you looked at the utility website for the pool pump rebates?		X
Using a scale of 1 to 5, where 5= "very satisfied" and 1 = "very dissatisfied," how satisfied have you been with the way the utility website explains the rebates for pool pumps?		X
Is the equipment that qualifies for the rebates usually available?		X
I'd like to know how satisfied you have been with the various types of customer rebates the utility offers. First, does your company have experience with the: Mail-in, Online, point-of-sale rebates?		X
How satisfied have you been with the mail in/ online rebates? [Ask each type for which the respondent answered "yes" in F5] Please use a scale where 1 means "not at all satisfied" and 5 means "very satisfied"		X
[If F5 includes online] Did you find the online rebate forms to be reasonable in terms of length and level of detail?		X
Have you interacted with any utility program staff or other representatives of the utility?		X
Using a scale of 1 to 5, where 1 = "very dissatisfied" and 5= "very satisfied," how satisfied have you been with your interactions?		X

Question	Year	
	'06-'08	2011
Are you aware of any training or education offered by the utilities regarding energy efficient pool pumps?		X
Have you, or anyone else at your company, participated in any of the utility provided trainings or educational events?		X
[If F13= A] Did this training help you promote energy efficient pool pumps or motors?		X
Are you satisfied with the rebate your company gets for installing a variable speed pool pump?		X
[If no] Why are you not satisfied?		X
On a scale of 1 to 5, where 1 = “very dissatisfied” and 5= “very satisfied,” how satisfied have you been with the rebate Program in general?	X	X
Do you have any suggestions for how to improve the California Home Energy Efficiency Rebate Program?	X	X

HEER PARTICIPANT SURVEY GUIDE

May I please speak with [Name]? Hello, my name is _____ calling on behalf of [Utility: Southern California Edison/ Pacific Gas and Electric]. According to our records, your household received a rebate from the utility for a(n) <APPLIANCE TYPE> that you purchased around [date]. We are conducting a BRIEF survey of utility customers who have received home energy efficiency rebates in the past two years. The results of this survey will help the utility improve their rebate program.

IF NEEDED: It will take less than 15 minutes.

IF NEEDED: I'm calling from _____, an independent research firm, who has been contracted to conduct the study.

IF RESPONDENT WANTS TO SPEAK WITH SOMEONE AT [utility] ABOUT THE STUDY, they can contact ...

1. Thank you. First, I'd like to clarify a couple of details. Do you pay [Utility: Southern California Edison/Pacific Gas and Electric] directly for the electricity you use or are you billed through a third party- such as a landlord?
 - a. Pay utility directly
 - b. Billed through a third party
 - c. Other: _____
 - d. Don't know
 - e. Refused

If Q1= a terminate interview. "Thank you for your time, at this time we are only interviewing people who pay the utility directly"]

2. Were you involved in either purchasing the <APPLIANCE TYPE> for which you received this rebate or applying for the rebate? [Clarify involvement]
 - a. Yes, involved in the purchase
 - b. Yes, involved in the rebate application
 - c. Yes, involved in both
 - d. No [Ask for adult who was involved in either]
 - e. Don't know/can't remember [Terminate]
 - f. Refused [Terminate]



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3. [When right person is reached] I have a few questions about your appliance purchases and where you go for information.

Awareness and Sources of Information

- A1. If you were looking for information on ways to lower your energy bill, where would you look or who would you talk to? [FOLLOW UP WITH:] Anywhere or anyone else? [ALLOW UP TO TWO RESPONSES]
- a. Utility- specify how: _____
 - b. Other website
 - c. Friend or relative
 - d. Television
 - e. Trades person (contractor, electrician, builder)
 - f. Home/trade show
 - g. Product manufacturer
 - h. Library
 - i. Government agency
 - j. Advertising
 - k. Mail
 - l. Newspaper
 - m. Other, specify _____
 - n. Don't know/Not sure/Can't remember
 - o. Refuse
- A2. What, if any, utility programs or services to help customers save energy in their homes have you heard of? Any others? [ALLOW MULTIPLE RESPONSES]
- a. Rebates on: _____ [specify rebate types]
 - b. Home energy audits/energy survey
 - c. Financing or approved contractor lists for central air-conditioning (A/C Quality)
 - d. Recycling used refrigerators or freezers



- e. Interrupting or cycling the central air conditioner (Summer Discount Plan)
 - f. Paying for energy efficient appliances for low income customers (Energy Management Assistance)
 - g. Incentives for solar power (California Solar Initiative)
 - h. Energy Upgrade California
 - i. Other, specify: _____
 - j. None
 - k. Don't know/Not sure/Can't remember/not aware
 - l. Refused
- A3. [IF A2= any other programs/rebates] From where did you hear about these OTHER utility programs/rebates? [Probe: Anywhere else? ALLOW MULTIPLE RESPONSES]
- a. Utility bill insert/ stuffer
 - b. Other utility direct mail piece
 - c. Word-of-mouth (friend/neighbor/landlord)
 - d. TV
 - e. A retailer/installation contractor
 - f. Participation in Edison program
 - g. Newspaper article/ ad
 - h. Utility Web site
 - i. Radio
 - j. Home/trade show
 - k. Email
 - l. Other , specify:_____
 - m. Don't know/Not sure/Can't remember
 - n. Refused
- A4A. Would you like to receive additional information from your utility concerning home appliance rebates?



- a. Yes
 - b. No [Skip to A5]
 - c. Don't know/Not sure/Can't remember [Skip to A5]
 - d. Refused [Skip to A5]
- A4B. If your utility wanted to inform you about any of its programs or services that help customers save energy, what would be the best way to do this? [ALLOW MULTIPLE RESPONSES]
- a. Utility bill insert/ stuffers
 - b. Other utility direct mail piece
 - c. TV
 - d. A dealer/retailer/contractor
 - e. Newspaper article/ ad
 - f. Utility Web site
 - g. Radio
 - h. Home/trade show
 - i. Email
 - j. Text message
 - k. Mobile App alert
 - l. Other , specify: _____
 - m. Don't know/Not sure/Can't remember
 - n. Refused
- A5. Have you seen or heard of yellow stickers called Energy Guide labels that appear on new appliances?
- a. Yes
 - b. No
 - c. Don't know/Not sure/Can't remember
 - d. Refused



- A8. In the past 12 months do you recall seeing or hearing any messages from your utility concerning how to manage home energy use, the energy efficiency of specific products, or utility programs that help customers save energy?
- Yes
 - No [Skip to next section]
 - Don't know/Not sure/Can't remember [Skip to next section]
 - Refused [Skip to next section]
- A9. What messages do you recall? [ALLOW MULTIPLE RESPONSES]
- Record: _____
 - Don't know/Not sure/Can't remember
 - Refused
- A10. Where did you see or hear these messages from the utility? [DON'T PROMPT. ACCEPT MULTIPLE RESPONSES]
- Label on appliances or electronic equipment
 - Display in stores
 - Salesperson
 - TV
 - Radio
 - Utility bill insert/ stuffer
 - Other mailing from your utility
 - Internet
 - Friend, neighbor, relative, or co-worker
 - Newspaper/ magazine ad
 - Newspaper/ magazine article
 - Other, specify: _____
 - Don't know/Not sure/Can't remember
 - Refused



A11. 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].

Yes

No

Don't know

Refused

HEER Participation

B1. When you were purchasing the <APPLIANCE TYPE> from where did you get information about what to buy? Any other sources of information? [DON'T PROMPT. ALLOW MULTIPLE RESPONSES]

- a. Retailers/ salesperson
- b. Installation contractor
- c. Friend, neighbor, relative, or co-worker
- d. Utility
- e. Other gas/electric utility
- f. Internet
- g. Consumer Reports or other product-oriented magazines
- h. Other magazines
- i. Newspaper
- j. Radio
- k. Television
- l. Did not look for any information about what to buy
- m. Other, specify: _____
- n. Don't know/Not sure/Can't remember
- o. Refused



- B2A. At what type of store, or from what sort of contractor, did you purchase the <APPLIANCE TYPE>?
- a. Sears
 - b. Appliance store
 - c. Best Buy, Wal-Mart or other “big box”
 - d. Home improvement store (e.g., Home Depot, Lowes, Menards)
 - e. Brand retailer (e.g., Maytag store)
 - f. Heating/ cooling/ plumbing installation contractor
 - g. Roofing contractor
 - h. Swimming pool contractor
 - i. Plumbing supply store
 - j. Local Hardware store/Ace/TruValue
 - k. Internet
 - l. Other, specify:_____
 - m. Don't know/Not sure/Can't remember
- B2B. When you were considering the purchase of the <APPLIANCE TYPE>, what characteristics of the <APPLIANCE TYPE> did you and any contractors or salespeople talk about? [FOLLOW UP WITH:] Anything else? [DON'T PROMPT. ACCEPT MULTIPLE RESPONSES.]
- a. None/Didn't talk to anyone
 - b. Price/Cost
 - c. Size (tons/Btus/capacity)
 - d. Brand
 - e. Operating cost
 - f. Efficiency level/SEER/EER
 - g. ENERGY STAR
 - h. Rebates
 - i. Warranty



- j. Color
 - k. Ease of Installation
 - l. Other feature:_____
 - m. Don't know/Not sure/Can't remember
 - n. Refused
- B2C. [IF NOT POS REBATE] Who actually filled out the application for your utility rebate on this <APPLIANCE TYPE>? [DO NOT READ. ACCEPT ONLY ONE RESPONSE.]
- a. I filled it out
 - b. Someone else in my household filled it out
 - c. The salesperson or installation contractor filled it out
 - d. Other (RECORD) _____
 - e. Don't know/Not sure/Can't remember
 - f. Refused
- B3. [IF NOT POS REBATE] Were you aware that the rebate forms were available online?
- B4a. Other than the rebate you received from the utility, were there any other rebates available for the <APPLIANCE TYPE > when you were purchasing it?
- a. Yes
 - b. No [Skip to B4B]
 - c. Don't know/Not sure/Can't remember
 - d. Refused
- B4b. Who was offering the other rebate(s) for the < APPLIANCE TYPE >? [DON'T PROMPT. ALLOW MULTIPLE RESPONSES]
- a. Another utility
 - b. Manufacturer
 - c. Retailer
 - d. ENERGY STAR
 - e. Government funds, ARRA funding



- f. Other – specify: _____
 - g. Don't know/Not sure/Can't remember
 - h. Refused
- B4c. If you had not received the rebate from the utility for this [APPLIANCE TYPE], how likely would you have been to purchase this model or type of [APPLIANCE TYPE]? ...Would you say you would have been [READ UNBRACKETED RESPONSES]
- a. Very likely
 - b. Somewhat likely
 - c. Not very likely
 - d. Or very unlikely
 - e. Don't know
 - f. Refused
- B5. Why did you select this model or type of < APPLIANCE TYPE >? [DO NOT READ; ALLOW MULTIPLE RESPONSES.]
- a. It was a good value/ in my price range
 - b. There was a rebate for it
 - c. It costs less to operate/energy savings
 - d. It is good for environment
 - e. It was all that was available/ only choice
 - f. The contractor/retailers recommended/ pushed it
 - g. It had the features I wanted
 - h. It was the right size, color
 - i. Wanted that brand
 - j. It had an ENERGY STAR label
 - k. Other (RECORD) _____
 - l. Don't know/ Not sure/ Can't remember
 - m. Refused



- B6. [ASK ONLY IF THERE WERE MULTIPLE RESPONSES TO B6A] Of those reasons, which was the main reason? [ALLOW ONLY ONE RESPONSE]
- a. It was a good value/ in my price range
 - b. There was a rebate for it
 - c. It costs less to operate/energy savings
 - d. It is good for environment
 - e. It was all that was available/ only choice
 - f. The contractor/retailers recommended/ pushed it
 - g. It had the features I wanted
 - h. It was the right size, color
 - i. Wanted that brand
 - j. It had an ENERGY STAR label
 - k. Other (RECORD) _____
 - l. Don't know/ Not sure/ Can't remember
 - m. Refused
- B7A. We'd like to get a sense of your satisfaction with several aspects of this purchase. Please use a 1 to 10 scale, where 1 means Extremely Dissatisfied, and 10 means Extremely Satisfied. How would you rate your satisfaction with . . . [RANDOMIZE]
- a. the rebate program overall?
 - b. the <APPLIANCE TYPE> that you purchased?
 - c. the savings on your utility bill as a result of installing this <APPLIANCE TYPE>?
 - d. the amount of the rebate you received?
 - e. how much time it took for you to receive your rebate?
 - f. the process of applying for the rebate and any forms you had to fill out?
 - g. the knowledge your salesperson, if any, had about the energy efficiency of the <APPLIANCE TYPE> you purchased?



- B8A. Did you or someone in your household install the <APPLIANCE TYPE> or did you pay someone else to install it?
- We installed it ourselves
 - We paid someone to install it
 - Don't know/Not sure/Can't remember
 - Refused
- B8B. Did someone in your household contact a utility staff member with questions about your rebate application?
- Yes
 - No
 - Don't know/Not sure/Can't remember
- B9. How satisfied were you with your interactions with utility staff concerning the rebate? IF NECESSARY READ: Please use the same 10 point scale, where 1 means Extremely Dissatisfied and 10 means Extremely Satisfied.
- Extremely dissatisfied 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - Extremely satisfied 10
 - Don't know/Not sure/Can't remember
 - Refused



Awareness, Knowledge, and Attitudes about Energy Efficiency

C1. 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) |
| f. | Home Energy Efficiency Rebates | (Yes) | (No) | (DK) | (Refused) |

C2. 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:

Infrequent actions

Did you...

- | | | | | | | | |
|--------|--|-------|------|------|------|-----------------------|-------|
| (a)... | install an attic vent to keep the attic cooler | (Yes) | (No) | (DK) | (NA) | (Came with the house) | (Ref) |
| (b)... | install programmable thermostats | (Yes) | (No) | (DK) | (NA) | (Came with the house) | (Ref) |
| (c)... | Install ceiling fans | (Yes) | (No) | (DK) | (NA) | (Came with the house) | (Ref) |
| (d)... | Install motion detectors for lights | (Yes) | (No) | (DK) | (NA) | (Came with the house) | (Ref) |

Segmentation Items

C3. 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.

- | | | | | | | | | | | | |
|----|---|---|---|---|---|---|---|---|----|-----|--|
| a. | I compare prices of at least a few brands | 1 | 2 | 3 | 4 | 5 | 6 | 7 | DK | Ref | before I choose one. |
| b. | I do NOT feel responsible for conserving | 1 | 2 | 3 | 4 | 5 | 6 | 7 | DK | Ref | energy because my personal contribution is very small. |



- C4. I'm going to read you a list of six 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"] [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
- C5. How worried are you about global warming? [READ CHOICES except DK or REF]
- a. Not at all worried
 - b. A little worried
 - c. Somewhat worried
 - d. Very worried, or
 - e. Extremely worried
 - f. Don't Know
 - g. Refused
- C6. 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"] Again, this is a 0 to 10 scale, different from before.
- | | | 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

Future Appliance/Energy-Using Equipment Purchases

- D1. Do you or someone else in your household plan to purchase a brand new _____ for this residence in the next 12 months? [ALLOW MULTIPLE RESPONSES, AS LONG AS NONE OF THEM =
- a. Refrigerator yes/no/don't know
 - b. Electric water heater yes/no/don't know
 - c. Room air conditioner yes/no/don't know
 - d. Evaporative cooler yes/no/don't know



- e. Whole house fan yes/no/don't know
- f. Pool pump yes/no/don't know
- g. Roof
- h. Refused

[FOR REMAINING QUESTIONS IN D SECTION, AUTOFILL APPLIANCES RESPONDENT INDICATED THEY PLAN ON PURCHASING IN D1, Ask about up to two randomly selected appliances]

D2. Have you already started shopping or researching options for the purchase of a new <PRODUCT TYPE>?

- a. Yes
- b. No
- c. Don't know/Not sure/Can't remember
- d. Refused

D3. What might prevent you from purchasing an energy efficient <PRODUCT TYPE>?
[ALLOW MULTIPLE RESPONSES]

- a. Price too high
- b. Lack of rebates
- c. Lack of information about which models are energy efficient
- d. Don't know where to go to purchase an energy efficient model
- e. Not available/in stock
- f. Wrong size or color
- g. Not the right brand
- h. Lacks other features I want
- i. Don't care about energy efficiency
- j. Other (RECORD)
- k. Don't know/Not sure/Can't remember
- l. Refused



- D4. Did you purchase a < APPLIANCE TYPE > with an ENERGY STAR label? The label could be on the product, the packaging, or in the operating instructions?
- a. Yes
 - b. No
 - c. Don't know/ Not sure/ Can't remember

Demographics

Finally I would like to ask you a few questions about your household where <appliance> installed.

- E1. Do you own or rent your home?
- a. Own
 - b. Rent
 - c. Other
 - d. Don't know/Not sure/Can't remember
 - e. Refused
- E2. For how many years have you lived at this address? [Record number of years, put 0 if less than one year.]
- a. _____ # of years at this address
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E3. Approximately what year was your home built?
- a. 1995 or later
 - b. 1990 to 1994
 - c. 1980 to 1989
 - d. 1978 to 1979
 - e. 1970 to 1977
 - f. 1960 to 1969
 - g. 1950 to 1959



- h. Before 1950
 - i. Don't know/Not sure/Can't remember
 - j. Refused
- E4. Including yourself and children, how many people live in your home at least six months of the year?
- a. Record number people living in home
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E5. How many people in your household are over 65 years of age?
- a. Record number of people over 65
 - b. Don't know/Not sure/Can't remember
 - c. Refused
 - d. IF D4=D5, SKIP TO D9
- E6. How many people in your household are 18 to 65 years of age?
- a. Record number of people 18 to 65 years old
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E7. How many in your household are 5 to 17 years of age?
- a. Record number of people between 5 and 17
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E8. How many people in your household are under 5 years of age?
- a. Record number of people under 5
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E9. What is your age?



- a. Record age of respondent: _____
 - b. Don't know/Not sure/Can't remember
 - c. Refused
- E10. What is the highest level of education you have completed?
- a. 8th grade
 - b. High school
 - c. Associates degree, vocational or technical school, or some college
 - d. Four year college degree
 - e. Graduate or professional degree
 - f. Don't know/Not sure/Can't remember
 - g. Refused
- E11. Next, I'd like to know your household's total 2007 annual income before taxes. Please stop me when I reach the category that best describes your household's income. [IF NECESSARY, SAY: THIS INFORMATION IS CONFIDENTIAL AND WILL ONLY BE USED FOR CHARACTERIZING RESPONDENTS TO THIS STUDY.]"
- a. Less than \$15,000
 - b. \$15,000 to less than \$20,000
 - c. \$20,000 to less than \$30,000
 - d. \$30,000 to less than \$40,000
 - e. \$40,000 to less than \$50,000
 - f. \$50,000 to less than \$75,000
 - g. \$75,000 to less than \$100,000
 - h. \$100,000 to less than \$125,000
 - i. \$125,000 to less than \$175,000
 - j. \$175,000 or more
 - k. Don't know/Not sure
 - l. Refused



E12. [RECORD GENDER OF RESPONDENT]

Male

Female

Thank you for taking the time to answer the questions. This will help [utility] improve the programs and services they offer their customers.



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HEER PG&E PROGRAM STAFF INTERVIEW GUIDE

Interview Objectives

The purpose of these interviews is to fill out our understanding of program management, administration, and implementation, and to learn about the successes and challenges thus far during the 2010-2012 program cycle.

The objective is to understand:

- How the program is implemented. How this differs, if at all, from the description in the SFRP manual. How the program has responded to the '06-'08 recommendations. How program implementation could improve and how it will evolve to prepare for potential program changes in the 2012-2014 program cycle.
- What marketing activities the program is engaged in. How broader marketing efforts are coordinated with program-specific marketing. Which measures are promoted and why.
- The ways in which the program is attempting to achieve desired outputs (AKA, customer satisfaction, progress towards savings, retailer/contractor relationships). How the program outputs could be improved.
- How the program coordinates with other energy efficiency programs, e.g. ARP, ESAP, HEES, ARRA funded programs.
- How free ridership concerns are addressed through marketing, rebate rules, and inspection.

Interview Guide

Name _____

Title _____

Phone _____

Email _____

Introduction

My firm, Research Into Action, is conducting a process evaluation of the HEER program. The purpose of the interview today is to better understand (a) how the program is currently marketed and implemented, (b) how well it is meeting its participation and savings goals, (c) the ways in which coordination with other programs occurs, (d) areas for improvement, and (e) any near-term changes you plan to make. Your responses will also help us refine our contractor/retailer survey and participant survey questions.



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Role

1. Please describe your role and how long you have been working in this position.
 - a. [If less than 5 yrs with HEER program]:
 - i. What kind of training, if any, would help you do this work better?

Program Progress

Let's start by talking about overall program progress.

The January 2011 monthly report we received states the program projected savings of 20,542,290 kWh for the 2010-2012 program cycle. There was no estimate of "installed savings" or any projected or installed gas savings numbers reported.

1. How well is the program meeting your expectations in terms of:
 - a. kWh savings?
 - b. Therm savings?
 - c. Appliance contractor/retailer participation?
 - d. [staff only] Pool contractor/retailer participation?
 - e. Customer participation?
2. If things continue as they currently are, do you think the program will meet its 2012 goals?
 - a. Do you foresee any circumstances or issues that could slow things down?
 - i. [if mentions problem area] How do you anticipate responding?
 - b. Are there opportunities to improve the chances of meeting goals?
3. How has the program responded to the 2006-2008 process and impact evaluation findings?
 - a. How have you prioritized your responses to recommendations?

Selection of Incentive Type

1. What are the pros and cons of the various rebate and incentive mechanisms?
 - a. POS, mail, online, VS. marketing only
 - b. Contractor/retailer, customer



2. What other methods besides rebates have been considered or are used to influence:
 - a. purchasing behavior?
 - b. product use behavior?
 - c. mid-stream product stocking?
 - d. up-stream product manufacturing choices?
3. [staff only] How do you select which type of incentive or rebate each product should have?
4. [staff only] How do you select the dollar amount?

Retailer/Manufacturer/Contractor Engagement

1. How do you encourage manufacturers, retailers, and contractors to work with the program?
 - a. How does the program benefit them?
 - b. What do you need them to do in order to increase customer participation?
2. How do you ensure cross-promotion of products in big box stores that sell multiple rebated products?
3. What are the barriers to securing POS agreements?
 - a. Access to data records
 - b. Display
 - c. Employee/manager training
4. Can you please elaborate on how you work with retailers on POS rebates?
 - a. Which retailers allow POS rebates?
 - b. What changes occurred in the program to make it more appealing?
 - c. How do you see the relationship evolving over time?
5. How do you seek to address free ridership with retailers and contractors?
 - a. To what extent would increasing SPIFs and retailer staff training, and recruiting retailers help?



Marketing and Outreach Campaigns/Processes

1. I would like to better understand a few aspects of the marketing plans. What are your marketing goals for this program cycle?
 - a. Which measures are prioritized and why?
 - i. Emphasizing under-performers or newer rebated products?
 - b. Which marketing methods are you prioritizing and for which products and customer segments?
 - c. What efforts have you made to cross-promote HEER rebates with HEES?
 - d. Do your marketing messages link home energy use and global warming?
 - e. What plans do you have for the rest of 2011 and 2012?
 - i. [if applicable] how do these activities coordinate with the broader marketing activities?
 - ii. [if still unclear] Who is responsible for these marketing activities?
2. Who handles direct marketing to pool pump retailers and contractors?
3. How often do you update the website? Who updates the website materials?

Processing Rebates and Incentives

I read through the Single-Family Rebate Program (SFRP) Manual and program documentation. I would like to make sure I understand the way the program operates and how your group is organized.

1. Is the organizational chart up to date? [name groups (HEER mngt, PSO, Call center, mktg), and managers, number of employees per group]
2. Are there other groups your staff interacts with to market and implement the program?[refer to SFRP manual process map]
 - a. Inspectors?
3. Would you please describe the role any third party vendors play?
 - a. What are the benefits of working with these vendors?
 - b. What issues or concerns do you face in working with these companies?
4. Considering the general process as it is outlined in the policies and procedures manual , have you made any changes to the process steps or who performs them?



- a. Verification of documentation
 - i. When an ENERGY STAR product is not listed in the processors' database, does it have to be added to the database before customers' rebates can be processed?
 - 1. How long does the listing take? How much longer does it take to get customers' rebates and retailers' incentives processed?
 - ii. When an ES product is delisted, how do you handle applications that request a rebate on a recently delisted product? There seems to be a grace period. How does this work and how long is the grace period?
- b. Selection for inspection
 - i. What is your role relative to inspection?
 - ii. Customer:
 - 1. Are inspectors only looking for installation, or are they also looking at the quality of installation?
 - 2. What happens if it the measure is poorly installed?
 - 3. Who are the inspectors? How are they trained? By whom?
 - iii. Retailer:
 - 1. Who conducts retail inspections?
 - 2. What is the purpose of the visit? (outreach and inspection?)
- c. Rebate processing
 - i. For POS – how quickly does PG&E reimburse the retailer for the rebated amount?
- d. Rejection letters
 - i. How often do customers receive “soft” rejections and “hard” rejections?
 - ii. How much more time does it take to process these rejections?
- e. Overrides
 - i. What are the most common reasons for overrides? How frequently do they occur?
- f. Reporting



5. Is there a need to streamline parts of the process?

Coordination with Other Programs

1. Would you please elaborate on the kinds of activities you coordinate with:
 - a. ARP
 - b. Sears along with the other PG&E programs
 - c. ARRA-funded programs
 - d. PDPP
2. How well does this coordination on [insert name of issue] work?
3. Are there any coordination issues that hinder HEER program implementation?

Working with Customers

1. What are your biggest challenges in keeping customers satisfied?

Closing

1. This program has been running for a while. Which aspects of the HEER program are running really well?
2. What best practices do you strive for?
3. What would you most like to change?
4. What stands in the way of making those changes?



HEER SCE PROGRAM STAFF & THIRD-PARTY IMPLEMENTER INTERVIEW GUIDE

Interview Objectives

The purpose of these interviews is to fill out our understanding of program management, administration, and implementation, and to learn about the successes and challenges thus far during the 2010-2012 program cycle.

The objective is to understand:

- How the program is implemented. How this differs, if at all, from the description in the SFRP manual. How the program has responded to the '06-'08 recommendations. How program implementation could improve and how it will evolve to prepare for potential program changes in the 2012-2014 program cycle.
- What marketing activities the program is engaged in. How broader marketing efforts are coordinated with program-specific marketing. Which measures are promoted and why.
- The ways in which the program is attempting to achieve desired outputs (AKA, customer satisfaction, progress towards savings, retailer/contractor relationships). How the program outputs could be improved.
- How the program coordinates with other energy efficiency programs, e.g. ARP, ESAP, HEES, ARRA funded programs.
- How free ridership concerns are addressed through marketing, rebate rules, and inspection.

Interview Approach

Phone or in-person interviews with program staff and third-party vendors will be conducted during September 2011 and should last less than an hour.

Interview Guide

Name _____

Title _____

Phone _____

Email _____



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Introduction

My firm, Research Into Action, is conducting a process evaluation of the HEER program. The purpose of the interview today is to better understand (a) how the program is currently marketed and implemented, (b) how well it is meeting its participation and savings goals, (c) the ways in which coordination with other programs occurs, (d) areas for improvement, and (e) any near-term changes you plan to make. Your responses will also help us refine our contractor/retailer survey and participant survey questions.

Role

1. Please describe your role and how long you have been working in this position.
 - a. [If less than 5 yrs with HEER program]:
 - i. What kind of training has helped you do this job?
 - ii. What kind of training, if any, would help you do this work better?

Program Progress

Let's start by talking about overall program progress.

The February 2011 monthly report we received states the program had “installed savings” of 25,058,240 kWh out the 2010-2012 goal of 63,416,417 kWh. Based on the spreadsheets we received, there are roughly 424 non-pool retailers and contractors and 264 pool retailers and contractors/retailers are currently participating.

2. How well is the program meeting your expectations in terms of:
 - a. kWh savings?
 - b. Appliance contractor/retailer participation?
 - c. [staff only] Pool contractor/retailer participation?
 - d. Customer participation?
3. If things continue as they currently are, do you think the program will meet its 2012 goals?
 - a. Do you foresee any circumstances or issues that could slow things down?
 - i. [if mentions problem area] How do you anticipate responding?
 - b. Are there opportunities to improve the chances of meeting goals?



4. How has the program responded to the 2006-2008 process and impact evaluation findings?
 - a. How have you prioritized your responses to recommendations?

Selection of Incentive Type

1. What are the pros and cons of the various rebate and incentive mechanisms?
 - a. POS, mail, online, VS. marketing only
 - b. Contractor/retailer, customer
2. What other methods besides rebates have been considered or are used to influence:
 - a. purchasing behavior?
 - b. product use behavior?
 - c. mid-stream product stocking?
 - d. up-stream product manufacturing choices?
3. [staff only] How do you select which type of incentive or rebate each product should have?
4. [staff only] How do you select the dollar amount?

Retailer/Manufacturer/Contractor Engagement

1. How do you encourage manufacturers, retailers, and contractors to work with the program?
 - a. How does the program benefit them?
 - b. What do you need them to do in order to increase customer participation?
2. How do you ensure cross-promotion of products in big box stores that sell multiple rebated products?
3. What are the barriers to securing POS agreements?
 - a. Access to data records
 - b. Display
 - c. Employee/manager training



4. Can you please elaborate on how you work with Howards and Sears (and others?) on POS rebates?
 - a. What changes occurred in the program to make it more appealing?
 - b. How do you see the relationship evolving over time?
5. How do you seek to address free ridership with retailers and contractors?
 - a. To what extent would increasing SPIFs and retailer staff training, and recruiting retailers help?

Marketing and Outreach Campaigns/Processes

1. You touched on marketing when Jane and Marti interviewed you and we received an updated during a recent meeting with the CPUC. I would like to better understand a few aspects of the marketing plans. What are your marketing goals for this program cycle?
 - a. Which measures are prioritized and why?
 - i. Emphasizing under-performers (e.g. whole house fans) or new products (portable room air conditioners, hybrid heat pumps)?
 - b. Which marketing methods are you prioritizing and for which products and customer segments?
 - c. What efforts have you made to cross-promote HEER rebates with HEES?
 - d. Do your marketing messages link home energy use and global warming?
 - e. What plans do you have for the rest of 2011 and 2012?
 - i. [if applicable] how do these activities coordinate with the broader marketing activities?
 - ii. [if still unclear] Who is responsible for these marketing activities?
2. [staff only] Is direct marketing to pool pump retailers and contractors handled through PSO or another group?
3. [staff only] How often do you update the website? Who updates the website materials?

Processing Rebates and Incentives

I read through the Single-Family Rebate Program (SFRP) Manual and program documentation. I would like to make sure I understand the way the program operates and how your group is organized.



1. [staff only] Is the organizational chart up to date? [name groups (HEER mngt, PSO, Call center, mktg), and managers, number of employees per group]
2. Are there other groups your staff interacts with to market and implement the program?[refer to SFRP manual process map]
 - a. Inspectors?
3. Would you please describe the role OSS and other third party vendors play (Ohana Companies - support services for Sears POS rebate)?
 - a. What are the benefits of working with these vendors?
 - b. What issues or concerns do you face in working with these companies?
4. Considering the general process as it is outlined in the SFRP manual, have you made any changes to the process steps or who performs them?
 - a. [If changes were made]:
 - i. Why were the changes made?
 - ii. Were they effective in addressing the issue?
5. [staff only] I would like to walk through the basic process step-by-step. As we go through the steps, I would like to make sure we capture (1) any modifications made to the process as described in the SFRP manual (2) the aspects of the process step that well and (3) issues that need to be addressed .I will also have a few clarification questions.
 - a. Application receipt (online Vs paper Vs POS Vs PDPP)
 - i. Confirm that PDPP is only paper
 - ii. POS gift card documentation – only mail/fax or can customers also scan and submit online?
 - b. Verification of documentation
 - i. When an ENERGY STAR product is not listed in the CIA database, does it have to be added to the list before customers’ rebates can be processed?
 1. How long does the listing take? How much longer does it take to get customers’ rebates and retailers’ incentives processed?
 - ii. When an ES product is delisted, how do you handle applications that request a rebate on a recently delisted product? There seems to be a grace period. How does this work and how long is the grace period?
 - c. Selection for inspection



- i. What is your role relative to inspection?
 - ii. Customer:
 1. Are inspectors only looking for installation, or are they also looking at the quality of installation?
 2. What happens if it the measure is poorly installed?
 3. Who are the inspectors? How are they trained? By whom?
 - iii. Retailer:
 1. Who conducts retail inspections?
 2. What is the purpose of the visit? (outreach and inspection?)
 - d. Rebate processing
 - i. For POS – how quickly does SCE reimburse the retailer for the rebated amount?
 - e. Rejection letters
 - i. How often do customers receive “soft” rejections and “hard” rejections?
 - ii. How much more time does it take to process these rejections?
 - f. Overrides
 - i. What are the most common reasons for overrides? How frequently do they occur?
 - g. Reporting
6. Is there a need to streamline parts of the process?

Coordination with Other Programs

1. [staff only] In your conversation with Jane and Marti you mentioned coordinating with some programs. Would you please elaborate on the kinds of activities you coordinate with:
 - a. ARP
 - b. Sears along with the other SCE programs
 - c. ARRA-funded programs
 - d. PDPP



2. [staff only] How well does this coordination on [insert name of issue] work?
3. Are there any coordination issues that hinder HEER program implementation?

Working with Customers

1. [staff only] What are your biggest challenges in keeping customers satisfied?

Closing

1. This program has been running for a while. Which aspects of the HEER program are running really well?
2. What best practices do you strive for?
3. What would you most like to change?
4. What stands in the way of making those changes?



HEER RETAILER SURVEY GUIDE

PURPOSE OF STUDY: The following document is the HEER survey guide for retailers of products incented by the program. This survey is intended to generate an understanding of the retailer methods for selling incented products, awareness of the program, and satisfaction with program related experiences. The research team has taken steps to ensure that the survey guide for this year will generate data that will be comparable to results from the previous evaluation conducted from 2006 to 2008. See Table A.10 for a mapping of the survey questions.

Interviewee Name:

Date:

Interviewer:

I1a. [IF SAMPLE HAS CONTACT INFORMATION] Hi, my name is _____ calling from Research Into Action on behalf of [INSERT UTILITY FROM SAMPLE: Southern California Edison/ Pacific Gas and Electric]. May I please speak to _____?

1 CONTACT AVAILABLE → SKIP TO I2

2 CONTACT CURRENTLY UNAVAILABLE → SCHEDULE CALL BACK

I1b. [IF SAMPLE HAS NO CONTACT INFORMATION] I'd like to speak with the person at your store who manages the appliance section of your store. What is that person's name? _____

1 CONTACT AVAILABLE → SKIP TO I2

2 CONTACT CURRENTLY UNAVAILABLE → SCHEDULE CALL BACK

I2. Hi, my name is _____ calling from Research Into Action on behalf of [INSERT UTILITY FROM SAMPLE: Southern California Edison/ Pacific Gas and Electric]. [INSERT UTILITY FROM SAMPLE: Southern California Edison/ Pacific Gas and Electric] is conducting an evaluation of the [IF SCE INSERT: Home Energy Efficiency Rebate Program known as HEER (HERE)/IF PG&E INSERT: Pacific Gas and Electric's residential rebate program] which offers rebates on refrigerators, evaporative coolers, whole house fans, and air conditioners. We are speaking to appliance retailers who participated in this program, which provides rebates for some energy efficient appliances. Your input will help us improve the program and your responses will be anonymous.

This will take about 15 minutes. Is this a good time?

PROVIDE UTILITY CONTACT NAMES IF NEEDED TO VERIFY STUDY:

1. Which of the following types of appliances does your store sell?



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		Yes	No	Don't Know	Refused
a.	Clothes washers	1	2	8	9
b.	Ducted evaporative coolers	1	2	8	9
c.	Dishwashers	1	2	8	9
d.	Refrigerators	1	2	8	9
e.	Room air conditioners	1	2	8	9
f.	Whole house fan	1	2	8	9
g.	Water heaters	1	2	8	9

IF 1a THROUGH 1g EQUALS NO, DON'T KNOW OR REFUSED, THANK AND TERMINATE, RECORD AS NQ.1

2. Before this interview, had you heard of [IF SCE INSERT: the HEER (HERE) Program/IF PG&E INSERT: PG&E's appliance rebates]? [IF NEEDED: This program offers rebates for energy-efficient measures, such as refrigerators, room AC, and water heaters.]

1 Yes

2 No >> THANK AND TERMINATE, RECORD AS NQ.2

8 Don't Know >> THANK AND TERMINATE, RECORD AS NQ.2

9 Refused >> THANK AND TERMINATE, RECORD AS NQ.2

3. [IF SCE INSERT: I will refer to Southern California Edison as SCE for the rest of this interview. IF PG&E INSERT: I will refer to Pacific Gas and Electric as PG&E for the rest of this interview.] How did you find out about [IF SCE INSERT: SCE/IF PG&E INSERT PG&E]'s rebate Program? [DO NOT READ, ALLOW MULTIPLE RESPONSES]

01 Utility Representative Came To Store

02 Utility Mailing/Brochures

03 Utility Website

04 Utility Meeting

05 Utility Email

06 Utility Phone Call

07 Equipment Manufacturer/Retailer



- 08 Trade Conference/Trade Association
- 09 Word-Of-Mouth/Industry Colleague
- 10 Other, Please Specify: _____
- 88 Don't Know
- 99 Refused
4. How knowledgeable do you think the appliance sales staff at your store are about what ENERGY STAR qualification means? Use a scale of 1 to 5 where 1 indicates "Not at all knowledgeable" and 5 indicates "Very knowledgeable."
- _____ 8=Don't Know 9=Refused
5. How helpful would additional training about ENERGY STAR be in helping your staff to sell energy efficient appliances? Use a scale of 1 to 5 where 1 indicates it would be "not very helpful" and 5 indicates it would be "very helpful."
- _____ 8=Don't Know 9=Refused
6. Are you aware that there are higher classifications of energy efficient appliances, above the general classification of ENERGY STAR? [IF NEEDED: This would be issued by another industry organization.]
- 1 Yes
- 2 No >> SKIP TO INSTRUCTION ABOVE A1
- 8 Don't Know >> SKIP TO INSTRUCTION ABOVE A1
- 9 Refused >> SKIP TO INSTRUCTION ABOVE A1
7. What classifications have you heard of?
-

IF SCE AND Q1d=YES CONTINUE OTHERWISE SKIP TO INSTRUCTION ABOVE B1

Refrigerator (SCE Only)

A1. Now I have some questions about the individual appliances you indicated your company sells.

I have some questions about the refrigerators your company sells. Before this interview, were you aware that SCE provides rebates to customers for ENERGY STAR refrigerators?

1 Yes



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- 2 No >> SKIP TO A7
- 8 Don't Know >> SKIP TO A7
- 9 Refused >> SKIP TO A7
- A2. Has your company been promoting these rebates over the past year?
- 1 Yes >> SKIP TO A4
- 2 No
- 8 Don't Know >> SKIP TO A4
- 9 Refused >> SKIP TO A4
- A3. Why hasn't your company been more active in promoting these rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 01 The Rebates Are Too Small To Bother With
- 02 The Rebates Are Too Much Hassle To Process
- 03 The Rebates Don't Affect Sales
- 04 Our Marketing Budget Is Too Small
- 05 We Don't Promote ENERGY STAR Refrigerators
- 06 We Don't Promote Refrigerators At All
- 07 Rebate Process (For Consumer) Takes Too Long
- 08 Appliances Rebated Are Too Expensive – Don't Sell
- 09 Other, Please Specify: _____
- 88 Don't Know
- 99 Refused
- A4. Do you think the current rebate is enough to motivate customers to purchase ENERGY STAR refrigerators?
- 1 Yes >>SKIP TO A6
- 2 No
- 8 Don't Know >> SKIP TO A6
- 9 Refused >> SKIP TO A6



- A5. What amount of rebate would be needed to create more consumer interest?
ACCEPTABLE RANGE: \$1 - \$100,000
\$ _____ 888888=Don't Know 999999=Refused
- A6. Would it be possible for your store to offer two different levels of rebate - for example, a \$75 rebate for refrigerators on the ENERGY STAR "most efficient" list and \$35 for regular ENERGY STAR refrigerators?
- 1 Yes >> SKIP TO A7
 - 2 No
 - 8 Don't Know >> SKIP TO A7
 - 9 Refused >> SKIP TO A7
- A6a. Why not?

-
- A7. What is the average price difference between ENERGY STAR and comparable non-ENERGY STAR refrigerators? [ACCEPTABLE RANGE: \$1 - \$100,000]
\$ _____ 777777=WE ONLY SELL ENERGY STAR
888888=Don't Know 999999=Refused
- A8. What is your marketing strategy for ENERGY STAR refrigerators? [DO NOT READ, ALLOW MULTIPLE RESPONSES] [IF NEEDED: What do you do to try to sell them?]
- 1 Salespeople Get Extra Commission
 - 2 Products Are Physically Positioned More Prominently
 - 3 Use Signage/Promotional Materials From Utility
 - 4 Use Signage/Promotional Materials From Manufacturer
 - 5 Same As All Other Refrigerators
 - 6 Extra Training For Sales Staff
 - 7 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused



- A9. What marketing messages do you find most effective at convincing customers to purchase the refrigerators included in the rebate program? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 Provide Energy Savings
 - 2 Saves Money Via Lower Operating Costs
 - 3 Qualifies For A Rebate
 - 4 Helps Protect Our Environment
 - 5 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- A10. Of all the refrigerators your company sold over the past year, what is your best estimate of the percentage that were ENERGY STAR qualified.
- _____ % 888=Don't Know 999=Refused
- A11. What, if anything, limits the sales of ENERGY STAR refrigerators? [DO NOT READ, ALLOW MULTIPLE RESPONSES (RECORD UP TO 3 MENTIONS)]
- 1 Cost
 - 2 Availability Of Features
 - 3 Availability Of Qualifying Units
 - 4 Nothing
 - 5 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- A12. Before this interview, were you aware of SCE's refrigerator and freezer recycling Program? [IF NEEDED: SCE will pay customers \$50 to upgrade from an old refrigerator/freezer. SCE also hauls away the old appliance from the customer's service address for free.]
- 1 Yes
 - 2 No >> SKIP T Don't Know O INSTRUCTION ABOVE B1
 - 8 >> SKIP TO INSTRUCTION ABOVE B1



- 9 Refused >> SKIP TO INSTRUCTION ABOVE B1
- A13. Has your company been actively promoting the refrigerator recycling program?
- 1 Yes >> SKIP TO INSTRUCTION ABOVE B1
- 2 No
- 8 Don't Know >> SKIP TO INSTRUCTION ABOVE B1
- 9 Refused >> SKIP TO INSTRUCTION ABOVE B1
- A14. Why hasn't your company been more active in promoting this program? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 The Rebates Are Too Small To Bother With
- 2 The Rebates Are Too Much Hassle
- 3 The Rebates Don't Affect Sales
- 4 Our Marketing Budget Is Too Small
- 5 We Don't Promote ENERGY STAR Products
- 6 We Have Our Own Recycling Program
- 7 Other, Please Specify: _____
- 8 Don't Know
- 9 Refused

IF Q1e=YES CONTINUE OTHERWISE SKIP TO INSTRUCTION ABOVE C1

Portable Air Conditioners (PG&E and SCE)

- B1. Next, I have some questions about the room air conditioners your company sells. Before this interview, were you aware that [IF SCE INSERT: SCE/IF PG&E INSERT PG&E] provides rebates to [IF SCE INSERT: SCE/IF PG&E INSERT PG&E] customers for ENERGY STAR room air conditioners?
- 1 Yes
- 2 No >> SKIP TO B5
- 8 Don't Know >> SKIP TO B5
- 9 Refused >> SKIP TO B5



- B2. Has your company been actively promoting the room air conditioning program?
- 1 Yes >> SKIP TO B4
 - 2 No
 - 8 Don't Know >> SKIP TO B4
 - 9 Refused >> SKIP TO B4
- B3. Why hasn't your company been more active in promoting the air conditioner rebates?
[DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 The Rebates Are Too Small To Bother With
 - 2 The Rebates Are Too Much Hassle
 - 3 The Rebates Don't Affect Sales
 - 4 Our Marketing Budget Is Too Small
 - 5 We Don't Promote ENERGY STAR Products
 - 6 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- B4. What is your company's marketing strategy for ENERGY STAR room air conditioners?
[DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 Salespeople Get Extra Commission For ENERGY STAR
 - 2 Products Are Physically Positioned More Prominently
 - 3 Use Signage/Promotional Materials From The Utility
 - 4 Use Signage/Promotional Materials From Manufacturer
 - 5 Same As All Other Room Ac
 - 6 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- B5. What is the average price difference between ENERGY STAR and all other comparable room air conditioners? [IF NEEDED: Between models that are comparable except for energy efficiency.] ACCEPTABLE RANGE: \$1 - \$100,000



\$ _____ 888888=Don't Know 999999=Refused

B6. Do you think the current rebate is enough to motivate customers to purchase ENERGY STAR room air conditioners?

1 Yes >> SKIP TO B8

2 No

8 Don't Know >> SKIP TO B8

9 Refused >> SKIP TO B8

B7. What amount of rebate would be needed to create more customer demand?
ACCEPTABLE RANGE: \$1 - \$100,000

\$ _____ 888888=Don't Know 999999=Refused

B8. About what percent of the room air conditioners your company sells are ENERGY STAR?

_____ % 777=We Don't Track That 888=Don't Know 999=Refused

B9. What if anything, limits the sales of ENERGY STAR room air conditioners? [DO NOT READ, ALLOW MULTIPLE RESPONSES (RECORD UP TO 3 MENTIONS)]

1 Cost

2 Availability Of Features

3 Availability Of Qualifying Units

4 Other, Please Specify: _____

5 Nothing

8 Don't Know

9 Refused

IF PG&E AND Q1f=YES CONTINUE OTHERWISE SKIP TO INSTRUCTION ABOVE E1

Whole House Fans (PG&E Only)

C1. Next, I have some questions about the whole house fans your company sells. Before this interview, were you aware that PG&E provides rebates to customers for whole house fans?

1 Yes



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- 2 No >> SKIP TO C6
- 8 Don't Know >> SKIP TO C6
- 9 Refused >> SKIP TO C6
- C2. Has your company been actively promoting the whole house fan incentives?
- 1 Yes >> SKIP TO C4
- 2 No
- 8 Don't Know >> SKIP TO C4
- 9 Refused >> SKIP TO C4
- C3. Why hasn't your company been more active in promoting these rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 The Rebates Are Too Small To Bother With
- 2 The Rebates Are Too Much Hassle
- 3 The Rebates Don't Affect Sales
- 4 Our Marketing Budget Is Too Small
- 5 Other, Please Specify: _____
- 8 Don't Know
- 9 Refused
- C4. Do you think the current rebate is enough to motivate customers to purchase efficient whole house fans?
- 1 Yes >> SKIP TO C6
- 2 No
- 8 Don't Know >> SKIP TO C6
- 9 Refused >> SKIP TO C6
- C5. What amount of rebate would be needed to create more customer interest in efficient whole house fans? ACCEPTABLE RANGE: \$1 - \$100,000
- \$ _____ 888888=Don't Know 999999=Refused



C6. Is there anything that limits the sales of efficient whole house fans?

- 1 Yes
- 2 No >> SKIP TO C7
- 8 Don't Know >> SKIP TO C7
- 9 Refused >> SKIP TO C7

C6a. What limits the sales of efficient whole house fans?

C7. What is your company's marketing strategy for efficient whole house fans? [DO NOT READ, ALLOW MULTIPLE RESPONSES]

- 1 Salespeople Get Extra Commission For Efficient Whole House Fans
- 2 Products Are Physically Positioned More Prominently
- 3 Use Signage/Promotional Materials From The Utility
- 4 Use Signage/Promotional Materials From Manufacturer
- 5 Same As All Other Room Ac
- 6 Other, Please Specify: _____
- 8 Don't Know
- 9 Refused

IF SCE AND Q1b=YES CONTINUE OTHERWISE SKIP TO INSTRUCTION ABOVE G1

Evaporative Coolers (SCE Only)

E1. Next, I have some questions about the evaporative coolers that your company sells. Before this interview, were you aware that SCE provides rebates for energy-efficient ducted evaporative coolers? [IF NEEDED: These rebates are for single-stage ducted evaporative coolers with an efficiency rating of .85 or higher and two-stage ducted evaporative coolers with an efficiency rating of .95 or higher.]

- 1 Yes
- 2 No >> SKIP TO E7
- 8 Don't Know >>SKIP TO E7
- 9 Refused >> SKIP TO E7



- E2. Has your company promoted rebates for these evaporative coolers?
- 1 Yes >> SKIP TO E4
 - 2 No
 - 8 Don't Know >> SKIP TO E4
 - 9 Refused >> SKIP TO E4
- E3. Why hasn't your company been more active in promoting these rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 The Rebates Are Too Small To Bother With
 - 2 The Rebates Are Too Much Hassle
 - 3 The Rebates Don't Affect Sales
 - 4 Our Marketing Budget Is Too Small
 - 5 We Don't Promote Energy Efficient Products
 - 6 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- E4. What is your company's marketing strategy for energy-efficient evaporative coolers? [DO NOT READ, ALLOW MULTIPLE RESPONSES]
- 1 Salespeople Get Extra Commission
 - 2 Products Are Physically Positioned More Prominently
 - 3 Use Signage/Promotional Materials From The Utility
 - 4 Use Signage/Promotional Materials From Manufacturer
 - 5 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- E5. Do you think the current rebate is enough to motivate customers to purchase energy efficient ducted evaporative coolers?
- 1 Yes >> SKIP TO E7



- 2 No
- 8 Don't Know >> SKIP TO E7
- 9 Refused >> SKIP TO E7
- E6. What amount of rebate would be needed to create more customer interest?
ACCEPTABLE RANGE: \$1 - \$100,000
- \$ _____ 888888=Don't Know 999999=Refused
- E7. What is the average price difference between energy efficient and standard efficiency ducted evaporative coolers? ACCEPTABLE RANGE: \$1 - \$100,000
- \$ _____ 888888=Don't Know 999999=Refused
- E8. Is there anything that limits the sales of energy-efficient ducted evaporative coolers?
- 1 Yes
- 2 No >> SKIP TO E9
- 8 Don't Know >> SKIP TO E9
- 9 Refused >> SKIP TO E9
- E8a. What limits the sales of energy-efficient ducted evaporative coolers?

-
- E9. Are customers more interested in window evaporative coolers than ducted models?
- 1 Yes
- 2 No
- 8 Don't Know
- 9 Refused

IF PG&E AND Q1g=YES CONTINUE OTHERWISE SKIP TO H1

Water Heaters (PG&E Only)

- G1. I have some questions about the water heaters your company sells. Does your company sell both electric and gas water heaters?
- 1 Both electric and gas
- 2 Only electric



- 3 Only gas
- 4 Other, Please Specify: _____
- 8 Don't Know >> SKIP TO H1
- 9 Refused >> SKIP TO H1

G2. I have some questions about the types of water heaters your company sells. Which of the following types of water heaters does your company sell?

		Yes	No	Don't Know	Refused
a.	Storage water heaters	1	2	8	9
b.	Tankless water heaters	1	2	8	9
c.	Condensing water heaters	1	2	8	9
d.	Heat pumps that heat water	1	2	8	9
e.	Other type of water heaters [IF YES PLEASE SPECIFY: _____]	1	2	8	9

G3. Before this interview, were you aware that PG&E provides rebates to customers for Energy Efficient water heaters?

- 1 Yes
- 2 No >> SKIP TO G8
- 8 Don't Know >> SKIP TO G8
- 9 Refused >> SKIP TO G8

G4. Has your company been promoting these rebates over the past year?

- 1 Yes >> SKIP TO G6
- 2 No
- 8 Don't Know >> SKIP TO G6
- 9 Refused >> SKIP TO G6

G5. Why hasn't your company been more active in promoting these rebates? [DO NOT READ, ALLOW MULTIPLE RESPONSES]

- 1 The Rebates Are Too Small To Bother With
- 2 The Rebates Are Too Much Hassle To Process



- 3 The Rebates Don't Affect Sales
 - 4 Our Marketing Budget Is Too Small
 - 5 We Don't Promote ENERGY STAR Water Heaters
 - 6 We Don't Promote Water Heaters At All
 - 7 Other, Please Specify: _____
 - 8 Don't Know
 - 9 Refused
- G6. Do you think the current rebate is enough to motivate customers to purchase Energy Efficient water heaters?
- 1 Yes >> SKIP TO G8
 - 2 No
 - 8 Don't Know >> SKIP TO G8
 - 9 Refused >> SKIP TO G8
- G7. What amount of rebate would be needed to create more consumer interest?
ACCEPTABLE RANGE: \$1 - \$100,000
- \$ _____ 888888=Don't Know 999999=Refused
- G8. What is the average price difference between Energy Efficient and comparable non-Energy Efficient water heaters? ACCEPTABLE RANGE: \$1 - \$100,000
- \$ _____ 777777= We Only Sell ENERGY STAR
888888=Don't Know 999999=Refused
- G9. What is your marketing strategy for Energy Efficient water heaters? [IF NEEDED: What do you do to try to sell them?] DO NOT READ, ALLOW MULTIPLE RESPONSES
- 1 Salespeople Get Extra Commission
 - 2 Products Are Physically Positioned More Prominently
 - 3 Use Signage/Promotional Materials From Utility
 - 4 Use Signage/Promotional Materials From Manufacturer
 - 5 Same As All Other Water Heaters
 - 6 Extra Training For Sales Staff



- 7 Other, Please Specify: _____
- 8 Don't Know
- 9 Refused

G10. Of all the water heaters your company sold over the past year, what is your best estimate of the percentage that were Energy Efficient qualified.

_____ % 888=Don't Know 999=Refused

G11. What if anything limits the sales of Energy Efficient water heaters? [DO NOT READ, ALLOW MULTIPLE RESPONSES (RECORD UP TO 3 MENTIONS)]

- 1 Cost
- 2 Availability Of Features
- 3 Availability Of Qualifying Units
- 4 Cost Of Installation
- 5 Complexity Of Installation (Re: Tankless And Heat Pump)
- 6 Nothing
- 7 Other, Please Specify: _____
- 8 Don't Know
- 9 Refused

IF G1=1 CONTINUE OTHERWISE SKIP TO G13

G12. Are there any differences in the promotion of qualifying electric water heaters compared to gas water heaters?

- 1 Yes
- 2 No >> SKIP TO G13
- 8 Don't Know >> SKIP TO G13
- 9 Refused >> SKIP TO G13

G12a. What differences are there in the promotion of qualifying electric water heaters compared to gas water heaters?



G13. Would you please offer us an estimate of what percentage of your customers that purchase water heaters from your store could be allocated among these different groups? [PERCENTAGES MUST TOTAL 100%.]

Customers who will install the unit themselves ____%

Customers who purchase a unit but will not install the unit themselves ____%

Contractors or plumbers who will install the unit for a customer ____%

Use your store personnel to install the units ____%

Don't Know 888

Refused 999

General Questions

H1. Next, I have a few general questions about how satisfied you have been with the [IF SCE INSERT: Home Energy Efficiency Rebate Program HEER (HERE) Program/IF PG&E INSERT: Pacific Gas and Electric's residential rebate program].

Now, I'd like you to think about the people who come to the store and installed the stickers or marketing materials. Using a scale of 1 to 5, where 5 means "very satisfied" and 1 means "not at all satisfied", how satisfied have you been with your interactions with the people who bring the marketing materials to the store?

_____ 6=I Don't Remember Anyone Coming To The Store

8=Don't Know 9=Refused

H2. Using a scale of 1 to 5, where 1 means "not at all effective" and 5 means "very effective," how effective are the marketing materials provided by the utility when you are attempting to sell efficient appliances?

_____ 6=Store Does Not Use Utility Provided Materials

8=Don't Know 9=Refused

H3. Do you remember any utility staff or utility representatives coming to your store to train you or other staff about the rebates?

1 Yes

2 No

8 Don't Know

9 Refused



H4. Using a scale of 1 to 5, where 1 means “not at all satisfied” and 5 means “very satisfied”, how satisfied have you been with your interactions with the rebate Program’s staff?

6=I Don’t Remember Anyone Coming To The Store/Have Not Had Any Interactions
8=Don’t Know 9=Refused

H5. Is the equipment that qualifies for the rebates usually available?

- 1 Yes
- 2 No
- 8 Don’t Know
- 9 Refused

H6. Have you had any problems with the point of sale rebates?

- 1 Yes
- 2 No >> SKIP TO H7
- 8 Don’t Know >> SKIP TO H7
- 9 Refused >> SKIP TO H7

H6a. What problems have you had?

H7. Using a scale of 1 to 5 where 1 means “not at all satisfied” and 5 means “very satisfied”, how satisfied have you been with your interactions with the rebate Program’s staff?

_____ 6=I Have Not Interacted With Any Program Staff

8=Don’t Know 9=Refused

H8. Using the same scale, how satisfied have you been with the rebate Program in general?

_____ 8=Don’t Know 9=Refused

H9. Do you have any suggestions for how to improve the California Home Energy Efficiency Rebate Program?

Verify1. (IF WE ALREADY HAVE A NAME) Those are all the questions I have. I would also like to verify that your name is _____ and that I reached you at _____.



VERIFY2. (IF THERE IS NO NAME) Those are all the questions I have. In case my supervisor needs to verify my work, may I please have your name? _____

Thank you very much for helping us with this important study! Have a good day/evening.



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Table A.10: Mapping of Questions from 2006-2008 and 2011 Evaluations

Question	Year	
	'06-'08	2011
Which of the following types of appliances do you sell?	X	X
Before this interview, had you heard of Edison's Home Energy Efficiency Rebate Program? This Program offers rebates for energy-efficient measures such as refrigerators, room air conditioners, and water heaters.	X	X
How did you find out about SCE's rebate Program?	X	X
How knowledgeable do you think the appliance sales staff at your store are about what ENERGY STAR certification means?	X	X
To what extent would additional training about ENERGY STAR help your staff sell energy efficient appliances?	X	X
Refrigerators		
Before this interview, were you aware that SCE provides \$50 rebates to SCE customers for ENERGY STAR refrigerators?	X	X
Has your company been promoting these rebates over the past year?	X	X
Why haven't you been more active in promoting these rebates?	X	X
Do you think a \$50 rebate is enough to move consumer demand for ENERGY STAR refrigerators?	X	X
What rebate level would be needed to move consumer demand for ENERGY STAR refrigerators?	X	X
Would it be feasible to offer two levels of rebate?		X

Question	Year	
	'06-'08	2011
What is the average price difference between ENERGY STAR and comparable non-ENERGY STAR refrigerators?	X	X
What is your marketing strategy for ENERGY STAR refrigerators?	X	X
What is your best estimate of the percentage of refrigerators that you sold over the past year that were ENERGY STAR-qualified?.	X	X
Are there any barriers that prevent sales of ENERGY STAR refrigerators?	X	X
Before this interview, were you aware of SCE's refrigerator and freezer recycling Program?	X	X
Has your company promoted the recycling Program?	X	X
Why haven't you been more active in promoting the recycling Program?	X	X
Room AC ('06-'08)/Portable AC (2011)		
Before this interview, were you aware that SCE provides \$50 rebates to SCE customers for ENERGY STAR room air conditioners?	X	X
Has your company been actively promoting the room/portable AC program?	X	X
Why haven't you been more active in promoting these rebates?	X	X
Do you think a \$50 rebate is enough to move consumer demand for ENERGY STAR room air conditioners?	X	X
What rebate level would be needed to move consumer demand for ENERGY STAR room air conditioners?	X	X
What is the average price difference between ENERGY STAR and comparable non-ENERGY STAR room air conditioners?	X	X

Question	Year	
	'06-'08	2011
What is your marketing strategy for ENERGY STAR room air conditioners?	X	X
What is your best estimate of the percentage of room air conditioners that you sold over the past year that were ENERGY STAR-qualified?.	X	X
Are there any barriers that prevent sales of ENERGY STAR room air conditioners?	X	X
Whole House fans		
Before this interview, were you aware that SCE provides \$50 rebates to SCE customers for whole house fans?	X	X
Has your company been actively promoting the whole house fan rebates?	X	X
Why haven't you been more active in promoting these rebates?	X	X
Do you think a \$50 rebate is enough to move consumer demand for whole house fans?	X	X
What rebate level would be needed to move consumer demand for whole house fans?	X	X
What is your marketing strategy for whole house fans?	X	X
Are there any barriers that prevent sales of whole house fans?	X	X
Evaporative Coolers		
Before this interview, were you aware that SCE provides \$300 to \$600 rebates to SCE customers for energy-efficient ducted evaporative coolers?	X	X
Has your company been actively promoting the evaporative cooler rebates?	X	X

Question	Year	
	'06-'08	2011
Why hasn't your company been more active in promoting these rebates?	X	X
Do you think a \$300 to \$600 rebate is enough to move consumer demand for energy efficient ducted evaporative coolers?	X	X
What rebate level would be needed to move consumer demand for energy-efficient ducted evaporative coolers?	X	X
What is the average price difference between energy efficient and standard efficiency ducted evaporative coolers?	X	X
What is your marketing strategy for energy-efficient ducted evaporative coolers?	X	X
Are there any barriers that prevent sales of energy-efficient ducted evaporative coolers?	X	X
Are your customers more interested in window evaporative coolers than ducted models?		X
Consumer Electronics [Pending approval]		
Before this interview, had you heard of Southern California Edison's Business and Consumer Electronics (BCE) Program? [If needed: This program offers incentives and marketing support to retailers to sell more energy efficient electronics such as televisions, desktop computers and monitors]		X
What is your marketing strategy for energy-efficient electronics?		X
Are any of the energy efficient electronics in your store promoted through the use of utility marketing materials?		X
Are staff trained to promote and sell more energy efficient electronics?		X
Are they trained to promote ENERGY STAR models?		X
Are they trained to promote electronics that are promoted by the utility?		X

Question	Year	
	'06-'08	2011
General Questions		
How satisfied have you been with your interactions with the people who bring the marketing materials to the store?		X
Using a scale of 1 to 5, where 5 means “very effective” and 1 means “not at all effective,” how effective are the marketing materials provided by the utility when you are attempting to sell efficient appliances?		X
Do you remember any utility staff or utility representatives coming to your store to train yourself or other staff about the rebates?		X
How satisfied have you been with your interactions with the rebate Program’s staff?	X	X
How satisfied have you been with the rebate Program in general?	X	X
Do you have any suggestions for how to improve the California Single-Family Energy Efficiency Rebate Program?	X	X

GLOSSARY OF STATISTICAL TERMS

Table A.11: Statistical Terms, Definitions with an Example

TERM	BRIEF DEFINITION	EXAMPLE
Chi-square (χ^2)	Used when we have categorical count data. The test uses frequencies (counts) from two groups/categories to see whether there are differences in proportions between groups/categories.	Whether PG&E participants versus SCE participants were significantly more likely to have seen Energy efficiency messaging.
z-test for proportions	Used when we have proportions (percent) but count data is present. z-test for proportions compares one percent to another given the size of sample used. (Useful for comparisons between previous studies where percent and sample size data are reported.)	Whether the proportion of participants who plan to purchase a refrigerator in this evaluation is higher than the proportion from '06-'08 participants.
t-test	Used when we have continuous data from two groups/categories. t-tests use sample data to show whether two group means differ from one another given the variability of each group.	Whether the mean score for the awareness scale is higher for HEER participants than non-participants.
Pearson Correlation (r)	Used when we have two sets of continuous data. Correlation measures the degree of linear relationship between two variables.	Whether there is a linear relationship between the awareness scale and the concern for environment scale.

Table A.12: Statistical Term Formulas

TERM	FORMULA
Chi-square (χ^2)	$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$
	$f_e = (Row\ Total) * (Column\ Total)$
	$z = \frac{(p_1 - p_2)}{SE}$
z-test for proportions	$p = \frac{(p_1 * n_1) + (p_2 * n_2)}{n_1 + n_2}$
	$SE = \sqrt{p(1-p) * \frac{1}{n_1} + \frac{1}{n_2}}$



TERM	FORMULA
t-test	$t = \frac{(\bar{X}_1 - \bar{X}_2)}{S_{\bar{X}_1 - \bar{X}_2}}$
Pearson Correlation (r)	$S_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ $r = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{n}}{\sqrt{\left(\sum X^2 - \frac{\sum X^2}{n}\right)\left(\sum Y^2 - \frac{\sum Y^2}{n}\right)}}$





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HEER MC METHODOLOGY

The methodology for each of the research tasks that contributed to the market characterization and program design deliverables is described in detail below.

METHOD FOR SELECTING THE FOUR APPLIANCES

The first task of the market characterization process was to select four products on which to focus the study, from the nine total products included in the SCE and PG&E HEER programs. The four products selected are: **clothes dryers, pool pumps and motors, refrigerators, and water heaters**. Table B.1 shows products which products are included in each utility’s HEER program, and the four products selected for this study.

Table B.1: HEER Products in SCE and PG&E Programs, and Selected for Further Study

PRODUCT TYPE	SCE HEER PROGRAM	PG&E HEER PROGRAM	SELECTED FOR STUDY
Clothes dryer			X
Clothes washer		X	
Dishwasher		X	
Ducted evaporative cooler	X		
Pool pump and motor	X	X	X
Refrigerator	X		X
Room air conditioner	X	X	
Water heater	X	X	X
Whole house fan	X	X	

The research team, working closely with the utilities’ M&E staff and program teams, used a systematic process to select the four products for further study. The team created an “Appliance Ranking Workbook” in MS Excel that compared all current HEER products, plus clothes dryers, according to the following criteria:

1. Potential energy savings
2. Household saturation in SCE and PG&E territories
3. Potential for “smart” capabilities
4. Program staff’s perceived importance of product to utility program energy savings



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5. Baseline efficiency and potential changes through 2016
6. Freeridership estimates from previous HEER evaluations
7. Importance of product to current HEER program savings based on program data

In order to select four products, the team looked for products that had high per-unit savings, high saturation, and the potential for “smart” capabilities. The team also paid attention to those products that were both perceived to be, and actually were, important to current HEER programs.

A selection of findings from the Appliance Ranking Workbook are presented below.

Potential Energy Savings

Estimates of potential energy savings were a key determinant of product selection. The utilities wanted to select products with high per-unit savings potential, but also high technical potential in their territory, based on household saturation. Three of the four products selected for study, clothes dryers (electric), pool pumps and motors, and water heaters (electric) have the highest per-unit savings.

The key source for the potential energy savings estimate for five of the products was Lawrence Berkeley National Laboratory’s 2011 study, *Max Tech and Beyond: Maximizing Appliance and Equipment Efficiency by Design*. Among the four products not included in that study, the team was only able to estimate potential savings for one product, pool pumps and motors, based on interview data. Unit savings were combined with saturation data and measure life to produce annual technical potential savings estimates for each utility territory.

Table B.2 shows the energy savings estimates from the Appliance Ranking Workbook.

Table B.2: Potential Energy Savings of Current and Potential HEER Products*

PRODUCT TYPE	POTENTIAL SAVINGS ESTIMATES			“BACK OF THE ENVELOPE” ANNUAL TECHNICAL SAVINGS POTENTIAL (GWH/YEAR)	
	Unit Savings (%)	Annual UEC (kWh/year)	Lifetime UEC (kWh)	PG&E	SCE
Clothes dryer					
Electric	30%	160	2,560	336	129
Gas	9%	N/A	N/A	N/A	N/A
Clothes washer	52%	125	1,750	482	453
Dishwasher	42%	88	1,138	292	256
Ducted evaporative cooler	N/A	N/A	N/A	N/A	N/A
Pool pump and motor**	50%	250	2,500	113	122



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PRODUCT TYPE	POTENTIAL SAVINGS ESTIMATES			"BACK OF THE ENVELOPE" ANNUAL TECHNICAL SAVINGS POTENTIAL (GWH/YEAR)	
	Unit Savings (%)	Annual UEC (kWh/year)	Lifetime UEC (kWh)	PG&E	SCE
Refrigerator	14%	57	961	262	247
Room air conditioner	N/A	N/A	N/A	N/A	N/A
Water heater					
Storage electric	58%	1,424	9,965	643	391
Storage gas	32%	5	60	15	16
Whole house fan	N/A	N/A	N/A	N/A	N/A

* Source for all data in "Potential Savings" columns, unless noted: LBNL, *Max Tech and Beyond: Maximizing Appliance and Equipment Efficiency by Design*. 2011.

** Source for pool pump and motor data in "Potential Savings" columns: interview with pool pump manufacturer, conducted by Research Into Action.

Saturation

Household saturation was another important determinant of product selection. The utilities wanted to select products with high household penetration in order to reach as many ratepayers as possible. Refrigerators were selected for study in part because they are the only product found in every SCE and PG&E household.

Saturation figures were drawn from the 2009 California Residential Appliance Saturation Study (RASS) conducted by KEMA and published in 2010. The RASS covered all the products in question and the data are available online at <http://websafe.kemainc.com/rass2009/>.

Table B.3 shows the household saturation estimates from the Appliance Ranking Workbook.

Table B.3: Household Saturation of Current and Potential HEER Products*

PRODUCT TYPE	PERCENT OF HOUSEHOLDS WITH PRODUCT	
	PG&E	SCE
Clothes dryer		
Electric	45%	18%
Gas	26%	54%
Clothes washer	83%	82%
Dishwasher	72%	67%
Ducted evaporative cooler	4%	6%



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PRODUCT TYPE	PERCENT OF HOUSEHOLDS WITH PRODUCT	
	PG&E	SCE
Pool pump and motorii	10%	11%
Refrigerator	100%	100%
Room air conditioner (>1 per household)	15%	22%
Water heater		
Storage electric	10%	6%
Storage gas	66%	74%
Whole house fan	8%	8%

* Source: KEMA. California Residential Appliance Saturation Study. 2010.

MARKET CHARACTERIZATION RESEARCH APPROACH

The primary data collection tasks for the market characterization research were a literature review and in-depth interviews with manufacturers and product experts.

Literature Review

Sources for the literature review included published reports, news releases, articles in online and print publications and some program data. Below we list some of the sources that were essential across all of the product studied. A full bibliography, by product type, appears below.

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Interviews

Table B.4 lists the number of interviews by type for each appliance. Interviews covering refrigerators and clothes dryers were often conducted jointly due to overlap among top supply chain players and the ability of the interviewees to speak about both appliances.

Interviews with retailers and distributors were not sought during this research period but will be conducted prior to the Final Report. Retailer interviews were postponed so that findings from the HEER process evaluation retailer survey could be used to inform the interview guide and contact list.

Table B.4: Interviews by Type and Appliance

INTERVIEWEE TYPE	REFRIG- ERATORS	CLOTHES DRYERS	WATER HEATERS	POOL PUMPS	GOAL (FROM WORK PLAN)
Appliance manufacturer	2		3	2	3
Component manufacturer	0		0	1	
Distributor	1		0	0	1
Retailer	0		0	0	1
Industry expert	5	4	4	0	1
Total	8	5	6	3	6

APPROACH TO MAKING PROGRAM DESIGN RECOMMENDATIONS

The program team used a process of trial and error to arrive at a four-step process to bridge the gap from market knowledge to program design. The rapid pace of the project meant the process was being developed, deployed, refined, and applied to four different appliance products simultaneously. The outcome is an approach to program design that is content-neutral – it can be applied to energy efficiency programs of any type, in any market. The approach is primarily qualitative, but with quantitative elements, using an MS Excel workbook-based tracking and organizational tool.

Step #1: Assess and prioritize the barriers to energy efficiency

The first task in this approach to designing a program that is firmly rooted in market knowledge is to assess and rank the problems the program will try to solve. In efficiency-speak these problems are typically called “barriers.” The team’s approach to identifying barriers was both quantitative and qualitative, and specific to each product. The first task was to identify the market penetration of efficient products to gauge whether the measures were at a saturation point or still had room to improve. Table B.5 lists penetration findings for the four products studied.



Table B.5: Market Share of Efficient Products

PRODUCT TYPE	EFFICIENT PRODUCT QUALIFICATION	MARKET SHARE (DESCRIPTION)
Refrigerator	ENERGY STAR	50% new unit sales, U.S. (2010)
		31% new unit sales, Calif. (2009)
		28% new unit sales, Calif. (2008)
		36% new unit sales, Calif. (2007)
Water heater	ENERGY STAR storage (gas)	12% gas storage sales, U.S. (2010)
	Tankless	~10% gas water heater sales, U.S. (2010) ~5% all water heater sales, U.S. (2010)
	Heat pump (electric)	2% electric water heater sales, U.S. (2010)
Pool pump	Variable speed	May be up to 33% of all new unit sales, U.S. (2011)
		Contractors and manufacturers report variable speed pumps outselling two-speed pumps in Calif. and in the U.S.
Clothes dryer	Heat pump (electric) clothes dryer	0% new unit sales, U.S. (to date)

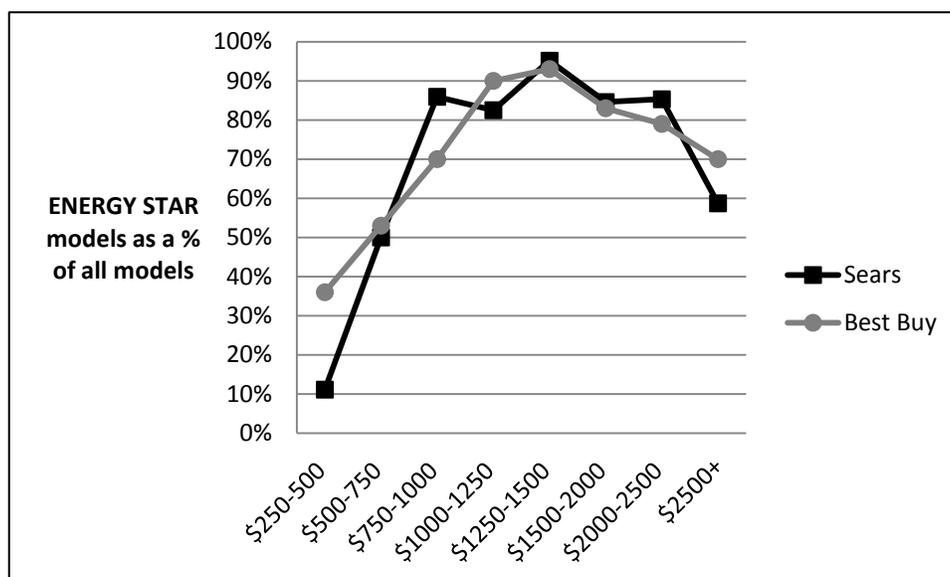
Sources: ENERGY STAR 2007, 2008, 2009; ENERGY STAR 2010a; ENERGY STAR 2010b; NEEA 2011a; ACEEE 2011b.

Penetration findings together with in-depth interviews and secondary research informed product-specific research questions. It was in answering these questions that the team was able to identify the unique barriers for each product. For example, penetration of ENERGY STAR refrigerators was low relative to other major appliances (especially prior to 2010). Yet interviewees reported few, if any barriers to adoption; ENERGY STAR products were widely available; And awareness of the SCE program's rebates was high. Why, then, wasn't ENERGY STAR penetration higher? Interviewees had noted that, in the refrigerator market, high sales volume occurs at the entry-level or "volume" price points (\$399 and \$499). An anecdotal review of refrigerator models by price point at two major retailers' websites showed fewer ENERGY STAR models at the lowest price increment (under \$500), relative to all other price points (Figure B.1.), as well as a higher incremental cost. The team thus concluded that one barrier to ENERGY STAR adoption may be the restricted selection and higher incremental cost for qualified efficient products under \$500, although a more systematic study is needed.



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Figure B.1. Percent of ENERGY STAR-qualified Refrigerator Models at Various Price Points, Best Buy (October 2011) and Sears (December 2011)



Sources: www.bestbuy.com (accessed October 27, 2011); www.sears.com (accessed December 14, 2011)

After the team identified the important barriers for each product they selected the single most important barrier. With one exception, the team placed no restrictions on the identification or prioritization of barriers. However, based on the seminal 1996 market transformation Scoping Study (Eto, et. al. 1996), team members were not permitted to select “first cost” as a key barrier. Table B.6 lists the key and secondary barriers were identified for each product type.

Table B.6: Barriers by Product Type

BARRIERS	PRODUCT TYPE			
	Refrigerator	Water heater	Pool pump	Clothes dryer
End user awareness/knowledge of energy efficient products or benefits lacking	x	x	x	x
First cost high, relative to baseline product (at some price points)	x	x	x	x
Retailer or contractor awareness/knowledge of energy efficient products or benefits lacking		x	x	x
Availability low at retail or wholesale	x	#1		x
Energy efficiency not a key purchase criteria	#1	x		
Enforcement of existing codes or standards lacking			#1	
Voluntary label lacking				x



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BARRIERS	PRODUCT TYPE			
	Refrigerator	Water heater	Pool pump	Clothes dryer
Codes/standards/testing procedures disadvantage energy efficient products				#1
Early replacement aversion		x	x	
Technology unfamiliar		x	x	
Availability low from manufacturers				x
Product performance - requires different expectations from end-users				x
Rebates not key purchase criteria	x			
Retailers do not promote energy efficient products		x		
Space or structural requirements for energy efficient products are increased or different		x		

Step #2: Identify intervention points in the supply chain to address each barrier

Using the barriers as a starting point, the team drew again on their knowledge of the product markets and efficiency programs to identify, for each barrier, where in the product's supply chain an intervention might be effective. This assessment was an exercise in the hypothetical, in which the team considered each intersection between barrier and supply chain player in turn, speculating on what, if any interventions might have an impact. Table B.7 shows a sample barrier, end user awareness/knowledge, and the potential supply chain intervention points for each product.

This assessment found general alignment among the products regarding intervention points. Brands, retailers and end users are potential intervention points for many barriers and products, particularly those purchased at retail. Products that move through contractor/installer channels like water heaters and pool pumps differ accordingly.

Table B.7: Leverage Points by Product, for Barrier “End user awareness/knowledge of energy efficient products or benefits lacking”

PRODUCT TYPE	LEVERAGE POINT							
	Component Supplier	Manufacturer/OEM/ODM	Brand	Whole-saler	Contractor/Installer	Retailer	End User	Government Agency/Other
Refrigerator			x			x	x	x
Water heater			x		x	x	x	x
Pool pump			x		x	x	x	x
Clothes dryer			x			x	x	x



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Step #3: Match strategies to barriers to products

Now that the team knew precisely which barriers the program would need to target and at which points in the supply chain, they needed a systematic way to figure out which intervention strategies might work, in preparation for evaluating them. The process, once designed, was quick to complete. The team compiled a list of more than 20 possible strategies based on the comparative strategy research tasks, although a list could be compiled in any number of ways – based on a team’s own experience, a more formal best practice study, or a creative brainstorm. The team collectively evaluated each strategy on several points, using MS Excel to track their conclusions: barriers addressed, applicable products, points in the supply chain it could target, and which of the ranking criteria it met. The team used the resulting strategy matrix to assign potential strategies to each barrier/supply chain intervention point. Table B.8 shows the findings for the end user awareness barrier for refrigerators.

Table B.8: Strategies by Leverage Point, for Barrier “End user awareness/knowledge of energy efficient products or benefits lacking”

PRODUCT	LEVERAGE POINT							
	Component Supplier	Manufacturer/OEM/ODM	Brand	Wholesaler	Contractor/Installer	Retailer	End User	Government Agency/Other
Refrigerator			1, 3, 6			1, 3, 5, 8	1, 2, 4, 7	3

Strategies:

Limited time incentives, varied based on incremental cost of efficient product over baseline product

Online marketing tactics, including retailer website marketing, social media campaigns, customer loyalty campaigns, product reviews via blogs

Improved POS marketing and price tag marketing (for example, simplified information, inclusive labeling, differentiation of efficient product price tags, labeling of super-efficient products)

Promotion of user-friendly product lists (for example, TopTenUSA, ENERGY STAR Most Efficient, utility-qualified lists)

Co-funded marketing with retailers

Co-funded marketing with brands

Bill inserts, other utility-sponsored direct mail

Retailer training

Step #4: Prioritize strategies

The team used the strategy matrix to rank each the potential strategies for every product based on the criteria established at the outset of the project. In total, the team considered upwards of 10 strategies for most of the products. They included the application of incentives at various points



in the supply chain and a wide range of marketing and training activities. The prioritization process was quantitative and qualitative. Each strategy received a numerical score, but the team considered other factors, including:

1. Which combination of strategies would yield a well-rounded program
2. Which strategies could be applied across multiple product types to streamline program implementation
3. Which strategies drew on the existing program's strengths

INTERVIEW GUIDE

Below we include questions from the refrigerator interview guide. Although the guides differed slightly across the four products studied, these questions are representative of all the guides.

Screening

1. Before we start, can you tell me your title and a little about what you do at [company]?
2. How long have you been in this position?

Features

3. What are the top features you use to promote refrigerators today?
4. I'm curious about whether you "bundle" efficiency with other product features. By this I mean, if a product is ENERGY STAR-qualified (or uses the most efficient components), are there other features that are also always included?
5. How do you decide whether to include energy efficient components or features in a particular refrigerator model?
6. What are the most important refrigerator technologies or features coming down the road that electric utilities need to be aware of? These can be things that will increase or decrease energy use.

Opportunities

7. If, over the next year or two, you could change anything about your refrigerators, what would you do to make them as energy efficient as possible – and by that I mean: using as little energy as possible while maintaining all their current functionality?



Supply Chain

8. Please take me through the process of designing and manufacturing a refrigerator. I'd like to get a clear picture of all the steps and actors involved.
9. Do you design different types of refrigerators for North America as opposed to other world markets?
10. What are the key energy-using components that manufacturers/OEMs purchase from external suppliers?
11. What do component vendors do to differentiate their products from others?
12. How do retailers differentiate themselves in terms of their refrigerator sales?
13. How long does a typical refrigerator model stay on the market?
14. How frequently do new refrigerator models come to the market?
15. How long does each stage of the design and production process take?
16. When in the year does the design process typically begin?
17. The most recent data I have on mfg market share for standard size refrigerator/freezer is from 2008: do you have anything more current you can share?

Barriers

18. Is there anything that discourages your company from making refrigerator even more energy efficient? For example, products that exceed ENERGY STAR standards?
19. ENERGY STAR qualified refrigerators have made up about one-third of total unit sales in the U.S. for the last few years. That's much lower than other appliance products like dishwashers and clothes washers. What's preventing efficient refrigerators, like ENERGY STAR products, from making up a larger portion of the market?
20. As you know, the U.S. minimum standard for refrigerators is going to rise dramatically in 2014. How do you expect your company's number of ENERGY STAR qualified models to change at that time, assuming the ENERGY STAR specification continues to require products to be about 20% more efficient than baseline?
21. What tools or information would help retailers sell more efficient refrigerators?
22. How is the refrigerator industry changing and how do you anticipate it continuing to change over the next few years?



Energy Labels/Codes/Standards

23. How do federal minimum (DOE) standards affected the refrigerator industry?
24. How have codes and standards affected the structure of your company?
25. What impact do codes and standards have on the design of your refrigerators?
26. Do codes and standards altered the types of products available on the market?
27. How do you stay aware of, and plan for, changes in energy codes and standards?





BCE REVIEWS METHODOLOGY

PROGRAM EXPERIENCE REVIEW METHODOLOGY

The program experience review focused on understanding the BCE program, as well as other programs focused on plug-load efficiency. This review was conducted to discover what worked well and what did not in this first generation of consumer electronics plug-load programs.

To construct an accurate picture of the BCE experience, the research team reviewed BCE program documentation and program data, and interviewed BCE program stakeholders.

In-depth interviews targeted the following categories of stakeholders:

1. IOU program staff,
2. Other IOU staff involved in relevant issues, such as retailer engagement or non-program approaches to plug-load efficiency,
3. Implementation contractor staff,
4. Staff from other utilities with programs targeting plug loads, and
5. Staff from other organizations that promote plug-load efficiency, such as the EPA ENERGY STAR program or CEE.

Stakeholder Interviews

The research team conducted 25 interviews with a range of stakeholders, including program staff and implementers from BCE and other utilities. 20 were in-depth interviews and lasted between 30 and 60 minutes. Five were short form interviews and lasted between 10 and 15 minutes. The complete stakeholder list is show below.

Table C.1: Stakeholders Interviewed for Program Experience Review

CONTACT	ROLE	ORGANIZATION	REASON CONTACTED	TYPE OF INTERVIEW
Lee Cooper	Manager	PG&E	BCE Program Staff	In-Depth
Sarah Bresko	Senior Product Manager	PG&E	BCE Program Staff	In-Depth
Kristina Wong	Manager	SCE	BCE Program Staff	In-Depth
Roy Bragg	Program Manager	SCE	BCE Program Staff	In-Depth



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CONTACT	ROLE	ORGANIZATION	REASON CONTACTED	TYPE OF INTERVIEW
Michael Ursem	Manager	SCE	SCE Planning Staff	In-Depth
Randall Higa	Engineer	SCE	SCE Codes and Standards Staff	Short
Linda Malek	Senior Manager, Strategic Alliances	SCE	SCE Strategic Alliances Staff	In-Depth
Patrick Kilroy	Account Executive	QDI Strategies	BCE Implementer	In-Depth
Luther Knopf	Information Systems Director	Energy Solutions	BCE Implementer	In-Depth
Alex Chase	Director	Energy Solutions	BCE Implementer	In-Depth
Rob Russell	Senior Manager	NEEA	Other BCE Utility	In-Depth
Mardi Cino	Consumer Products Manager	NEEA	Other BCE Utility	In-Depth
Adam Grant	Program Manager	NV Energy	Other BCE Utility	In-Depth
Paula Robertson	Program Planner	SMUD	Other BCE Utility	In-Depth
Jennifer Potter	Energy Efficiency Planner	SMUD	Other BCE Utility	In-Depth
Denise Allard	Program Manager	DTE	Plug-Load Program Staff	Short
Alicia Forrester	Sr. Program Manager	Commonwealth Edison	Plug-Load Program Staff	Short
Kim Sherman	Product Portfolio Manager	Xcel Energy	Plug-Load Program Staff	Short
Scott Kessler	Project Manager	NYSERDA	Plug-Load Program Staff	In-Depth
Michael Russom	Program Planning and Development Manager	VEIC	Plug-Load Program Staff	Short
Joe Pater	Program Implementation Manager	WECC	Plug-Load Program Implementer	In-Depth
Carl Uthe	Program Manager	Lockheed Martin	Plug-Load Program Implementer	In-Depth
Katharine Kaplan	ENERGY STAR Team Lead	US EPA	ENERGY STAR	In-Depth
Hewan Tomlinson	EPA ENERGY STAR	US EPA	ENERGY STAR	In-Depth
Margie Lynch	Sr. Program Manager	CEE	Other Consumer Electronics Program	In-Depth



In-Depth Interview Guide

This is the guide used to conduct in-depth interviews.

Objectives

1. Understand the BCE programs in California and nationwide. Develop a broad-brush conception of the major elements and plans for California's IOU BCE programs including program history, logic models as filed, strategy, marketing initiatives, relationships and strategies with government, manufacturers, and resellers, program operations, management structure, and future program development plans.
2. Identify technical issues, relevant data sources, and industry experts to inform the technology opportunity map (Task 5B)
3. Identify market issues, relevant data sources, and industry experts to inform the market analysis (Task 5C).
4. Identify potential new program designs.
5. Identify industry experts and data sources for further research into BCE and miscellaneous plug load program designs.

Interview Targets

1. IOU (PG&E and SCE) program implementation staff [n=5],
2. IOU implementation contractors [n=4],
3. Other BCE partner utility program managers [n=3],
4. Other relevant utilities with consumer electronics and/or miscellaneous plug load programs [n=5], and
5. National and state organizations that also promote energy-efficient electronics [n=3; e.g., CEE, ENERGY STAR, CEC].

1. Introduction and Background

[For internal contacts, e.g., IOU program implementation staff, contractors, other BCE partner utilities, etc.] Hello this is _____ from Energy Market Innovations. We're working with Southern California Edison and Pacific Gas and Electric on a process review of the BCE program, as well as forward looking research to inform future program designs for electronics and other miscellaneous plug loads. Our goal in this interview is to gain a deep understanding of the BCE program, past and present, and to gather information to help make recommendations for improving operations and informing future program strategy.



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[For external contacts, e.g., other relevant utilities, national and state organizations, etc.] Hello my name is _____ from Energy Market Innovations. We're working with Southern California Edison and Pacific Gas and Electric to research new designs for energy-efficiency programs that target electronics, such as televisions and computers, and other miscellaneous plug load products. For this research we are speaking with a variety of stakeholders that are familiar with the California Business and Consumer Electronics (BCE) program, or other similar programs that are targeted at electronics and other miscellaneous plug loads. We'll be using the results of this research to try and improve future program designs for these product types. I'd like to talk to you about your involvement with the ___(Relevant Program Name)___ program so we can understand your perspective on program design, efficient technologies, and the market for consumer electronics and other products that contribute to miscellaneous plug loads.

[Ask all] Is this a good time to talk? Do you have any questions about this research?

- 1.1. To get started, can you please tell me what your current role is at ___(Organization)___? How long have you held that particular role? What role did you have prior? What is the predecessor in your role doing now? How long have you been there?
- 1.2. [For BCE partners] What is your role in relation to the California Business and Consumer Electronics Program, or BCE program? [As Relevant] How long have you held that particular role? What role did you have prior? What is the predecessor in your role doing now?
- 1.3. [For non-BCE partners] How does your organization/program collaborate with the BCE program, if at all? Who are the key people in your organization involved in this collaboration?
- 1.4. [If applicable] How long have you worked with/for the BCE program?
- 1.5. Does your organization support other miscellaneous plug load measures, beyond the BCE/electronics program? Please describe.

2. Understand the BCE Programs

For BCE/Utility program managers and implementers only

- 2.1. When did you launch the program? Did it build on other programs? Is it still operating? How has it evolved since its inception? What are your future plans for the program?
- 2.2. Can you briefly explain the program theory, or what the program does and how it creates energy savings?

PROBE: Does the program theory differ for different product types (e.g., computers, televisions, monitors, etc.)?



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PROBE: Can you describe if this program theory is working well? If yes, why? If not, why not?

- 2.3. Does your program have ongoing communication or involvement with other BCE programs? To your knowledge, how does this program compare in implementation to other programs targeting consumer electronics?

PROBE: To your knowledge, does it differ from the PG&E and/or SCE program implementation?

- 2.4. Does the program include incentives?

PROBE: [If yes] Who does your program pay incentives to (e.g., end users/downstream, retailers/mid-stream, manufacturers/up-stream, etc.)?

PROBE: [If yes] What is the intended effect of the incentives? In other words how does the incentive influence the market in a way that results in energy savings?

- 2.5. How is the program marketed?

PROBE: To end consumers, retailers, manufacturers, others?

- 2.6. Does the program aim to increase end-user awareness of the energy use or energy savings opportunities in electronics/miscellaneous plug loads?

- 2.7. Does the program aim to increase retailer awareness of the energy use or energy savings opportunities in electronics/miscellaneous plug loads?

- 2.8. [If applicable] What retailers participate in the program?

- 2.9. What types of products are eligible for the program (e.g. televisions, monitors, computers, advanced power strips, set top boxes, etc.)?

- 2.10. What are the qualification criteria for these products? How were these criteria established?

PROBE: since the BCE and miscellaneous plug load products may have had very rapid product life cycles and movements in product standards (i.e., ENERGY STAR 4.0 to 5.0 to 6.0 Televisions), how does the program manage these changes? Is there an agreed to rationale or agreement on when the program should move to the next standard?

- 2.11. Are there certain products that represent most of the program participation? What about products with only a small number of units incented through the program?

- 2.12. Have energy or demand impacts been reported for the program?

- 2.13. Has the program been evaluated?

PROBE: What were the energy and demand impacts? Did they meet/exceed expectations? Why?



PROBE: Was there a process evaluation as well? What were the key findings?

PROBE: Is there a public impact evaluation we could see?

2.14. [If the program has not been evaluated] What is the evaluation plan for the program?

3. BCE/Other Utility Program Experience

3.1. What has worked particularly well in the program?

3.2. What have been some of the major challenges with the program?

PROBE: Are there any changes you'd like to see made to the program? Where do you see room for improvement?

PROBE: Are there any types of products that potentially shouldn't continue to be in the program?

3.3. Are there any evaluation challenges that you're aware of? What are they?

3.4. Do you anticipate any changes to the program theory or implementation?

[If yes] What are they? What future program designs are being considered?

[If yes] Why are these changes being implemented?

For ENERGY STAR and CEE only

3.5. How does the California BCE program help you achieve the goals of your organization?

4. Identify technical issues, relevant data sources, and industry experts to inform the technology opportunity map (Task 5B)

We are researching products and technologies that SCE and PG&E could target for new energy-efficiency programs. We're specifically looking for opportunities in the area of "miscellaneous plug loads," or anything that you would plug into your wall that's not a major appliance.

4.1. What defines a promising product or technology to include in a miscellaneous plug load program?

4.2. What defines an inappropriate product or technology to include in a miscellaneous plug load program?

4.3. Do you have any thoughts about what specific product types, components, or technologies should be considered for a program?

4.4. Looking forward (2-3 years), are there any product types or technologies on the horizon worth investigating for future programs?



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- 4.5. Do you know of any good sources of information on technical potential for energy savings in miscellaneous plug load products?
- 4.6. For any of these new product concepts, where could the utility intervene to create savings (i.e., what is the program theory or rationale)? What are the market barriers where utility intervention could create savings?

5. Identify market issues, relevant data sources, and industry experts to inform the market analysis (Task 5C)

The other area of our research will be to research the market structure and dynamics of miscellaneous plug load products including consumer electronics.

- 5.1. How have retail markets for electronics and/or other plug load products changed over the last three to five years?

PROBE: How have these changes impacted your program?

PROBE: How has the usage of plug load products changed over the last three to five years?

- 5.2. How have these market changes affected the ability of utilities to run cost effective energy efficiency programs for these products?
- 5.3. How do you expect markets for electronics and/or other plug load products to change over the next three to five years?

PROBE: How will these changes affect products covered by your program?

- 5.4. How might these future market changes affect the ability of utilities to run cost effective energy efficiency programs for these products?
- 5.5. What opportunities may come up for market intervention? What challenges might arise?

6. Identify potential new program designs

- 6.1. Based on changing technology and market dynamics, do you have any recommendations for different program models / market intervention strategies for consideration for future plug load programs? What are they?

PROBE: Any radically different ideas?

- 6.2. Do you have any recommendations for how utilities across the country could collaborate to create effective energy efficiency programs for these product types?

For ENERGY STAR and CEE only:



- 6.3. What plans does the ___(Organization)___ have for updating product specifications for miscellaneous plug load products in the next 3-5 years? Clarification: Can answer on a high level and provide more detailed follow up information.
- 6.4. Does ___(Organization)___ see any future opportunities to collaborate with utility programs to drive energy efficiency in these products?

PROBE: Any new ideas for opportunities for collaboration?

7. Identify industry experts and data sources for further research into BCE program experiences

- 7.1. Who else should I talk to about these programs?
- 7.2. Are there any reports or other sources you'd recommend we review to get a better understanding of your program, or of the technology or market dynamics for consumer electronics?

8. Wrap up

Those are all the questions I had for you. Thanks for taking the time to talk with me – I really appreciate your insight.

Short Interview Guide

Hello, my name is _____ from Energy Market Innovations. We're working with Southern California Edison and Pacific Gas and Electric to research new designs for energy-efficiency programs that target electronics, such as televisions and computers, and other miscellaneous plug load products. For this research we are speaking with a variety of stakeholders that are familiar with the California Business and Consumer Electronics (BCE) program, or other similar programs that are targeted at electronics and other miscellaneous plug loads. We'll be using the results of this research to try and improve future program designs for these product types. I'd like to talk to you about your involvement with the ___(Relevant Program Name)___ program so we can understand your perspective on program design, efficient technologies, and the market for consumer electronics and other products that contribute to miscellaneous plug loads.

[Ask all] Is this a good time to talk? Do you have any questions about this research?

1. We're interested in getting a picture of the design of your program, areas where this design has proven effective, and your thoughts on dealing with roadblocks for this type of program. Are you the right person for me to talk to, or is there someone else I should get in touch with? [Who?]
2. What's your role in this program?



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3. Can you give me an overview of the program?
 - a. PROBE – What’s the current status of the program? What is your program cycle? Will the program continue? [If no] Why won’t the program be continued?
 - b. PROBE – What products do you cover?
 - c. PROBE – Do you use consumer-facing marketing materials?
4. Are you familiar with the California BCE Program?
 - a. [If yes] How is your program similar and different to theirs?
5. What is going well [worked well] with your program?
6. What roadblocks or concerns have you encountered in the implementation of the program?
7. Has the program been evaluated at all? (If yes) Do you have any published evaluations or other material you could share with me? (If no) Are you planning to evaluate it, do you have an evaluation plan in place?
8. Do you have any other programs in place or planned to address miscellaneous plug loads or consumer electronics?
9. We’re interested in researching miscellaneous plug-load products that could be the basis for new product offerings and programs. What products do you think are most promising?
10. We’re also interested in the potential for different program designs to address miscellaneous plug loads. Do you have any thoughts on alternative program designs that could be worth considering in this area?
11. Do you know of any other contacts or utilities that are very active in electronics or miscellaneous plug load programs?

Thanks for the insight into your program, this will be very helpful to SCE and PG&E as they design their next generation of plug-load programs. I would love to follow up with you when we’re deeper into the project, since it sounds like you can offer a great perspective on the successes and barriers to these types of programs. Can I get in touch with you?

12. [If we don’t already have their email] What’s your email address?

Thank you! I really appreciate your time.



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TECHNOLOGY AND MARKET REVIEW METHODOLOGY

Technical Sources for Potential Savings Calculations

Table C.2 describes the sources and calculations used to estimate technical potential savings.



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Table C.2: Residential Customer Base

DATA	SOURCES
1. Annual unit energy consumption (UEC) in kWh	<ul style="list-style-type: none"> • LBNL 2011b. <i>Max Tech and Beyond: Maximizing Appliance and Equipment Efficiency by Design</i>. Lawrence Berkeley National Laboratory: Berkeley, California. (Report and accompanying tables) April 22, 2011.
2. Est. Annual product sales in California ^(a) - all sectors	<ul style="list-style-type: none"> • California Energy Commission (CEC) 2011a. <i>Title 20 proposals</i>. August 31, 2011. Accessed at http://www.energy.ca.gov/appliances/2011rulemaking/documents/2011-08-31_workshop/proposals/ • LBNL 2011b. <i>Max Tech and Beyond</i>.^(b)
3. Est. Annual product sales in California ^(a) - residential sector	<ul style="list-style-type: none"> • Estimated residential product sales are calculated by multiplying the annual incidence rate of a product with the household population of California from the 2010 U.S. Census for California. Annual incidence rate of a product is estimated by dividing the 2- yr product incidence rate (measured in the 2012 GPS study) by two.
4. Annual per-unit technical potential energy savings in kWh	<ul style="list-style-type: none"> • Research into Action [RIA] 2011b. <i>Electronics Ranking Chart</i>. (Excel Spreadsheet) Draft October 27, 2011. HEER-BCE_Task5_Electronics_Ranking_Chart_draft_2011.10.27.xls • LBNL 2011b. <i>Max-Tech and Beyond</i>.^(c)
5. Annual per-unit dollar savings in \$	<ul style="list-style-type: none"> • Per-unit achievable savings potential multiplied by the average residential power rate in California^(d)
6. Total annual energy use in GWh	<ul style="list-style-type: none"> • Per-unit energy consumption multiplied by the yearly product sales in California
7. Total annual technical potential savings in GWh	<ul style="list-style-type: none"> • LBNL 2011b. <i>Max-Tech and Beyond</i>.

a. Data includes both consumer and business sales.

b. California sales estimates were determined by multiplying national estimates by 0.12, which represents the percentage of population represented by California based on the 2010 U.S. Census.

c. Consistent with the technology ranking chart, savings estimates use the average of the best-on-market and max-tech estimates from the LBNL report, where available. For products where max-tech values were not available best on market was used.

d. \$0.14 / kWh based on CEC estimate (CEC 2011b)

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RECOMMENDATIONS METHODOLOGY

The research team synthesized the findings from the technology and market research to develop actionable recommendations for addressing miscellaneous plug loads. This synthesis included working with Research into Action to develop holistic recommendations that cover all plug load products, for example, major appliances previously covered under the HEER program, consumer electronics previously covered under the BCE program, and other miscellaneous plug load



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products. The research team modified the initial recommendations based on feedback from utility and CPUC staff.



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