PY2010-2012 UAT-HEA-OBG Evaluation Report

CALMAC Study ID SCE0339.02

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Prepared for:
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Executive Summary

Study Goals and Methods

For over a decade Southern California Edison (SCE) has offered its residential customers an energy-efficiency audit tool. In 2009, as part of its directions to the Investor Owned Utilities (IOUs) regarding integrated demand-side management (IDSM),[1] the California Public Utilities' Commission (CPUC) instructed the IOUs to provide plans for developing an integrated Universal Energy Audit Tool. SCE's response was the Universal Audit Tool (UAT), an umbrella strategy that integrates energy efficiency, demand response, and distributed generation (e.g., solar) to help SCE customers better assess and implement energy-saving and demand-reduction opportunities in their homes and small businesses.

To identify opportunities for improvements to the UAT strategy, SCE contracted with Cadmus to conduct a process evaluation of key 2010-2012 UAT residential components.[2] This report is based upon completing the following research tasks to assess the UAT status, the Home Energy Advisor (HEA) online audit, and the Online Buyers Guide (OBG):

- Review of program documents and interviews with 28 SCE staff members about UAT development and integration.
- Assessment of the energy analysis and functionality of the Home Energy Advisor (HEA) online tool, including a comparison to the Home Energy Efficiency Survey (HEES) tool, which was formerly available online, but is now provided to customers only via mail, telephone, or in-home assessments.
- An examination of HEA use, based on website metrics.
- A survey of customers about their HEA experience.
- An assessment of the Online Buyers Guide (OBG).

Future of HEA

SCE is rebidding the HEA software vendor in the 2013-2014 program cycle to include the following enhancements:

- Integrated platform to consolidate customer facing tools (audit, rate analyzer, budget assistant, alerts and notifications)
- Social media and "gamification" with rewards to promote customer engagement
- Allow customers to access HEA using their SCE website account

[1] Decision 09-09-047, September 24, 2009.

[2] Cadmus previously completed a process evaluation of an additional 2010-2012 UAT component: The Community Language Efficiency Program (CLEO) 2010-2012. This report can be found on the CALMAC database under identification SCE0339.01.

Conclusions and Recommendations

Drawing from findings across these tasks, we have grouped our conclusions and recommendations into the following categories:

- The state of UAT system integration
- Assessment of HEA
- OBG's role in the UAT

The State of UAT System Integration

These conclusions and recommendations are based upon interviews we conducted with SCE staff in June 2013. Since SCE has reviewed our initial analysis of these interviews, it may have begun to address some of the conclusions and recommendations presented here.

Conclusion: At the time of the interviews, which occurred after a major reorganization at SCE that included staff departures and moves to new positions, about one-half of key SCE staff had limited knowledge about the UAT requirements and HEA's development status and an organization-wide consensus did not exist regarding the objectives for UAT integration.

Recommendation: SCE management should further develop and communicate to key staff a clear understanding of the UAT requirements, the status of HEA development, and objectives for UAT integration and policies supporting these activities.

Conclusion: UAT and HEA face major challenges that include: the lack of a direct link between HEA and SCE's main customer account website; how to link a large number of SCE customer websites with HEA and each other; and how to meet CPUC requirements during a time when technologies are changing rapidly.

Recommendation: SCE should develop a thorough list of challenges to HEA development and UAT implementation and prioritize them for resolution. The existing roadmap, including short- and longer-term milestones, should be updated based on this analysis and then used to guide the process.

Assessment of HEA

This assessment draws upon the SCE key staff interviews, a comparison with SCE's alternative residential audit tool (HEES), analysis of customer usage data, and a survey of HEA users.

Inputs, Outputs, and Placement

Conclusion: HEES requires more detailed information than HEA for appliances. Thus, HEES can pinpoint individual appliance energy use, while HEA provides only aggregate appliance energy use estimates. Survey responses suggest some customers may prefer more detail on individual appliance usage, while others may prefer fewer inputs and a more aggregated approach.

Recommendation: Give users the flexibility to vary the amount of information they input depending on how much detail they want in their outputs. Provide default values for inputs customers choose to not enter. Give customers the option of returning to the audit tool and providing more detail later.

Conclusion: HEA provides only limited information that would inform customers on how to make energy-efficiency purchase decisions.

Recommendation: HEA measure recommendations should emphasize practical tips for selecting the right product or service provider. In addition, the site could provide a phone number or form for requesting an in-person audit or further technical assistance from SCE staff.

Conclusion: Based on the testing we were able to conduct, HEA outputs do not always vary with changes in customer inputs as expected. In some cases, we also found inconsistent information on energy savings.

Recommendation: SCE's HEA vendor should conduct validation tests of its online audit tool, providing results to SCE, to ensure that it provides reliable results when customer inputs change.

Conclusion: Having HEA outside of the SCE website limits the opportunities that could come from integration with a customer's existing account page.

Recommendation: Allow customers to access HEA using their SCE website account to increase the data available to both customers and SCE, and to eliminate a step – and multiple passwords – for customers.

Customer Response to HEA

Conclusion: Customer use of and engagement with the HEA is low for many reasons. Only about 7,000 customers had used HEA between its official roll out in December 2012 and September 2013 and only stayed on the site for an average of 6 minutes, hardly long enough to complete a home energy audit. Despite customers' relatively high satisfaction ratings of the HEA (87% of survey respondents were somewhat to very satisfied), only 10% of customers returned to use the site again. These findings are consistent with the views of key staff, with Cadmus' initial review of website elements, and with user feedback that HEA and the UAT needs to be much more customer-centric to successfully engage with customers. The small number of customers who interacted with the HEA is attributed to the fact that it was not easily accessible from the main SCE website and because SCE did not have a robust marketing campaign to drive customers to the HEA website in 2013 since SCE was in the process of rebidding the HEA software vendor.

Conclusion: Customers who had linked to their billing data had taken about twice as many energy-efficiency actions in the past than those using proxy data. Customers linked to billing data viewed about 70% more actions than those using proxy data, but neither group viewed very many actions offered on the site (0.79 vs. 0.48, on the average).

Recommendation: In the next iteration of the HEA, SCE should increase marketing efforts, HEA accessibility, and conduct customer research to better understand how to enhance the customer experience and increase HEA engagement. At a minimum, the research should focus on these specific areas identified in this study:

- How to personalize customer experience, including communicating to customers the importance of linking to their own billing data and tailoring recommendations to those most valid and achievable for the customer
- What type of information, and in what format, is most helpful and motivating to customers (for instance, providing appliance energy use, having a dashboard, or presenting advice on how to purchase efficient products)
- What types of milestones (for instance, % reduction in use) and rewards would most engage and motivate customers to use HEA and take actions (for instance, bill credits, coupons, special offers)
- What types of feedback and prompts would most motivate and engage customers
- The importance of easy access to other websites and to on-line or other forms of personal help
- Advice from customers on what information they are willing to provide that would help ensure the analysis and recommendations best fit their situation and needs

OBG Assessment

Conclusion: In its current state, the OBG is a non-resource, educational offering. The lack of the OBG name on the core list of tabs under *Making Your Home More Energy Efficient* and the separate *Buyer's Guides* tabs prevents customers from seeing the OBG as a distinct program. SCE.com would require restructuring to make the OBG a stand-alone program. If established as a program, the OBG would need much greater integration with HEA (which is outside of SCE.com) and efficiency programs, along with the adoption of on-line feedback mechanisms and tracking of customer actions, to measure its influence.

Recommendation: Retain the OBG as a non-resource support for other DSM programs. Improvements to the OBG should focus on improving its presence and usefulness to customers as an educational and referral tool. The visibility and usefulness of the OBG and *Buyer's Guides* should be increased (for instance, have more consistent naming, more interactivity and clear links within the guides). Consider use of pop-up surveys[3] to gather feedback, better tracking from the site to program sign-ups, and Spanish language versions.

[3] Pop-up surveys should be kept short (three easy to answer questions) to minimize disturbance to the OBG user.

Introduction

For over a decade Southern California Edison (SCE) has offered its residential customers an energy-efficiency audit tool. In 2009, as part of its directions to the Investor Owned Utilities (IOUs) regarding integrated demand-side management (IDSM),[4] the California Public Utilities' Commission (CPUC) instructed the IOUs to provide plans for developing an integrated Universal Energy Audit Tool. SCE's response was the Universal Audit Tool (UAT), an umbrella strategy that integrates energy efficiency, demand response and distributed generation (e.g., solar) to help SCE customers better assess and implement energy-saving and demand-reduction opportunities in their homes and small businesses.

This report describes the results of Cadmus' process evaluation of 2010-2012 component programs under the residential UAT umbrella. For this process evaluation, Cadmus assessed the Home Energy Advisor (HEA) online audit, the Online Buyers Guide (OBG), and the Community Language Efficiency Outreach (CLEO) program. For the OBG, we assessed if and how its influence on energy savings could be determined. The results of the CLEO evaluation are documented and available separately.[5]

SCE requested this process evaluation to help identify improvements to the UAT suite of tools. The process evaluation programs and key research tasks are briefly described in this section, and organized throughout the report as follows:

- UAT System Integration Assessment
- HEA and HEES Tool Overview and Comparison
- HEA Usage Study and Customer Experience Assessment:
    - Part 1: HEA Usage Analysis
    - Part 2: HEA Customer Survey
- OBG Assessment

UAT System Integration Assessment

This part of the study assesses the UAT's integration within SCE's organization, and SCE stakeholder perceptions of the HEA tool's development. To assess the UAT's integration processes and development, Cadmus conducted interviews with 28 stakeholders involved in its design and implementation. In these interviews, conducted primarily at SCE headquarters, Cadmus gathered information about the history, design, and implementation of the tool, and stakeholder feedback about how SCE could achieve system integration on a wider scale.

HEA Overview and Comparison with HEES

Cadmus compared the HEA online audit tool with the Home Energy Efficiency Survey (HEES) audit tool (online version), RECAP, which SCE has used for years in the HEES program. HEES provides residential

[4] Decision 09-09-047, September 24, 2009.
[5] The 2010-2012 CLEO report has been uploaded to CALMAC with identification SCE0339.01.

customers with more detailed home audit information; it is administered now to customers only through the mail, over the telephone, or through an in-home assessment, but was formerly available online.

For this task, Cadmus compared the modeling functions of the HEA and online HEES tools to identify similarities and differences. We compared (1) energy end-use reports from each tool for four customers' homes and (2) the tools' online interfaces for functionality.

HEA Usage and Customer Experience Assessment

HEA provides SCE's residential customers with ongoing online access to information about energy-saving opportunities, recommendations, and conservation tips. After logging into the HEA website, customers can compare monthly energy consumption and savings, and learn about SCE's rebate programs including energy efficiency, demand response, and distributed generation. The evaluation team analyzed the HEA's usage and customer experience.

Part 1: HEA Usage Analysis

Cadmus analyzed the HEA's login activity to assess the customers' level of engagement with it and to inform the customer survey and sampling design. We looked at the type of data being tracked in the tool, the frequency of recorded activities, and how often customers signed in.

Part 2: HEA Customer Survey

Cadmus conducted an online survey with HEA participants to assess experience, satisfaction, and behavior changes resulting from using the online audit. The online survey contained visual prompts to help customers recall the different features of HEA.

Online Buyers Guide (OBG) Assessment

The Online Buyers Guide (OBG) provides SCE's residential customers with information and advice for making informed decisions on a wide variety of energy-efficiency products. The OBG is embedded in SCE's online Home Energy Guide on SCE.com, which is available to all website visitors. It provides information on reducing customers' home energy use. SCE has said that it intends to offer the OBG as part of the integrated UAT suite at a future date.

After an initial review of the OBG, Cadmus determined that its impacts could not be evaluated because there currently is no way currently available to link the use of OBG to customers' energy-saving actions. Instead, Cadmus assessed how the OBG could be integrated into the UAT and how OBG's design and data tracking could be modified to allow it to be evaluated.

Future of HEA

In late 2013, SCE made the decision to re-bid the software tool. By mid-2014, SCE was in the final award phase of a competitive RFP for a HEA software vendor to enhance the current audit tool to:

- Integrate platform to consolidate customer facing tools (audit, rate analyzer, budget assistant, alerts and notifications)
- Include social media and “gamification” elements, with rewards to promote customer engagement
- Allow customers to access HEA using their SCE website account

Once the new tool is in place, SCE expects to accompany the release with a marketing campaign to drive additional users to the tool.

UAT System Integration Assessment

UAT Purpose

The California Public Utilities Commission (CPUC) directed[6] that the UAT be an enhanced energy audit tool that offers integrated energy solutions to California residents through continual engagement and that it is:

- Verifiable
- Site-specific
- User-friendly
- Comprehensive
- Accessible
- Compatible with California Solar Initiative (CSI).

To meet the UAT requirements, and to provide customers with an enhanced customer experience, SCE developed online energy audit tools for residential and nonresidential customers. Over the past few years, the UAT has evolved as it moves toward integration with SCE's DSM service areas. While SCE has conducted a number of successful UAT platform upgrades, the audit tool remains in the early stages of organization-wide system integration. In the coming year, SCE plans to enable several new web features that will require further integration with DSM service areas, including energy efficiency and demand response, as well as distributed generation.

Research Objectives and Methodology

Cadmus conducted interviews with 28 SCE stakeholders including program staff, management, and implementers involved in designing and launching the online audit tool. The objectives of the stakeholder interviews were to assess experiences and perceptions about the HEA integration process, and to gather information about its development status and trajectory. We spoke primarily with staff and management from SCE's Customer Service Organization involved in these areas:

- Customer programs and services
- Operations
- Compliance
- Marketing
- New product development
- Information technology
- Business planning.

To develop the interview guide and understand the UAT's history, design, and development, Cadmus reviewed the following materials:

- CPUC's supplemental UAT ruling (October 30, 2008; Appendix C)

[6] D.09-09-047, Section 5.9.2, at pp. 214-215 and Appendix C.

- HEA vendor scope of work
- Implementation meeting agendas and product updates
- SCE organization charts (Effective Q2 of 2013)

Cadmus conducted the stakeholder interviews primarily in person at SCE headquarters on June 13-14, 2013. Cadmus performed phone interviews with stakeholders who did not meet in person, including staff members from C3, the HEA implementation vendor.

Stakeholder interviews investigated the key research topics and questions listed in Table 1:

Table 1. Key Research Topics and Questions

Key Research Topics	Questions for Investigation
Staff Familiarity, UAT History and Updates	How familiar are stakeholders with the UAT integration requirements? How is the UAT integration process being communicated to SCE staff, and what is its current status?
Goals and Expectations	What are the staff and management expectations, goals, priorities, and concerns about the UAT integration? What benefits does integration offer for the UAT tool? Are the goals realistic? Why or why not?
DSM Service Area Integration	Which of the integrated demand-side management (IDSM) service areas will be part of the UAT integration, and how will they be affected? Which of the IDSM service areas have existing tools that must be integrated with the UAT tool? Which tools are these? What is needed for the UAT tool to be integrated with these systems and tools currently in use or under development?
Barriers	What are the potential risks, bottlenecks, or obstacles that might impede integration of UAT into the IDSM service areas?
Suggestions for Improvements	What actions or elements will make this new tool usable and accepted throughout SCE's organization? What advice do stakeholders have for the UAT integration?

UAT Stakeholder Interview Findings

Staff Familiarity with UAT Integration Requirements

Prior to the interviews, SCE underwent a major reorganization, which included staff departures and moves into new roles. SCE informed Cadmus that some of the staff who had shifted roles during recent organizational changes might not be familiar with the CPUC's UAT requirements. Furthermore, historical knowledge was lost from those who left SCE. Thus, at the start of the interviews, we provided overview materials about the CPUC's UAT integration requirements, and focused discussion on the HEA's development status.

During the interviews, we found more than half of the stakeholders (16 of 28) were very familiar with the UAT's CPUC requirements and the HEA tool's development status. These stakeholders had been involved with overseeing the tool's regulatory requirements or selection of the vendor responsible for

the tool's development. The remaining stakeholders were only somewhat familiar (five of 28) or not too familiar (seven of 28), having heard only recently about SCE's plan for UAT integration.

UAT's Early Development and Current Status

SCE has offered home energy audits to its residential customers for a number of years through the mail, over the phone, or with assistance from on-site audit technicians. SCE stakeholders involved in the UAT's early development reported that the CPUC's interest in enhanced energy audit tools grew out of the promise of real-time energy data from installation of smart meters. In response to the CPUC's UAT order, SCE selected a vendor to design a self-directed online energy audit tool that could integrate with a customer's smart meter data, and provide information about SCE's DSM programs.

According to stakeholders, SCE's initial RFP (issued in 2010) was designed to solicit a vendor capable of instituting universal properties that could be standardized across all of California's IOUs. However, SCE's initial vendor scope was narrowed to accommodate SCE's system and organizational goals at that time.

In 2012, the HEA vendor selected by SCE, E2.0, was acquired by C3. A few stakeholders reported that this transition resulted in some disruption of the tool's development and a slight loss in functionality. For example, the tool was offline for a period of time and content was not being updated on a regular basis. A few stakeholders reported that, prior to the transition, the vendor was working on incorporating a reward system to encourage customers to use the HEA tool more frequently. However, during transition, the development of this functionality was put on hold. Stakeholders said the loss in functionality may have also been related to SCE's data security requirements and new vendor contractual issues.

Stakeholders at SCE who were involved in the UAT's early development believed the main focus of the integration has been on meeting the requirements as specified in CPUC's supplemental ruling Appendix C.[7] About half the stakeholders at SCE believed the UAT had met CPUC requirements in these ways:

- The tool meets requirements for standardization by providing energy usage information using savings algorithms under DOE guidelines.
- The tool was initially launched (in 2011-2012) using proxy data for energy consumption estimates. In early 2013, a new feature was added allowing customers to link the tool to their monthly billing data for analysis.
- The tool is simple to use and available online to all SCE customers.
- The tool includes information and website links to SCE's other programs such as demand response, solar, and energy efficiency.

[7] Assigned Commissioner's and Administrative Law Judge's Ruling Requiring Supplemental Filings October 2008, Appendix C (of D.09-09-047, Section 5.9.2). The ruling specifies characteristics of the enhanced energy audit tool.

- The tool provides information about SCE's solar program, and includes a link to the CSI calculator and other solar information.

SCE stakeholders reported that, over the past year, SCE has begun expanding the regulatory definition of UAT integration to include internal business goals, which would make the tool even more customer service oriented and user friendly. As described by stakeholders, incorporating business requirements into the audit tool would enable SCE to focus on new and innovative strategies for customer engagement through social media, rewards, or behavioral interventions.

Stakeholder Perceptions about UAT Goals

Cadmus asked stakeholders at SCE to describe UAT's integration goals, both within the group in which they work, and organization wide. Although the goals varied by SCE service area, stakeholders focused on a few common themes such as customer engagement, user friendliness, centralization of information, and cost-effectiveness. Table 2 lists reported stakeholder goals, grouped by common themes.

Table 2. UAT Integration Goals

Common Themes	Stakeholder Reported Goals
Improve customer engagement and satisfaction	Provide a tool for self-service, and enhance the customer experience from end to end.
	Provide a starting point and helper to improve customer-company relationship.
	Change SCE's focus from business-oriented to customer-centric.
	Provide customers with a means for continuous engagement with SCE.
	Provide an intelligent tool that knows customers' historical participation in SCE programs.
	Provide a diagnostic tool for conducting a gap analysis of the home, and lead generation for SCE follow-up.
Improve user friendliness through streamlined online tool	Provide a one-stop shop for customers to learn how to save money, decide in which programs to enroll, learn about ROI, and get recommendations.
	Provide a seamless and easy-to-use online tool.
	Make use of customer-specific utility data showing different aspects about customers beyond just demographics.
	Provide information about energy efficiency, distributed generation, and demand response in one place.
	Reduce website links, enrollment requirements, and paperwork.
Increase cost effectiveness	Provide a cost-effective way to get information to customers through a single tool or link.
	Integrate all tools into one, to decrease costs.
	Provide a tool for customers to learn about and apply energy efficiency in their home, and avoid waste created by installing oversized solar.
Engage customers in behavioral changes	Engage more than 5% of customers in behavior-modification savings.
	Provide a mode for consumer behavior modifications.

Challenges and Solutions for Meeting Goals

The SCE stakeholders believed the goals for the UAT are realistic, but not achievable in the short term. Many reported SCE lacked a common agreement on the company-wide objectives for UAT integration. SCE has multiple engagement tools in its various service areas, either currently in use or in development. This has resulted in multiple independent goals and perspectives for how the UAT tool should be integrated into SCE's organization.

Many stakeholders emphasized the importance of reaching agreement to meet the UAT goals. One stakeholder said, "We need to get everyone on the same page." Other common themes emerged, including the following:

- One entity within SCE should be responsible for the tool's maintenance and updates.
- Reaching out to third parties (such as the tool's vendor) is an important step.
- The tool should be aligned with the organization's vision.
- SCE will need to fundamentally shift its method of product delivery to address security concerns within its vertical organization. Its current approach poses challenges for delivering products to the market.
- The UAT should be an umbrella for the group of customer engagement tools.
- The tool should be viewed as one that is evolving (rather than static) and continually being updated and advanced.
- The tool should showcase SCE programs and should mirror the direction of the company.
- Rewards are a necessary and innovative component needed to improve the customer experience and to motivate customers to come back.

SCE Customer Service Areas and Tools Affected by UAT Integration

SCE's previous strategy was to engage customers through different tools offering services for demand response, smart meter connection, rate and budget comparison, distributed generation, and energy efficiency. Consequently, a number of customer engagement tools have been or are still in development, and many are linked to SCE's website. One stakeholder thought there were as many as 40 different websites offering information or services for SCE customers.

During the SCE stakeholder interviews, we learned about these other customer engagement tools at SCE:

- *Budget assistant*. This is a tool that is currently available online that provides 12 months of interval data (from smart meters) to residential customers showing usage comparison for the same month over a three-year period. The tool provides a report showing customer energy usage and pricing. The tool also provides demand alerts for small-business customers.

- *Rate analyzer*. This tool is under development to provide SCE's business group with dynamic pricing options to customers. The tool uses customer billing data and shows pricing differences between current rates and dynamic pricing.
- *Central data warehouse*. The marketing team is developing a central repository for customer data that will enable communication to different service areas.
- *BARE wizard*. This tool is under development to help customers solve issues such as high bills. The tool can be used by SCE representatives to walk the customer through the steps for reducing their bills through a lifestyle change, reducing energy use, and recommending efficient equipment options.

Some stakeholders believed the UAT could be enhanced (to meet CPUC requirements) simply by providing website links to SCE's various energy-efficiency, demand response, and distributed generation programs. Others discussed the possibility of combining all the engagement tools into one, with access to customer smart-meter data. However, there was no consensus about which tool should provide the central platform. The majority of SCE staff was unaware how the UAT integration would affect separate customer engagement tools in their service area.

Barriers Preventing UAT Integration

Stakeholder perspectives about barriers affecting the tool's integration efforts varied. Those indirectly involved in the tool's development were least aware of any barriers to integration. However, those involved in regulatory compliance, vendor solicitation, product development, information technology, and data integration reported several barriers. Views varied on the feasibility or desirability of fully integrating and linking UAT with other SCE tools:

- Instead of a single point of entry, numerous links and sign-ins are required. Some stakeholders noted that not having a single sign-in for enrollment to SCE programs makes them more complicated and time consuming, and reduces customer participation.
- Currently, the tool is not linked to SCE's main *My Account* website. To access HEA, customers are routed to an additional website, which adds another step and reduces accessibility.
- SCE's marketing team may be hesitant to promote a service that takes customers away from the *My Account* website.

The majority of stakeholders reported that coordinating with the many DSM service areas and linking the various customer engagement tools presents the biggest barrier to UAT integration. Stakeholders did not think SCE has well-established internal policies to govern the integration of the various engagement tools in a consistent way.

Many of SCE's programs and service areas have different funding vehicles, timing, and reporting cycles. Although management did not believe this was a major impediment, they emphasized the importance of coordinating with SCE program managers in multiple service areas. While the UAT integration requires long-term planning with consistent and sustained sources of funding, most SCE programs have

two-year funding cycles. These programs may also have different customer eligibility requirements that present additional challenges for coordination.

Many stakeholders reported obstacles and delays to data integration posed by SCE's interpretation of CPUC's Rule 25 (regarding privacy and security protection of customer usage data). Initial plans for SCE's UAT integration called for linking the tool to real-time data (provided by smart meters). However, SCE's policy is to minimize customer data provided to vendors. Stakeholders reported that linkage would require providing the vendor with a continual data feed from smart meters, and housing the tool behind SCE's security firewall; however, SCE has not granted legal permissions to the UAT's vendor to enable this continual data feed. Currently, customers can choose to link their audit tool account to monthly billing data (which requires only a single data transfer to the vendor once a month).

A few stakeholders noted the tool's integration could be accomplished with the use of proxy data, or linking to monthly billing data. However, more than half the stakeholders believed limiting data to proxy or monthly data reduced effectiveness of the tool.

What is Needed for Wide-Scale Integration

Some stakeholders said it was important to keep in mind that the tool is intended for customers, and not for internal use. Therefore, they thought decisions regarding the UAT integration should be governed by policies established by SCE's senior management rather than at the operational level. Although stakeholders noted it is important for each of the subject experts to develop an integration plan within their service areas, SCE policies would help to steer internal priorities toward optimizing the customer experience. Stakeholders also believed that the tool's core development team should hold regular meetings and communicate decisions and updates about the integration process to other organizations.

We asked stakeholders how they suggested handling any disagreements over the UAT integration prioritization. Most agreed SCE should use the process that is currently in place for handling disagreements. If needed, a few stakeholders suggested that the tool's sponsor should make the final call.

Stakeholder Advice

We asked stakeholders if they had additional advice for improving the UAT integration process. Although some of the advice has already been voiced above, stakeholder suggestions for improvements are distilled below:

- Provide a consistent vision for the UAT integration across management.
- Clarify definition of integration and implementation. All parties involved should be informed about the steps of the implementation process early on and how different groups should become involved. Clarify the type of resources available for the UAT integration process.
- Ensure that SCE's senior management is in agreement about the expected integration process outcomes.

- Continue the current trajectory of breaking down silos to make integration possible.
- Ensure that the tool is user-friendly (identified through testing). If the tool is not simple enough for SCE staff and managers to understand, it may be difficult for customers to understand.
- Develop the tool for customers, not for the regulator.
- Ensure that SCE identifies target groups, and that resources are adequate to promote participation.
- Develop a customer "journey map" diagram illustrating the steps customers go through while engaging with SCE and the online audit tool. The diagram would also describe the elements needed for the customer to have a good HEA experience.
- Measure customer actions and reactions to the tool. Make sure experience delivered through this tool is consistent with all other customer digital experiences with SCE.
- Clearly define a path for phasing in the tool using a flow chart or road map. The road map would organize the goals and requirements of the tool, and identify steps and expectations for launching each task and deliverable.
- Take a cost-effective approach to the tool's integration, and provide cost-effective guidelines.

HEA Overview and Comparison with HEES

This chapter presents findings from comparing SCE's HEA online audit tool, developed by C3, with the HEES audit tool, RECAP, developed by DNV-GL (formerly KEMA). RECAP is still administered through HEES audits, except those conducted online, where it has been replaced by HEA.

Cadmus conducted the comparison in response to SCE's request to identify potential improvements for the HEA tool's modeling algorithms based on a comparison to HEES. SCE's initial purpose was to examine in detail the calculations that each tool performed, and determine and compare their accuracy as the basis for assessing their validity. The initial objectives of this review and comparison were:

- Review, compare, and assess the calculation algorithms in each tool
- Contrast the functionality of both tools' interface and analysis outputs
- Highlight effective and ineffective functionality aspects of both tools
- Provide recommendations for future HEA tool implementation.

The sections in this chapter present the following information:

- Brief description of the HEA and HEES calculation tools
- Initial goals, study methodology, approach, and findings
- Revised study methodology, approach, and findings
- Summary of findings

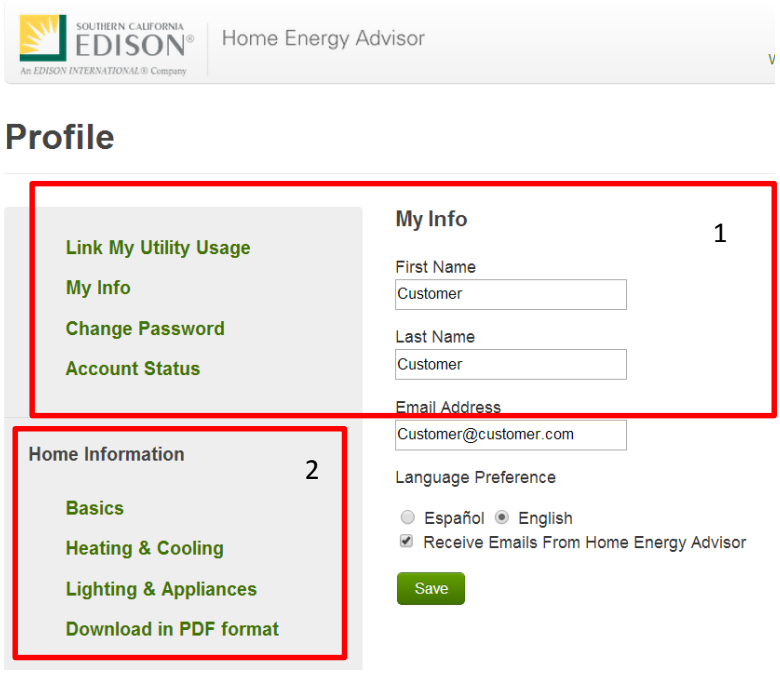
Although HEES is no longer implemented online, Cadmus obtained access to the online version and was able to conduct the review and comparison with HEA.

Description of HEA and HEES Interface

HEA

HEA is designed to provide residential customers of energy utilities with information about ways to conserve energy, save money, and help protect the environment. The user experience begins in the *Profile* section of the tool. This section is divided into two parts as highlighted in Figure 1.

Figure 1. HEA Profile Screen



The first part of this section displays basic user information, which includes account status, password, contact information, and an option to link users' utility usage for a more personalized user experience. The second part of the *Profile* section is titled *Home Information*. In the *Home Information* section, the user can provide information about the home's characteristics and occupancy, which the tool integrates with the energy savings and energy end-use distribution calculations. The *Home Information* section collects the information shown in Table 3.

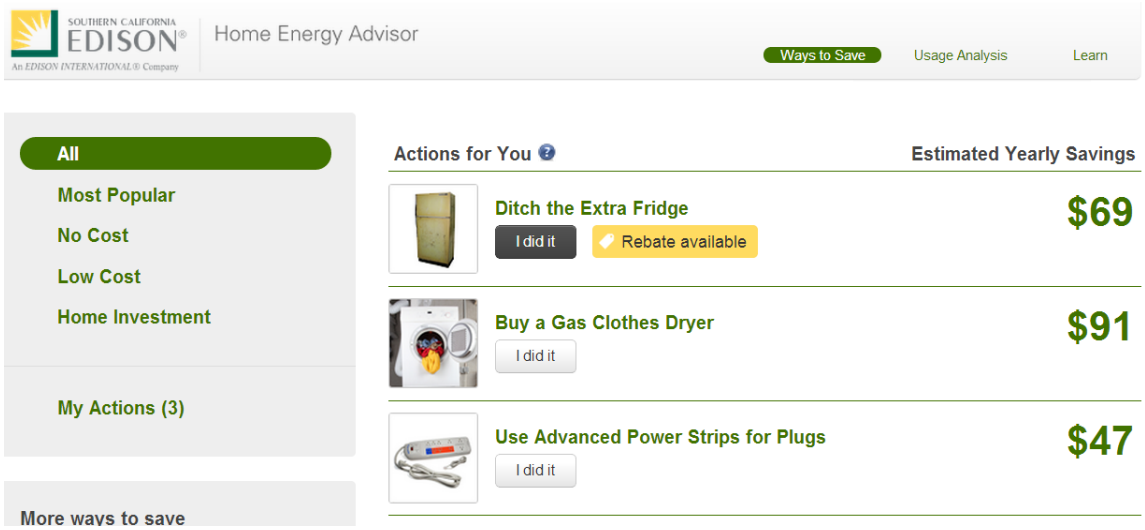
Table 3. Home Information Collected

Basics	Heating and Cooling	Lighting and Appliances
Number of residents Number of rooms Square footage Building type Exterior wall surface Year built Household income	Heating fuel type Heating equipment age Temperature settings Cooling equipment Water heater fuel and size	Number of lights used and duration Outdoor lighting use Presence of various appliances Clothes washer temperature setting Clothes dryer fuel type Pool heater fuel type Cooking fuel type Number of refrigerators and age Number of televisions

The HEA tool has three primary components, as shown at the top right of Figure 2:

1. Ways to save
2. Usage analysis
3. Informative tips under the tab *Learn*.

Figure 2. Ways to Save Screen

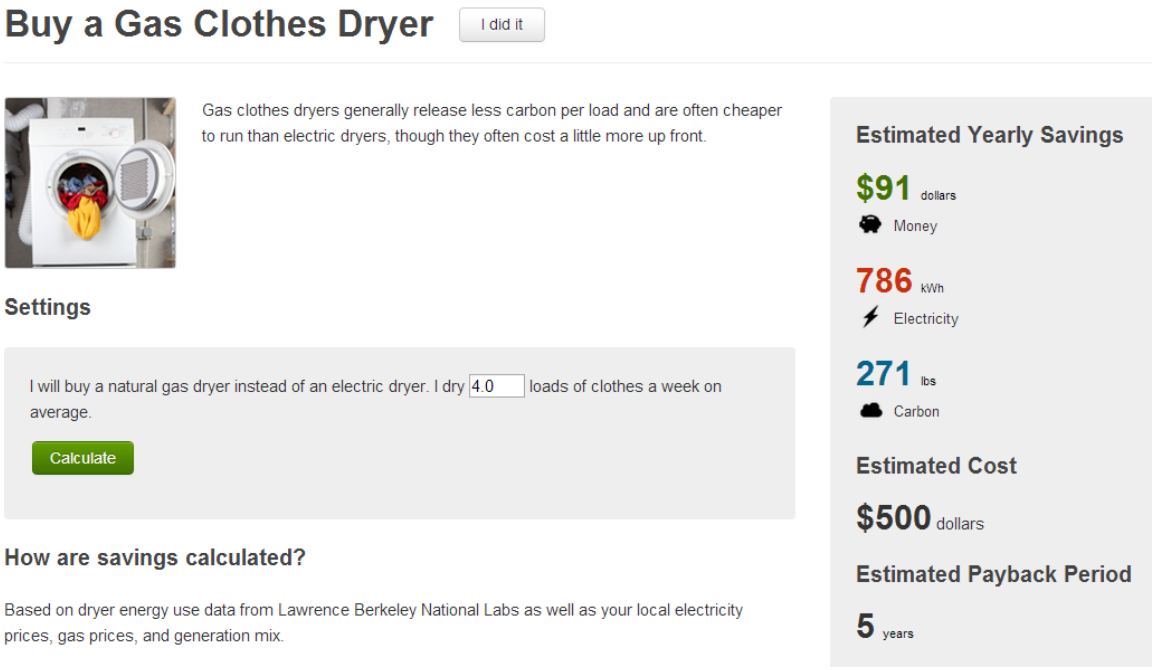


Ways to Save

Ways to Save displays a list of energy-efficient measure suggestions (Figure 2). Suggested measures are organized into one of three categories: no cost, low cost, and home improvement.

Each measure links to a page that provides a description of the action and a calculator that generates estimated monetary, carbon, and energy savings associated with the implementation of that particular action in the home. Estimates are generated using individual savings equations that factor in multiple inputs including billing data, home profile information, and baseline assumptions regarding that particular action. Figure 3. shows an example for the measure *buy a gas clothes dryer*.

Figure 3. Detailed Measure Information for Gas Clothes Dryer

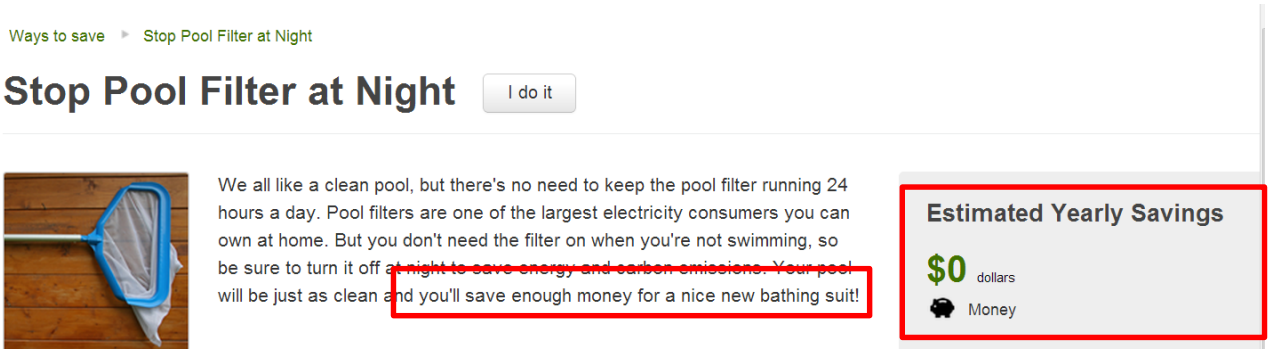


In addition to being able to calculate and view individual measure savings, the user can view a combined total of annual savings from all actions by clicking the *I did it* button and viewing the *My Actions* tab (Figure 2). Any rebates available for completing a specific measure action will be displayed next to the corresponding *I did it* or *I do it* button.

Upon closer inspection of a few recommendations, we noticed some inconsistencies in results. We also found areas that require further customer input to determine how pages can best communicate with customers and encourage them to act. Examples of each of these issues are described below.

- Some parts of the detailed measure pages conflict with each other. Figure 4 shows one example in which we found the description claiming a nonzero dollar savings, while the estimated yearly savings showed $0.

Figure 4. Pool Filter Recommendation

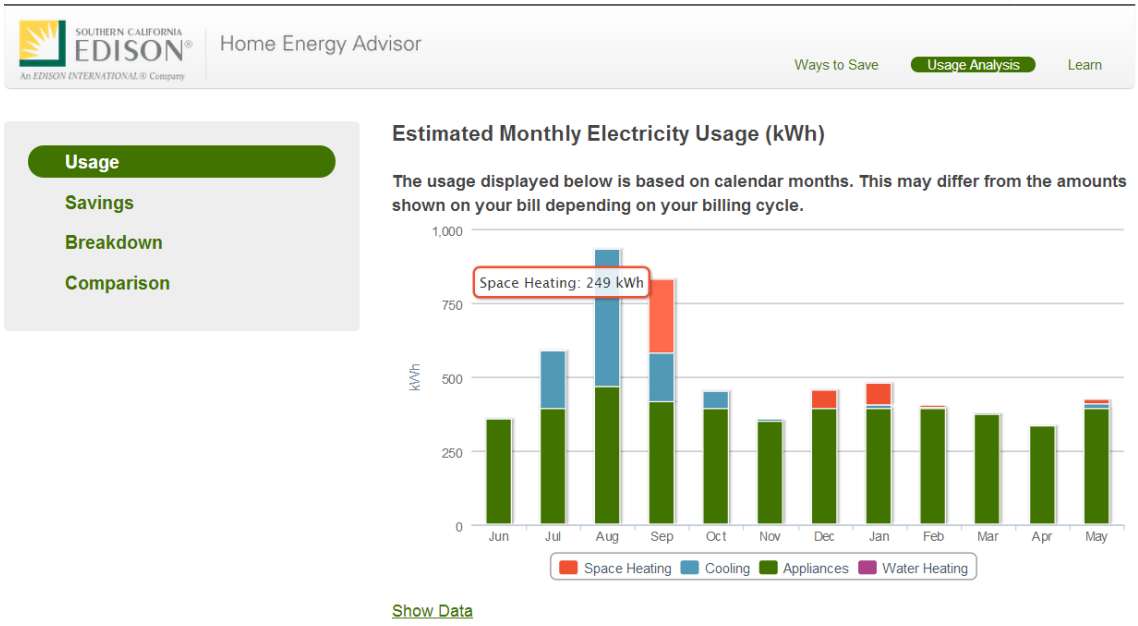


- Information about rebates and SCE programs are appropriately linked, but for home-improvement recommendations, such as installing an efficient ceiling fan, the tool does not provide enough information for customers to take the next step. The ceiling fan recommendation does not mention how to tell if a ceiling fan is efficient (for example, there is no mention of ENERGY STAR® specifications).

Usage Analysis

The *Usage Analysis* screen provides access to four categories of analysis to the user: usage, savings, breakdown, and comparison. An example of this screen for a test account is shown in Figure 5.

Figure 5. Usage Analysis Screen



The first category, *Usage*, provides a bar graph with estimated kWh used per month for the previous year's billing period. A numerical data table with the same information is also available by clicking *Show Data* at the bottom of the screen. Each month (bar) is divided into several colors, with each color indicating a category of energy distribution: space heating, cooling, appliances, and water heating. Appliance energy use is not broken down by specific appliance.

The *Savings* tab presents a double bar graph that illustrates monthly savings estimated for two different years. The first bar of each month represents savings estimates for the current year, and the second bar represents savings data for the same month during the previous year for comparison. An optional numerical graph displaying the same information is available for the user to view as well.

The *Breakdown* tab presents a pie chart illustrating estimated total energy use (kWh) for the previous billing period, distributed into the same categories shown in Figure 5.

Using percentages, the *Comparison* tab compares the user's energy usage (kWh) with neighbors' usage and with the average American household's usage.

Learn

The *Learn* tab provides short descriptions of the benefits of energy-efficient equipment and information about improving energy efficiency at home. It also provides a link to a customer energy reference that discusses five major energy end-uses: space heating, water heating, cooling, lighting, and large appliances. The energy reference briefly describes the end-use's typical energy consumption, related energy efficient products, and some tips on how to use less energy.

HEES Tool

HEES uses the RECAP home auditing tool designed by DNV-GL with the purpose of providing energy saving tips and energy usage analysis to utility customers[8]. Cadmus obtained access to it for purposes of examining its features and comparing it to HEA. HEES uses a comprehensive survey feature that requests a substantial amount of information from the user for the purposes of integrating survey data into model calculations and for access in a marketing database, as illustrated in Figure 6.

The survey requires customer home profile information in the following areas:

- Your Home and Lifestyle
- Laundry
- Heating
- Refrigerators
- Cooling
- Stand-Alone Freezers
- Water Heater
- Food Preparation
- Other Appliances
- Spas, Hot Tubs, and Pools
- Water Usage
- Lawn and Garden
- Lighting
- Optional (section asks for house income)

HEES uses a building simulation model that factors in billing history data, regional weather data, customized engineering set-up data, and customer survey data to provide detailed reports for electricity, natural gas, and water. It also provides energy-saving tips and a comparison of how the customer compares to others.

The *Electric Charts* section provides two bar graphs displaying an annual trend of electricity cost and electricity usage. In addition, this section provides the user with a graph illustrating an estimated cost of electricity for each major appliance annually and provides the percentage of each appliance's electricity cost divided by the total.

The second and third sections, *Natural Gas Charts* and *Water Charts,* provide annual cost and usage broken down monthly, as well as an estimated breakdown of appliance use.

[8] This tool is not currently available to SCE customers, but Cadmus was provided access by DNV GL for purposes of conducting the comparison presented here.

The *How Do You Compare* section of the report presents a graph comparing the user's previous year's total usage of electricity and gas measured in kWh and therms compared to a neighbor.

The last section of the report, *Savings Tips,* provides the customer with suggested energy-saving measures. This section provides two lists. The first list includes tips that offer annual savings estimates; the second list provides information regarding actions done and more suggested actions. Savings estimates are presented to the user as a range of lowest and highest expected savings.

Initial Study Methodology and Findings

To fulfill the study objectives, Cadmus originally planned to assess and identify potential improvements to the HEA residential tool's modeling algorithms by comparing the calculations implemented in SCE's HEA with those in HEES.

Our intent was to compare measure savings estimates generated from equations used in each tool's model. Our planned methodology for comparing savings estimates was to compare the calculation procedure used by each tool for specific energy-efficiency measures and vary the tool inputs and examine how the variations affected the calculations and outputs from each tool. We sought to compare each tool's measure savings using an identical sample set of SCE customer billing data and varied parameter levels. This design would entail running multiple simulations of each measure to generate savings, with varying parameter levels for each simulation, with the objective to compare each tool's response. Our initial research questions included:

- How do HEA results compare to those of HEES, for a range of home types and characteristics?
- How can differences be explained?
- How can differences be reconciled?

A condensed outline to the approach of this methodology included the following steps:

1. Analyze technical documents from DNV-GL (HEES) and C3 (HEA) to determine what energy-efficiency measures the tools have in common and how energy calculations are performed.
    a. Make the testing process more manageable by selecting a total of 10 measures to test based on highest levels of savings and popularity of customer interaction.
2. Define parameters for savings equations that are likely to have the highest effect on savings and determine appropriate levels for testing.
3. Determine the best method for calculation
    a. Use each application online if possible or use the savings equations embedded in each to devise a calculator to produce the same estimates each online tool does.
4. Calculate savings for common measures chosen in HEES and HEA for each customer using varied parameters.
5. Analyze data for discrepancies between HEA and HEES outputs.

6. Investigate discrepancies and expand the analysis to determine causal relations or correlations between varying parameter levels and differences in each tool's calculation models, which would account for the differences in outputs.
    a. Compare both tools' calculation models to standard engineering equations as a reference.

Initial Findings

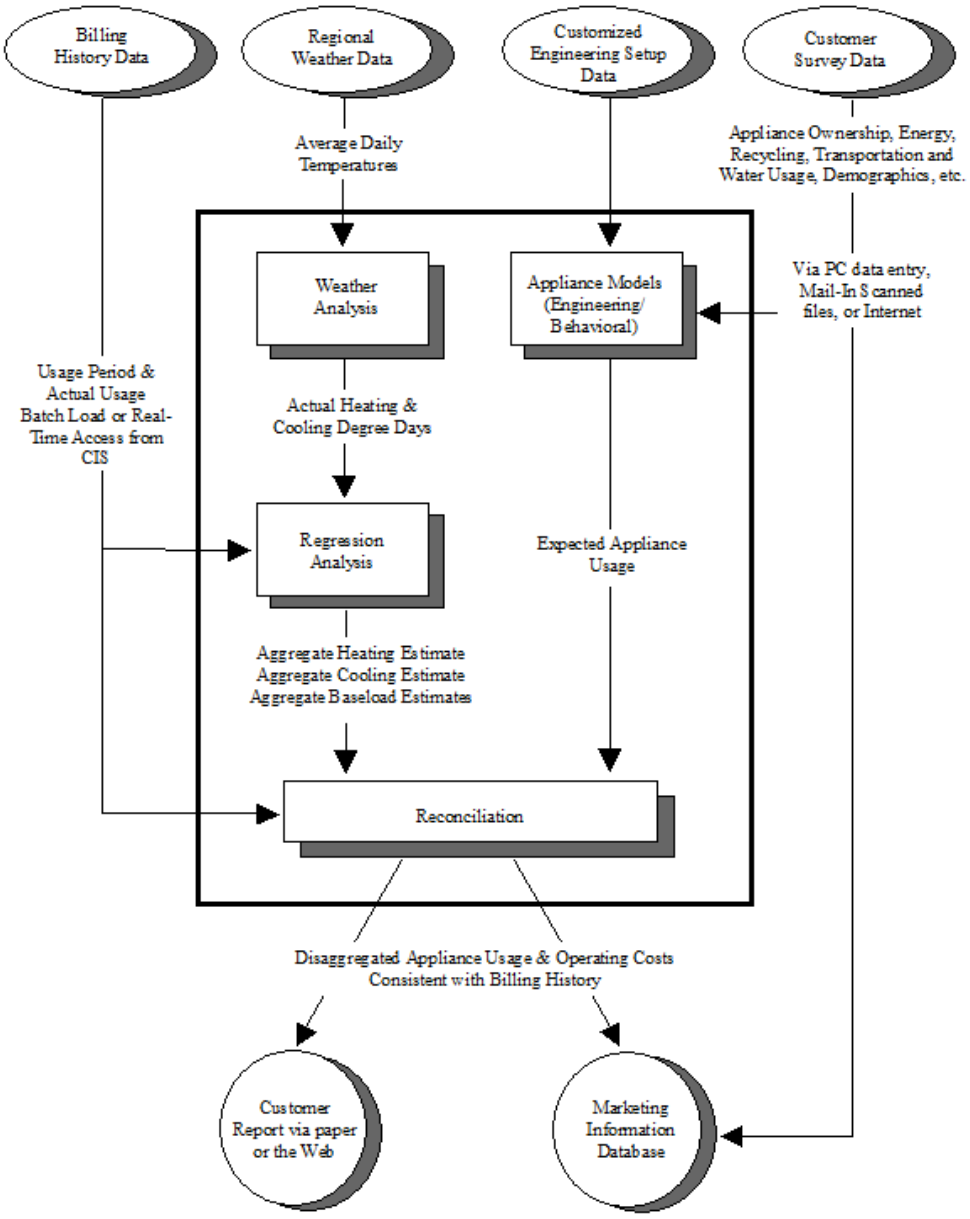
We began at step 1, with a review of technical documents received from C3 and DNV-GL to determine how each tool calculated energy savings and identify which energy-efficient measures both tools had in common. We expected each document to contain a master list of energy-efficient measures as well as corresponding savings equations for each measure listed.

The document provided by C3 did contain equations for 77 measures such as "no pool heat," "lower thermostat," and "heat pump water heater." The equations were engineering algorithms that used customer profile inputs, billing data, and default values. Although the equations generally appeared to be reasonable, HEA limited the inputs the user had to provide to the degree that most equations would use default values for some key variables instead of customer-specific values. This would result in energy savings calculations that might be accurate on the average, but not very accurate for each customer.

The document that DNV-GL provided contained a list of measure actions, but no equations. Upon request for additional information, DNV-GL provided us the diagram in Figure 6, which shows the overall flow of the modeling process. DNV-GL staff informed us of three characteristics regarding the functionality of the RECAP analysis embedded in HEES that impeded our ability to proceed with the initial goal of comparing individual calculations in the two tools and assessing potential improvements to HEA by means of comparing savings equations:

1. The complexity of HEES' calculation process makes it infeasible to manually calculate savings.
2. HEES does not have an application for calculating individual measure savings.
3. HEES offers a limited and targeted set of energy-efficient measure suggestions to the customer based on the user survey and billing data. Customers cannot view a large list of measure recommendations.

Figure 6. Overview of HEES RECAP Analysis Process



Revised Methodology

From our review of the information provided about the two online tools, we determined that is was not possible to view or compare calculation procedures for individual measures because they were not available for HEES. Consequently, we decided to pursue a more indirect approach by examining how the outputs from the two tools varied when we changed the home and user profile, keeping the inputs provided to the two tools as consistent as possible. Because each tool used actual billing data (if the user

chose to) in its analysis, our ability to examine the effects of varying inputs was limited by the fact that the tools were constrained to match the billing data. For example, if we wanted to examine the effect of house size on end-use energy consumption, doubling the house floor area (while matching observed billing data) might lead to the tool generating meaningless results or no results at all. As a result, we anticipated that we could not explore how the tools responded to very large changes in consumer inputs.

Because of these limitations on how well we could compare the energy savings aspects of the tools, we focused much of this research on comparing other aspects of the functionality and use of the tools to provide SCE with helpful feedback that could inform future HEA tool implementation.

Cadmus chose to evaluate and compare both tools' user interface and home energy distribution graphs to provide findings about the usability and effectiveness of each tool. We explored and compared the energy calculations of the tools indirectly by varying a limited set of inputs and comparing the HEA and HEES outputs. We conducted the following steps:

1. Evaluate each tool's user interface by:
    a. Examining each tool's layout (the way information is presented) and procedural steps the user must take to interact with the tool.
    a. Investigating the amount and types of educational opportunities available in each tool.
2. Compare usage analysis graphs based on how both tools react to varying scenarios. This approach provided findings on how both tools' estimated energy use compared for a base case and how it fluctuated when we varied specific home characteristics. Given the differences between the tools and the commonalities between them, the characteristics we chose to vary were:
    a. Home vintage
    b. Home square footage
    c. Age of main heating system
    d. Quantity of refrigerators.

For each of four users, Cadmus conducted a total of 10 simulations, five for each tool. The first simulation for each user in each tool started with no alteration to home specifications and served as a base case reference to identify how results were affected by variation in the inputs. Each simulation was designed to assess the impact that each aspect of the home profile had on each tool's output; thus, original inputs had to be restored between each run. Our methodology for the simulation process was as follows:

1. Select four SCE customers with a range of home types and billing data.
2. Verify that home profile inputs and billing data are equal and otherwise comparable between both tools.

a. Home profile information is integrated into HEES via the survey feature of the tool and HEA via the *Home Information* section.

3. Define parameter levels for each user regarding our selected home profile characteristics that will be varied.
4. Simulate home energy analysis estimates for each customer in both tools using original inputs.
5. Conduct simulations, varying parameter levels equally or otherwise comparably across both tools.
   a. Some input options in HEES and HEA differ in that one tool might ask for a specific input and the other might ask for a range. For example, HEES has an input field for *age of heating equipment* in five-year ranges, whereas HEA requires a specific numerical age input.
6. Observe the distribution of estimated energy use, comparing each new run to the original and comparing results between the tools.

Findings

User Interface

Cadmus reviewed both tools in terms of usability, use of visuals, and the variety and depth of results. We found that each tool had benefits and limitations to its design.

Table 4 displays our assessment of the benefits and limitations of the HEES tool.

Table 4. Cadmus' Assessment of HEES Tool

Benefit	Limitation
In-depth survey gives the user a detailed breakdown of energy usage	Takes a long time to complete the survey, which may bore or not engage the customer
Integrates gas and water usage into its survey and breakdown	No graphics or illustrations are included to catch the customer's eye; looks very much like a paper survey put into a webpage
Gives the customer the option of a PDF report of their results and recommendations	The customer can see only the recommended actions, not all the possible actions

While HEES provides the customer with a detailed breakdown of energy, water, and gas usage along with personalized recommendations, the time and thoroughness required to complete the survey could be a barrier to participation. HEES provides a useful downloadable file of results for the customer, but the number of recommendations is very limited and no information is presented on options to save energy that are not recommended by the tool.

Table 5 lists the benefits and limitations of the HEA tool.

Table 5. Cadmus Assessment of the HEA tool

Benefit	Limitation
Looks modern with many graphics and simple layout	Not detailed in results and breakdown of energy savings (at the end-use level instead of the equipment level)
Learning section is detailed and has links to articles and information about different equipment	Link to HEA is hard to find on the SCE website, as it is not a part of the SCE website itself, and many information sources are outside the HEA website
Savings calculator is built in and it updates as user chooses ways to save for real-time feedback	Customer can simply click the *I did it* button without further reading about the measure
Links to available rebates are paired with the ways to save	There is no summary page for the customer to easily navigate all the information

HEA, with its more visual presentation and multiple opportunities to educate and offer a wide variety of recommendations to customers, contrasts starkly with the HEES interface. However, the energy-use breakdown offered by HEA at the end-use category level is not as detailed as that provided by HEES, which shows annual usage at the equipment level. While HEA has multiple places for a customer to explore options and find more ways to save, it has no summary page displaying everything (actions taken, usage charts, and relevant education suggestions) in one easy-to-understand place. It simply defaults to the *Ways to Save* page, and customers have to click through to see the other sections individually rather than in a more interconnected fashion.

Illustrations of these facets of the tools and direct comparisons between the tools are presented next. In Figure 7, the *Ways to Save* page from HEA (on left) is compared to the summary and tips presented by the HEES tool (on right). HEA features more graphics, larger fonts, and SCE branding, while HEES is almost all in small text. HEES does have linked tips directly associated with the survey results, while HEA lists all possible actions anyone could take.

Figure 7. Presentation of Energy Tips and Potential Savings (HEA left, HEES right)

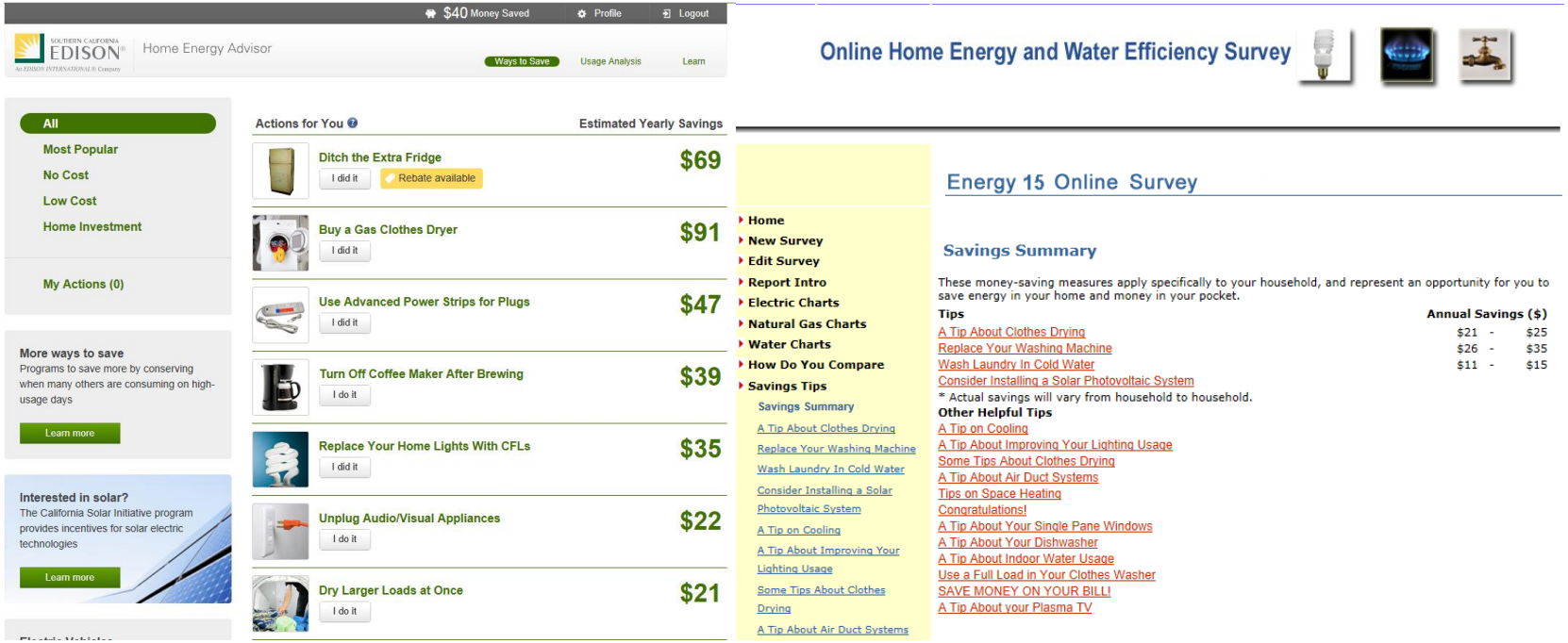


Figure 8 shows the different ways each tool disaggregates energy use. HEA uses a pie chart to break energy usage into three simple overall sections: appliances, space heating, and cooling. HEES uses a bar graph to show how much energy specific pieces of equipment use: air conditioning, refrigerators, laundry, etc. The HEES tool even shows what percentage of the total energy costs can be attributed to specific appliances.

Figure 8. Breakdown of Potential Energy Usage (HEA left, HEES right)

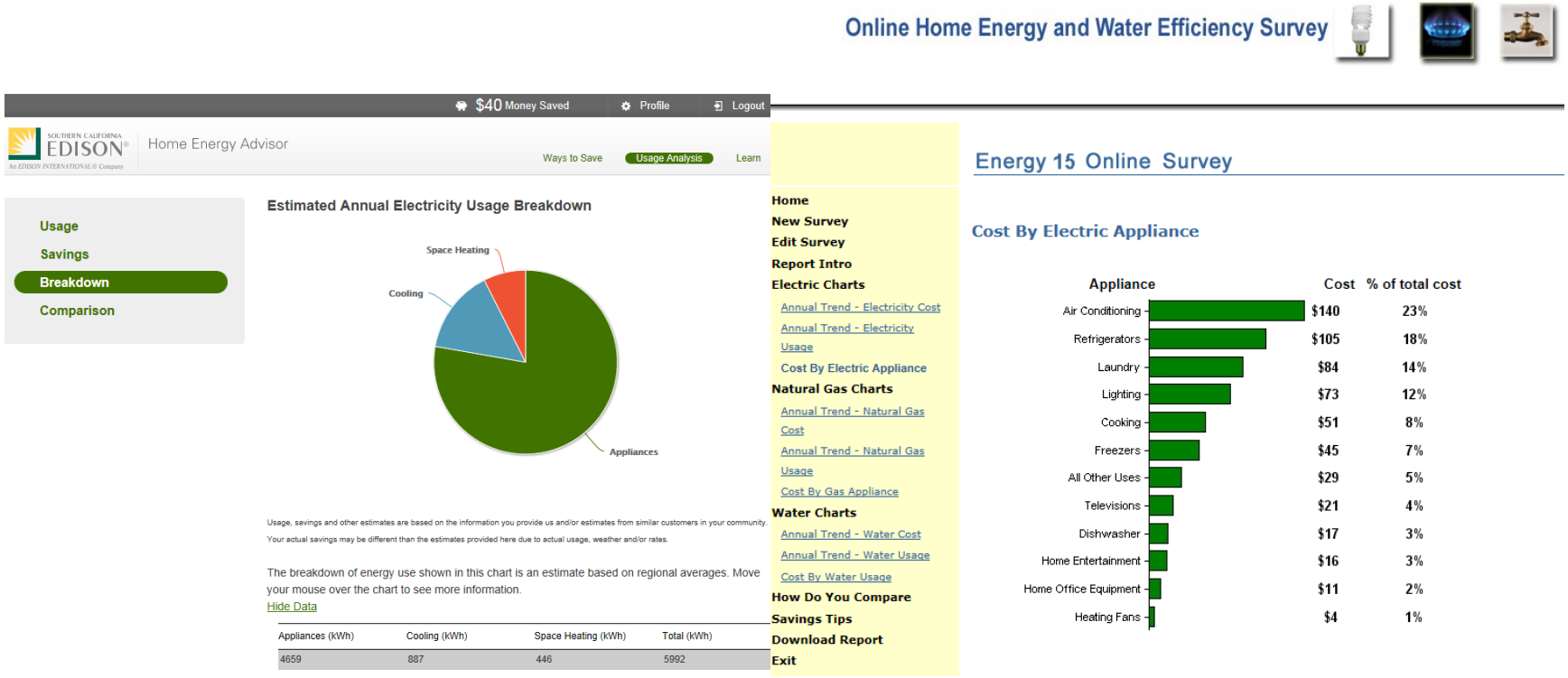


Figure 9 shows screenshots of pages where customers input more detailed information. The HEA tool has inputs for its *Ways to Save*, each with adjustments the customer can make to get more accurate savings estimates. The HEES tool has 16 pages (A through O and *Finish* along the yellow highlighted panel) that require customers to input data before they can see results or tips.

Figure 9. Detailed Inputs by Tool (HEA left, HEES right)

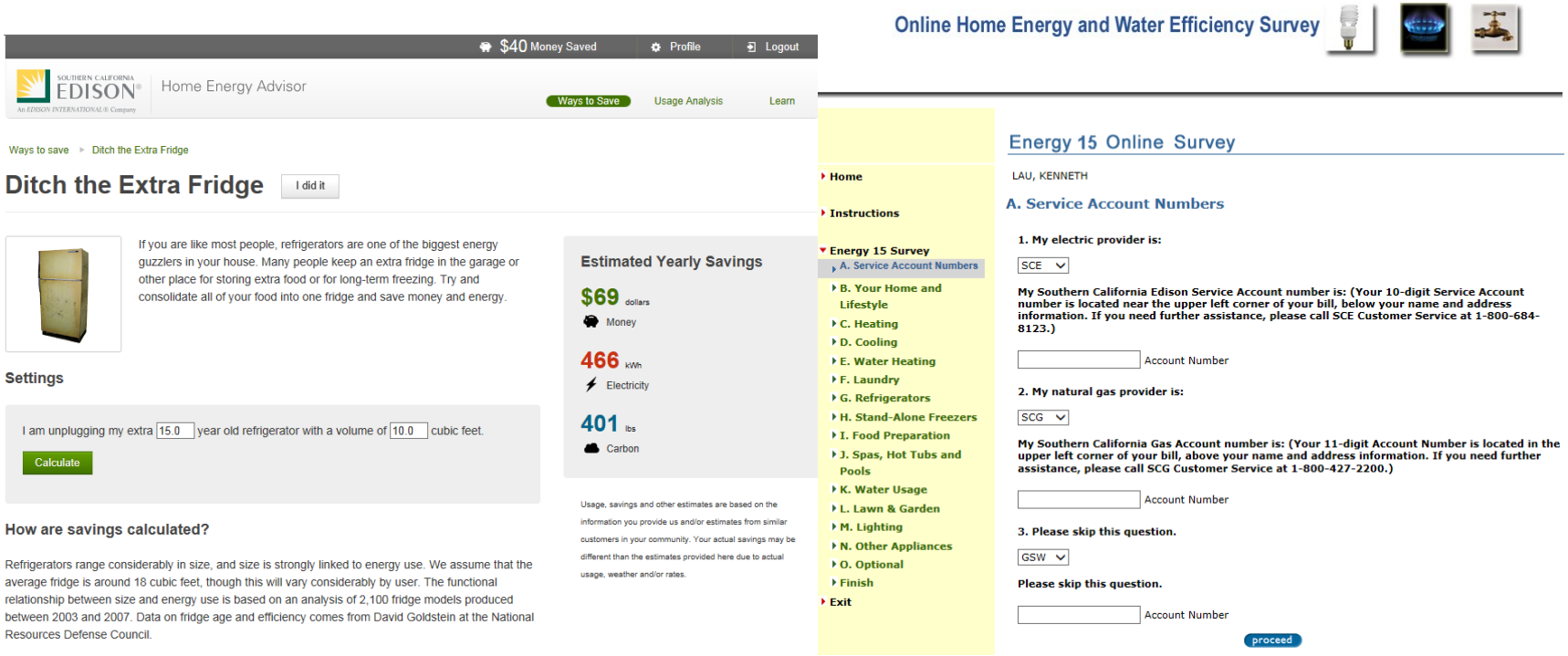
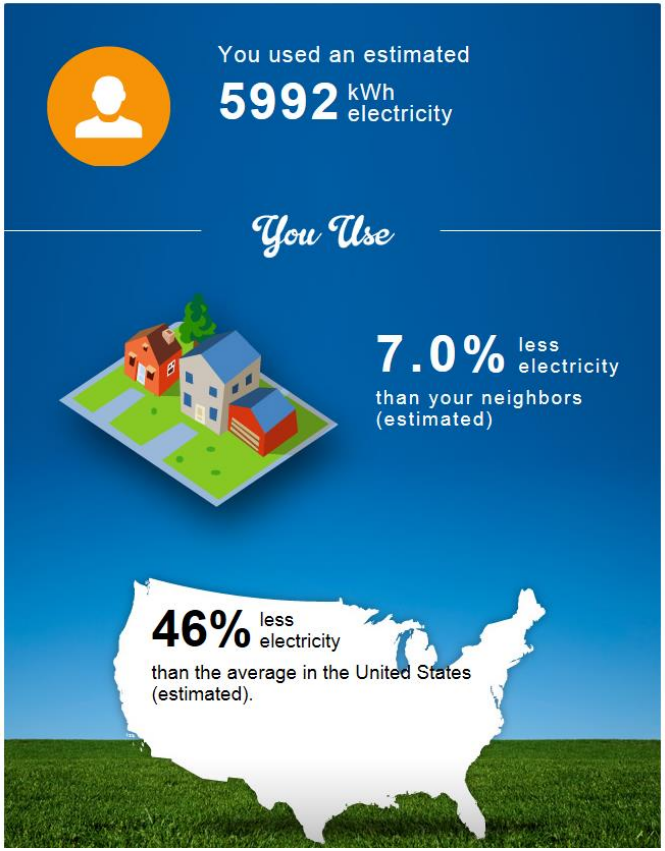
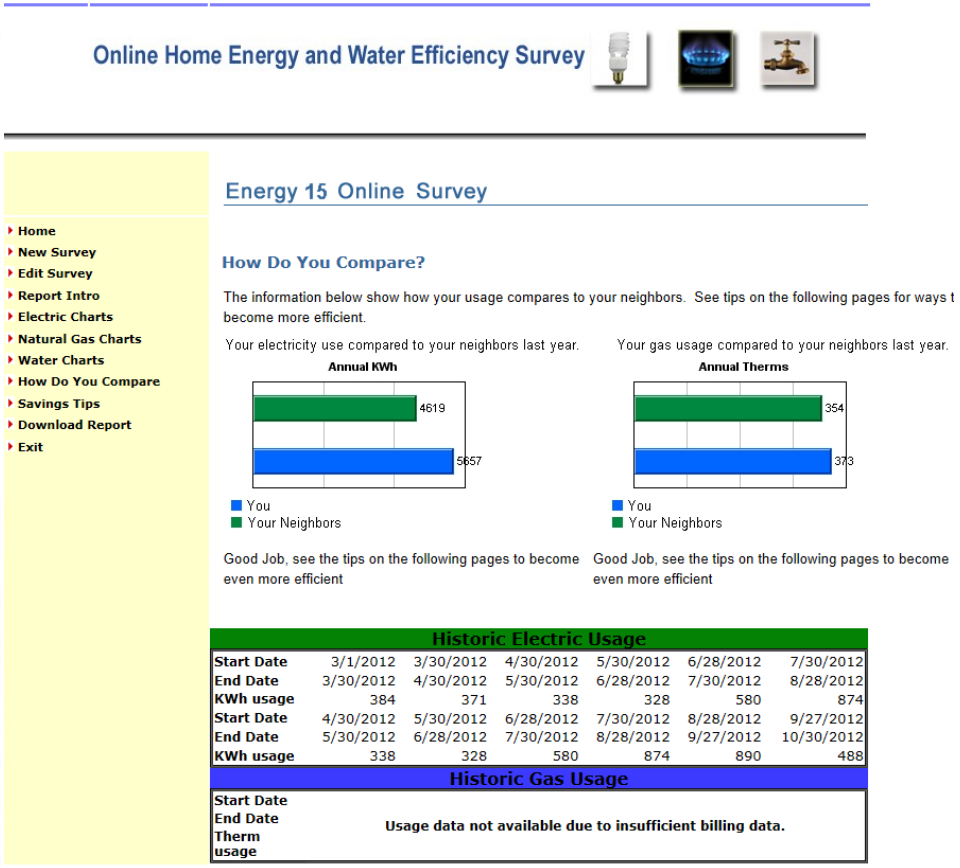


Figure 10 shows the energy-usage comparison pages from each tool. The HEA tool uses a large, simple graphic. HEES shows data tables and charts with detailed information.

Figure 10. Customer Comparison Charts (HEA left, HEES right)

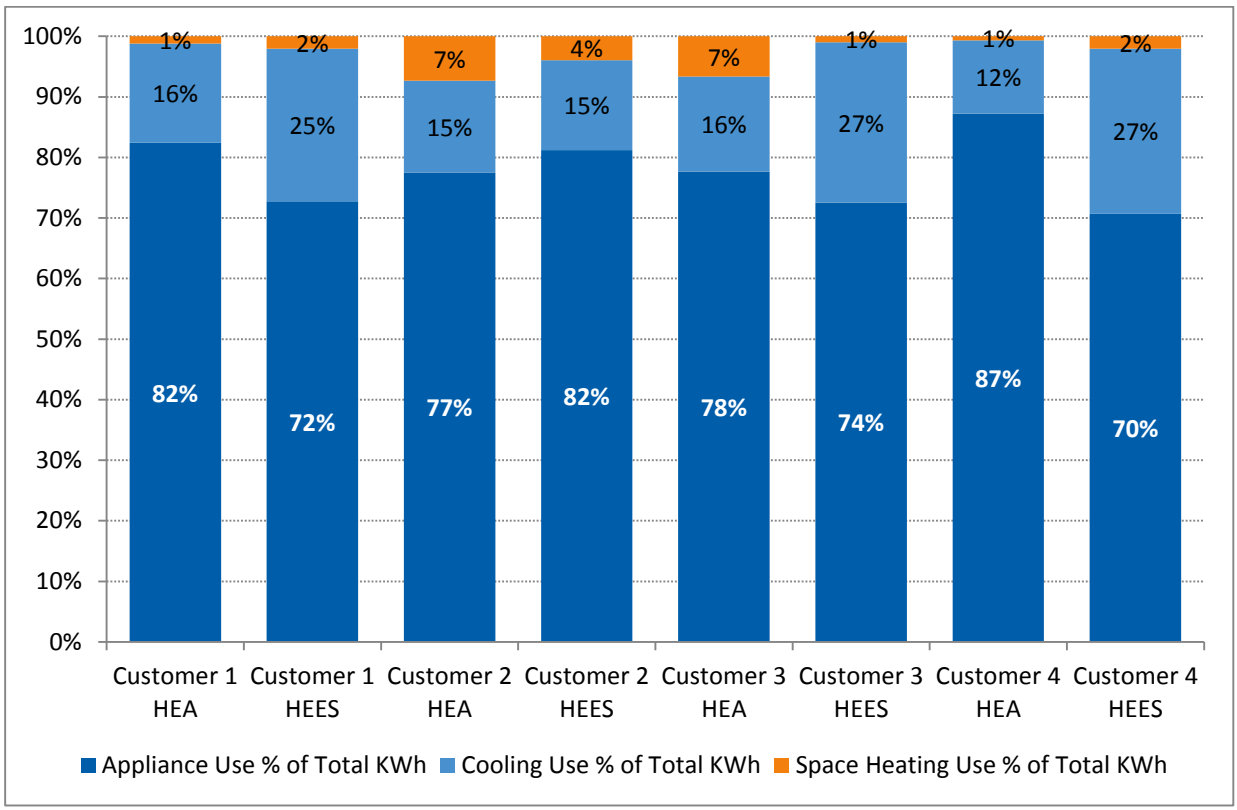




Consumption End-Use Graph Comparison

Cadmus selected four SCE customers for an energy usage comparison study. In the first run we conducted, we used the default inputs for each home. Because the two tools defined some key inputs in different ways (such as ranges vs. point values), the baseline conditions could not be matched exactly for all inputs. We set parameters in the tools to be as similar as possible. Figure 11 shows the outputs of the energy usage simulations by major end-use category for the four customers. These results are without alterations to any characteristics of the home.

Figure 11. First Customer Default Energy End-Use Usage Comparison



This analysis shows that the tools produced end-use distributions with some basic similarities, but little consistency in the way distributions varied from one house to another.[9] Both tools allocated the most energy use to appliances, followed by cooling, and then space heating. Except for the second customer, however, the results from the two tools showed marked differences in the energy end-use distributions. On average, the estimated share of energy used for cooling differed by nine percentage points. This difference was notable given that the estimated share of energy used for cooling varied between 12% and 27% of total home electricity use. In three of four cases, the estimate of cooling energy use percentage from HEES was nearly twice as large as the estimate from HEA.

[9] To compare the outputs, we aggregated the individual appliance estimates from HEES to provide a direct comparison to the total appliance output from HEA.

After completing the baseline runs, we defined four scenarios for each home by varying input parameters that could be adjusted consistently between the tools: home age, home size, heating equipment age, and quantity of refrigerators. To illustrate the types of changes made in the inputs and how consistency between the tools was limited by the options allowed for specifying the inputs, Table 6 lists the parameters selected for the different runs for customer 1.

Table 6.Values of Input Parameters for Customer 1 Runs

Input	HEES		HEA	
	Base case	Parametric Runs	Base case	Parametric Runs
Vintage	2002-2005	Before 1978	2000 or newer	Before 1940
Floor Area, sqft.	4001 to 5000	2001 to 2050	4500	2250
Age of Heating System	6-10 years	16-30 years	8 years	23 years
Number of Refrigerators	3	1	3	1

Table 7 through Table 10 show the parameters changed for each run and the resulting distribution of energy usage estimated by HEA and HEES. For customer 1 (Table 7), increasing the age of the home made little or no difference in the two tools' results. HEES results differed when home size was reduced with appliances representing a larger share of usage as would be expected, and both tools showed a smaller share of energy for appliance use when the number of refrigerators was decreased.[10] Contrary to expectations, HEA showed a slight increase in cooling energy share when the number of refrigerators decreased.

[10] Note that total energy use (kWh) was established from the customer's billing data and was not expected to vary across the runs. As noted, the billing data used by the two tools was from slightly different periods so the total kWh estimated differed between the results for the two tools.

Table 7.Full Results of Usage Scenarios for Customer 1

Run	Parameter Changes	Tool	Appliance Use Pct. of Total KWh	Cooling Use Pct. of Total KWh	Space Heating Use Pct. of Total KWh
1	None	HEA	82%	16%	1%
		HEES	72%	25%	2%
2	Increased Age of Home	HEA	No Change	No Change	No Change
		HEES	-1%	+3%	No Change
3	Reduced Total Square Footage of Home	HEA	No Change	No Change	No Change
		HEES	+6%	-4%	-1%
4	Increased Age of Heating System	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
5	Decreased Quantity of Refrigerators	HEA	-2%	+2%	No Change
		HEES	-2%	-3%	No Change

HEA results for Customer 2 (Table 8) varied little across the different scenarios, showing only a small increase in appliance energy use for the case in which the number of refrigerators increased. HEES results were most sensitive to house size, showing a significant increase in space heating and cooling use when house size increased. Again contrary to expectations, HEA showed a slight decrease in the cooling energy use share when the number of refrigerators increased.

Table 8. Full Results of Usage Scenarios for Customer 2

Run	Parameter Changes	Tool	Appliance Use Pct. of Total KWh	Cooling Use Pct. of Total KWh	Space Heating Use Pct. of Total KWh
1	None	HEA	77%	15%	7%
		HEES	82%	15%	4%
2	Decreased Age of Home	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
3	Increased Total Square Footage of Home	HEA	No Change	No Change	No Change
		HEES	-11%	+3%	+6%
4	Increased Age of Heating System	HEA	No Change	No Change	No Change
		HEES	-1%	No Change	No Change
5	Increased Quantity of Refrigerators	HEA	+2%	-2%	+1%
		HEES	-1%	No Change	No Change

For customer 3 (Table 9), the results did not vary for any scenario except in the case of increased refrigerators; however, neither tool showed an expected increase in the share of electricity used for appliances when the number of refrigerators increased.

Table 9. Full Results of Usage Scenarios for Customer 3

Run	Parameter Changes	Tool	Appliance Use Pct. of Total KWh	Cooling Use Pct. of Total KWh	Space Heating Use Pct. of Total KWh
1	None	HEA	78%	16%	7%
		HEES	74%	27%	1%
2	Increased Age of Home	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
3	Reduced Total Square Footage of Home	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
4	Increased Age of Heating System	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
5	Increased Quantity of Refrigerators	HEA	No Change	-1%	No Change
		HEES	No Change	-1%	No Change

Results for customer 4 (Table 10) showed a response pattern similar to that for customer 1. HEES results responded to the change in home size (in this case, the share of appliance usage increased as house size decreased). Both tools showed increased appliance usage when refrigerator quantities increased, but HEA showed an unexpected decrease in electricity share for cooling.

Table 10. Full Results of Usage Scenarios for Customer 4

Run	Parameter Changes	Tool	Appliance Use Pct. of Total KWh	Cooling Use Pct. of Total KWh	Space Heating Use Pct. of Total KWh
1	None	HEA	87%	12%	1%
		HEES	70%	27%	2%
2	Increased Age of Home	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
3	Reduced Total Square Footage of Home	HEA	No Change	No Change	No Change
		HEES	+4%	-2%	-1%
4	Reduced Age of Heating System	HEA	No Change	No Change	No Change
		HEES	No Change	No Change	No Change
5	Increased Quantity of Refrigerators	HEA	+3%	-2%	No Change
		HEES	+2%	+1%	No Change

Based on our runs comparing the annual usage distributions, HEES responded more sensitively when we varied home square footage, heating system age, and number of refrigerators. We found that the HEA tool did not show a change in energy distribution in response to input parameter changes except when we varied the quantity of refrigerators in the home. However, the changes that resulted in both tools for each category (space heating, cooling, and appliances) were very limited, and neither tool exceeded more than a 6% increase or decrease from its original estimate in each run. We note it is possible that while the

parameters we varied (namely those that were common to both tools) may not have resulted in any large changes, this does not mean that the tools are not sensitive to other parameters that we did not test.

Summary of Findings

Overall, our findings after comparing HEA and HEES indicate that the HEES tool's comprehensive survey feature provides the user with more detailed information because it is capable of producing a breakdown of individual appliance use estimates, as shown in Figure 8. The downside to the HEES tool is that the survey length may be a barrier to customer engagement.

One challenge to comparing the tools was the discrepancy between the options available for selecting inputs in specific categories. For example: *age of heating equipment* and *home square footage* are categories that require a numerical input in HEA, whereas HEES offers a choice of ranges. In this instance, we chose inputs for HEA that were within the ranges offered by HEES. Another example is *home vintage*, a category for which both tools offer input selections based on a range of years, but the ranges are not the same.

We found that the HEA energy distribution profile was not sensitive to the parameters we varied in this analysis. The effect varying these same parameters had on the HEES output was also not very significant, but was generally consistent with expectations. Although the scope of the sensitivity analysis we could conduct was limited by the restricted access to the tools and real data, the results suggest that SCE should require the future HEA vendor to demonstrate the validity of the tool's calculations.

HEA Usage Study and Customer Experience Assessment
Part 1: HEA Usage Analysis

Cadmus analyzed the HEA's online activity tracking logs to assess customers' level of engagement, including number of visits, and to understand what information is being tracked.

Research Objectives and Methodology

To begin the HEA data tracking analysis, Cadmus reviewed the website and program materials to understand functionality from a user's experience, and to assess changes and status of the tool's development. In addition to the website, we reviewed the following from SCE:

- HEA participant tracking database
- Previous HEES evaluation reports
- HEA project plans and checklists
- Presentation to CPUC on HEA
- Marketing tactics and participation forecasts.

Cadmus analyzed the HEA participant activity data (tracked in the online tool) to:

- Understand what data are tracked by the vendor
- Test the assumption that customers would have sufficient familiarity with HEA to provide detailed feedback
- Inform development of the HEA customer surveys and sampling methodology.

We looked at both the frequency of a customer's visits to the HEA website and the level of that customer's activity while using various features. We also compared the activity of customers who linked to their monthly billing account in HEA to those customers who used proxy billing data rather than their actual billing data.

Through our analysis of the data, we aimed to answer the following research questions:

- What types of data is HEA tracking?
- How often do customers use HEA?
- Has the tool compelled customers to come back to engage with HEA again?
- How many actions have customers recorded and viewed in HEA?
- How many customers have authorized billing integration?

HEA Data Tracking Analysis Results

How Data is Tracked in the Tool

As described earlier, customers can fill out a HEA profile of their home characteristics, such as house

size, types of lighting, and equipment used for heating and cooling. In the profile section, customers can link to their utility usage or remain as proxy data users. Once customers have completed their profile, they can record their energy-saving activities by clicking on the individual actions in the *Ways to Save* section of the website. The actions listed in the *Ways to Save* section are categorized as one of the following: no-cost, low-cost, and home investment. By clicking on the icons for each of these activities, customers can view energy-saving information (for example, savings attributed to lowering their thermostat).

Cadmus' analysis of the HEA data showed that the following information is being tracked in the *Profile* section about the characteristics of customer homes:

- Year the home was built
- Square footage of house
- Number of people in household
- Household income
- Fuel type used to heat the home
- Fuel type used to by the water heater
- Home cooling type.

When customers log into the *Ways to Save* section of HEA, the tool records the following behaviors:

- Actions that the customer claims to have done (by clicking on *I did it* or *I do it*).
- Actions that the customer views (by clicking on an action icon, such as replacing incandescent bulbs in home lights with CFLs).

The tool also keeps track of these data:

- Date customer created their HEA account
- Date the customer started using *Ways to Save*
- The last time the customer updated his or her actions in *Ways to Save*
- The last time the customer logged into the HEA website
- The number of times customers logged into the HEA website. (The number of times customers logged into the website may not be equal to the *Ways to Save* activity.)

Frequency of Use

Based upon an interview with the HEA's vendor, customers spend an average of six minutes on the site. We could not verify this figure through the available data. Our analysis of the database showed 6,730 users during the time period between December 15, 2012 (when it was officially launched) and the first week of September 2013 (the most recent records in the database file we received).

Our data analysis revealed the following insights about how customers are using HEA:

- The large majority (90%) of the customers using HEA (n = 6,730) recorded energy-saving actions in *Ways to Save* on only one day.

- Ten percent of customers returned to use HEA *Ways to Save* on a different day (n = 653).
- Approximately 64% (n = 4,311) of customers who used the HEA since December 15, 2012 chose to be linked to their actual billing account data.
- Of the customers who linked to their billing account data, 89% (n = 3,838) recorded actions in *Ways to Save* on only one day.

Cadmus compared customers who were using proxy data with those linked to their billing accounts for same day versus returning customers. As shown in Table 11, customers who were linked to their billing data were considerably more likely (11%) to return to HEA on a different day than those customers who used proxy data (7%). Customers linked to their billing data recorded, on average, twice as many completed actions compared to those using proxy data. They also viewed about 70% more actions (0.79 vs. 0.48), but the average number of actions viewed was small for both groups.

Table 11. Comparison of Customers Using HEA

Activity	Customers Using Proxy Data	Customers Linked to Billing Data
Customers Using HEA One Day	2,239 (93%)	3,838 (89%)
Customers Returning to HEA	180 (7%)	473 (11%)
Average Actions Viewed per Customer	0.48	0.79
Average Actions Completed per Customer	6.42	12.38

HEA Activity Comparison

Table 12 compares the level of activity for participants linked to their billing account data and participants using proxy billing data for no-cost, now-cost, and home investment options. Customers who linked to their billing data indicated they had taken actions much more often than those customers using proxy data: two-thirds of customers linked to billing data said they had taken at least one action, whereas only 40% of customers using proxy data said they had. Slightly more than half of the customers linked to billing data said they had taken *Home Investment* actions, compared to only 17% of the customers using proxy data.

Table 12. Counts of Customers Indicating They Had Done/Viewed at Least One HEA Action

	Total Participants Using Proxy Data	Percentage Participants Using Proxy Data	Total Participants Linked to Billing Data	Percentage Participants Linked to Billing Data
Actions Done				
Action No-Cost	923	38%	2,805	65%
Action Low-Cost	608	25%	2,282	53%
Action Home Investment	405	17%	2,180	51%
Total Customers Who Took at Least One Action	962	40%	2,873	67%

	Total Participants Using Proxy Data	Percentage Participants Using Proxy Data	Total Participants Linked to Billing Data	Percentage Participants Linked to Billing Data
Total Customers Who Did Not Take Any Actions	1,457	60%	1,438	33%
Actions Viewed				
Viewed No-Cost	232	10%	619	14%
Viewed Low-Cost	270	11%	816	19%
Viewed Home Investment	191	8%	584	14%
Total Customers Who Viewed at Least One Action	533	22%	1,430	33%
Total Customers Who Did Not View Any Actions	1,886	78%	2,881	67%

Both groups of customers visited the pages to *view* actions less frequently than they visited the pages about *doing* actions. Again, the customers linked to billing data were likely to have viewed more actions: one-third said they viewed at least one action, whereas only about one-fifth of customers using proxy data said they had taken at least one action.

Summary of Findings

Cadmus' analysis of the HEA tracking data revealed two key observations about participating customers:

- Most customers were not sufficiently engaged with the Home Energy Advisory to justify in-depth questions about their experience with it.
- Some differences exist between the responses of customers who linked HEA to their actual billing data and customers who used proxy billing data. We have not identified the reasons for these differences.

Based on these findings, Cadmus took the following approach to the HEA participant survey:

- Conduct a short online survey across all users to assess their recall using HEA, experiences, satisfaction, and demographic characteristics.
- Construct the sample so customers can be tracked and compared in at least these two ways:
  - Those who used proxy consumption data versus those who used actual utility consumption data.
  - Those who recorded activities in *Ways to Save* once versus those who recorded actions multiple times.

HEA Usability Study and Customer Experience Assessment
Part 2: Customer Survey

Based on the HEA data analysis results, Cadmus determined that customers are not sufficiently engaged to answer in-depth questions about their experience with the audit. To facilitate customer recall of HEA, Cadmus designed a short online survey with visual prompts using screen shots and multiple-choice questions to quickly gather information.

Research Objectives and Methodology

The objectives of this research were to assess participant recall of the HEA audit, and to gather information about their experiences and behavior changes while using HEA, their satisfaction, and their demographic characteristics. Table 13 lists research topics we investigated in the online HEA participant survey.

Table 13. Proposed HEA Survey Research Questions

HEA Customer Experience Research Topics
How did customers hear about the Home Energy Advisor? How well do they remember their experience using the audit?
What are the customer's experience with the Home Energy Advisor in terms of ease of use, usefulness of information, and challenges?
How satisfied are customers with the Home Energy Advisor audit?
What improvements can be made to encourage customers to use HEA more frequently?
How does linking to billing data affect customer use of the HEA? Is there a difference in customer experience between those using billing data and those using proxy data?
What effect does the Home Energy Advisor have on changing customer attitudes and behavior toward energy conservation?
Do customers see energy benefits in using Home Energy Advisor?
What effect does the Home Energy Advisor have in driving customers to purchase energy-efficient appliances and equipment?
What effect does the Home Energy Advisor have in driving customers to SCE's residential energy-efficiency programs?
What are the characteristics of customers who are using the Home Energy Advisor?

Cadmus, with the assistance of a market research firm, conducted online participant surveys in December 2013 and January 2014 with participants who used the HEA from December 2012 through September 2013 (after the HEA was fully launched to customers). Of more than 4,000 SCE customers with recorded activities in the HEA tracking database, Cadmus identified 653 who returned to use the HEA on more than one day. Roughly 70% of these participants had elected to link HEA to their monthly billing data. A primary concern for the online survey was to obtain a high response rate while avoiding any sample bias. (Bias might occur if, for example, more of one group of participants were sampled).

With this in mind, Cadmus randomly selected an equal number of participants who visited HEA on only one day, split evenly between customers linked to their monthly data and those using proxy data.

To test any differences in activity level between customers who used the HEA more frequently and those who elected to link to their billing data, Cadmus constructed the survey sample to compare customer responses in at least these two ways:

- Those who used proxy consumption data versus those who used actual utility consumption data
- Those who recorded activities in *Ways to Save* once versus those who recorded actions multiple times.

To encourage the highest response possible, Cadmus sent introductory e-mails offering a small incentive. Table 14 shows the sample frame, targeted completes, and number of completed surveys achieved. Overall, we completed more surveys than targeted.

Table 14. HEA Online Survey Sample Targets and Completes

Sample Groups	Sample Frame	Target Completes	Completed Surveys
Used HEA multiple days, linked billing data	471	94	84
Used HEA multiple days, proxy billing data	182	36	39
Used HEA one day, linked billing data	325	65	79
Used HEA one day, proxy billing data	325	65	65
Totals	**1,303**	**261**	**267**

Research Results

Sample Groups and Overall Customer Profile

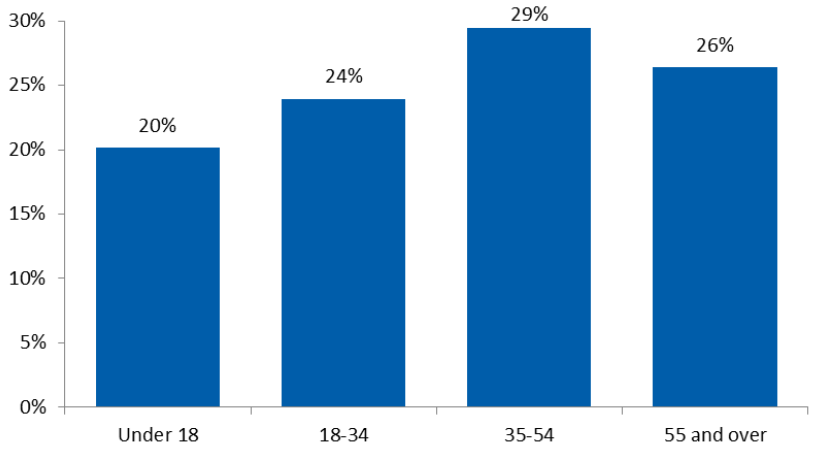
Through database analysis of HEA users, Cadmus hypothesized that there may be differences between participants who chose to link their monthly billing data versus participants who used proxy billing data, and between participants who recorded activities in *Ways to Save* once versus those who did multiple times. To investigate this possibility, we compared survey responses of participants in each group, but did not find any statistically significant differences between the groups. HEA participants were not sufficiently engaged, nor were the groups significantly different from one another to determine that linking monthly billing data or the number of recorded activities per user influenced their engagement.

Having found no statistical differences between the sample groups, Cadmus compared the overall HEA participant survey results with data from the 2012 American Community Survey (ACS) 1-Year Estimates for the Los Angeles-Long-Beach-Santa Ana Metropolitan Statistical Area (MSA) for demographic, economic, social, and housing characteristics.[11]

[11] 2012 American Community Survey 1-Year Estimates
http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

The gender and age distributions of HEA survey respondents are similar to those results from the 2012 ACS data. The distribution of gender was equal for male and female participants overall (50% each) across all survey participants. Participants reported an average of 3.4 people living in the home; slightly higher than the 2012 ACS estimate of 3.04 people per home. Figure 12 shows the distribution of household members' ages for HEA participants reporting at least one person in an age group.

Figure 12. Distribution of Household Members' Ages (at least one person in each age category, n = 261)



Significantly more survey respondents (82%) own or are buying their homes, compared to 48% of metropolitan area residents. This was not very surprising, however, given that residents living in rental property were less likely to have electric utility accounts. Survey respondents have lived in their homes for an average of 10.4 years, with 29% or respondents having moved in from 2000 to 2009, and 28% of respondents having moved in before 2000. Residents of the metro area have slightly shorter home tenure, with 38% having moved in from 2000 to 2009, and a comparable amount (33%) of residents having moved in before 2000. Most survey respondents (86%) reside in single-family (detached and attached) homes, while 57% of metro area households in the area live in single-family (detached and attached) homes. Survey respondents have an average of 3.4 bedrooms in their homes; more bedrooms per home than the general population of Los Angeles-Long-Beach-Santa Ana MSA residents (Figure 13).

Figure 13. Comparison of HEA Participant-Reported Number of Bedrooms with 2012 ACS Housing Characteristics

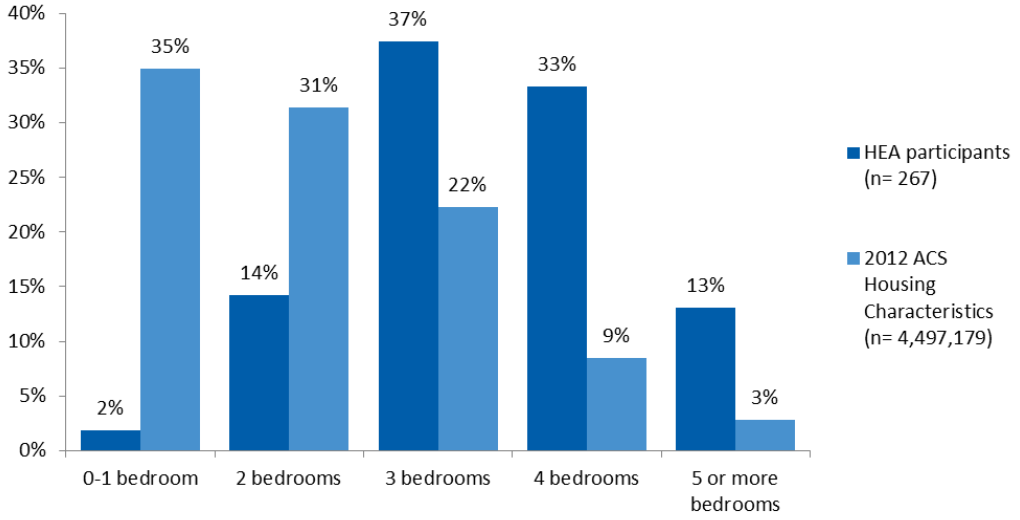
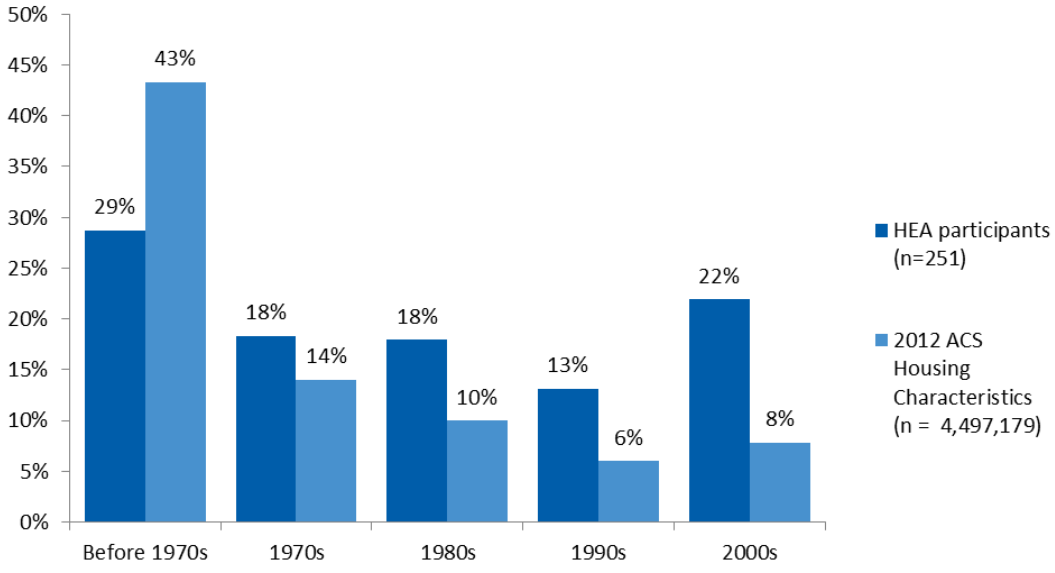


Figure 14 shows the distribution of home vintage, as reported by participants who could tell us the year their home was built compared with the 2012 ACS 1-Year Estimates for the area. HEA participants live in newer building stock than the general population, with nearly three times more HEA participants reporting that their homes were built after 2000.

Figure 14. Comparison of HEA Participant-Reported Year Home Was Built with 2012 ACS Housing Characteristics



The majority of the HEA online survey participants (over 74%) self-reported their race, ethnicity, and primary language spoken at home as white, non-Hispanic/Latino, English-speakers. Twenty-one percent

of HEA participants self-reported their ethnicity as Hispanic/Latino. The 2012 ACS social characteristics for the area show that 56% of the area residents identified as white, non-Hispanic/Latino(a), 45% identified as Hispanic/Latino (of any race), and 55% of area residents speak a language other than English at home. Overall, HEA respondents are less ethnically and racially diverse than the general population.

Figure 15 shows that HEA survey respondents attain higher levels of formal education than the average metro population. Nearly all HEA participants (90%) have completed some college, with 35% having completed college degrees and 25% having completed graduate and postgraduate degrees. Fewer than 60% of residents of the metro area have completed college or technical school, and a significantly higher percentage (41%) of area residents' educational attainment was at a high school level or some or no formal schooling.

Figure 15. Comparison of HEA Participant-Reported Education Levels with 2012 ACS Social Data

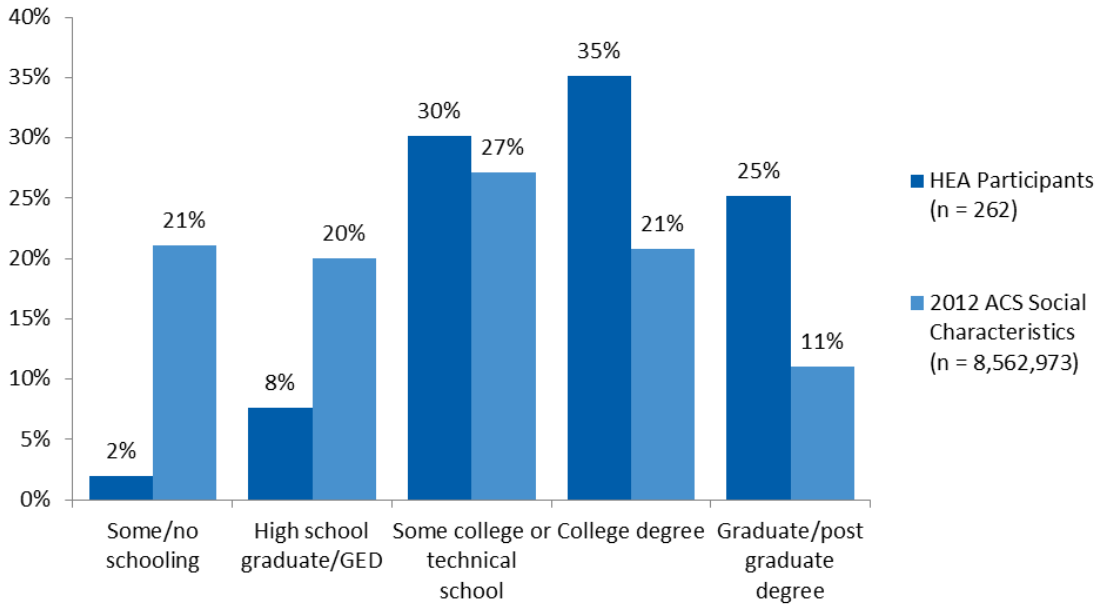
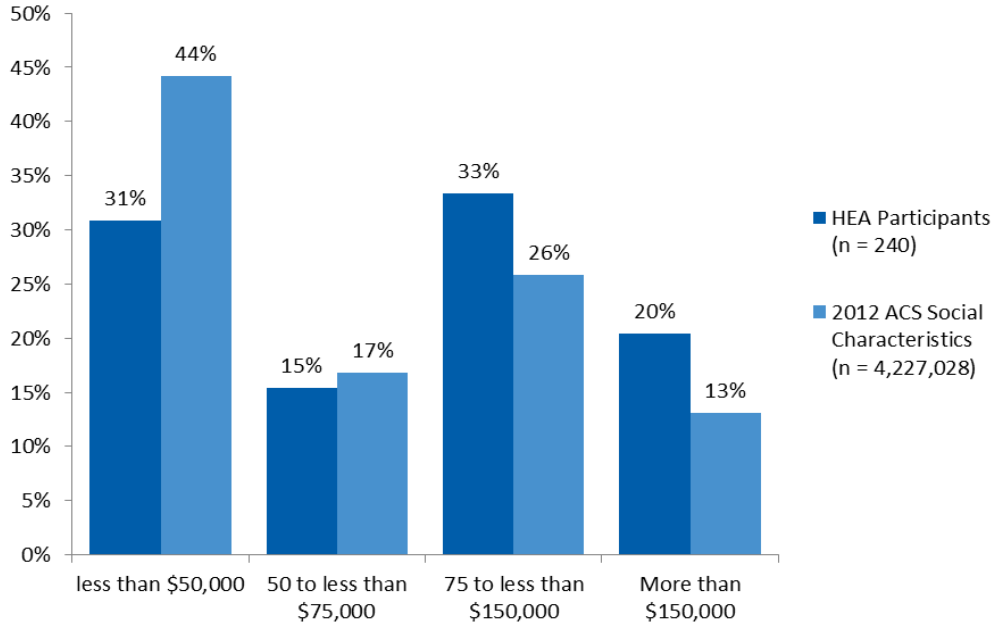


Figure 16 shows survey respondents have higher annual income levels than the general population.

Figure 16. Comparison of HEA Participant-Reported Annual Income Levels with 2012 ACS Social Data



HEA and SCE Program Recall

The majority of HEA online survey participants recall using the audit *pretty well* (49%) or *somewhat well* (41%). A very small group (9%) did not recall using the HEA at all.

Most participants (87%) said that they had heard about HEA through SCE's general website, *My Account* on SCE.com, and other SCE communications (e-mail or mail), while the remaining (12%) said that they heard about HEA through their solar contractor, word-of-mouth, or a home improvement contractor. Participants decided to go online and look at the HEA website to:

- Save money on their electric bill (67%)
- Learn ways to save energy (14%)
- Find out more about SCE's energy-efficiency incentives (13%).

Some participants (6%) said they decided to visit the HEA website because it was required to get their solar rebates or their solar contractor had advised them to do so, or to analyze their home energy use.

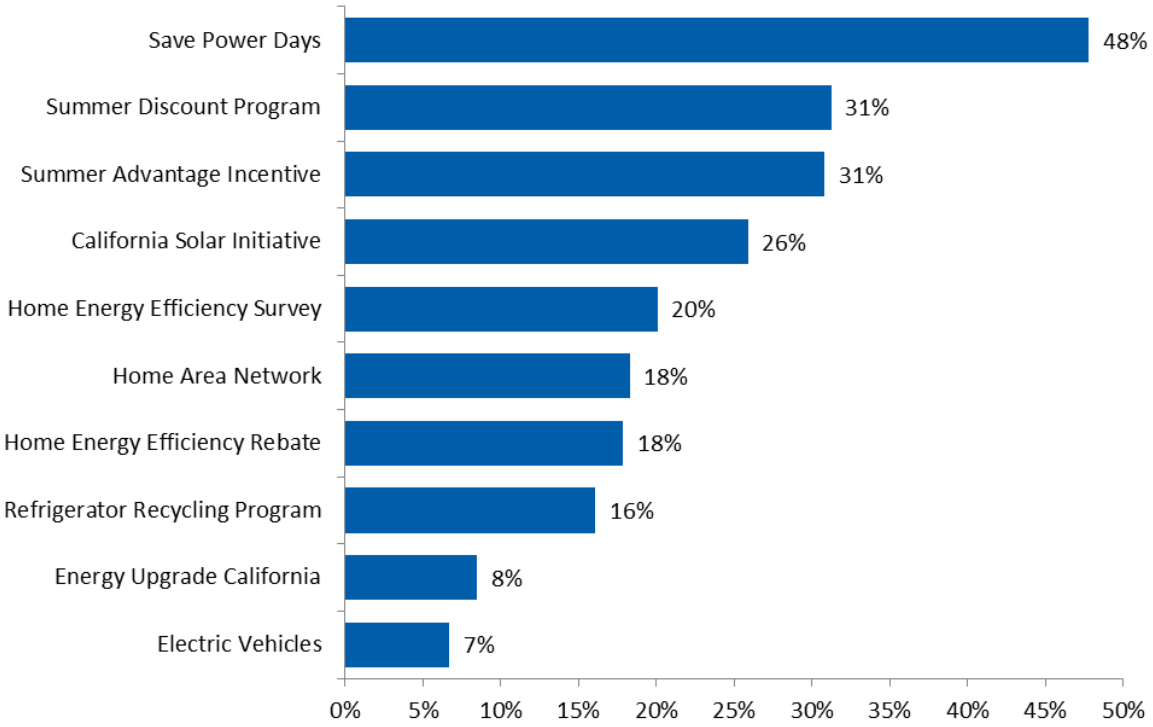
Nearly all participants (94%) said they were aware of some SCE energy-efficiency programs and rebates. While visiting the HEA website, participants said they learned about these programs:

- Home Energy Efficiency Survey
- Home Energy Efficiency Rebate
- Summer Advantage Incentive
- Electric Vehicles
- California Solar Initiative
- Summer Discount Program

- Refrigerator Recycling Program
- Energy Upgrade California
- Save Power Days
- Home Area Network.

While visiting the HEA website, customers can sign up for SCE programs. The programs with the highest level of reported sign-ups are the demand-response programs: Save Power Days (48%), Summer Discount Program (31%), and Summer Advantage Incentive (31%). Customers can easily enroll and participate in demand-response programs such as Save Power Days and the Summer Discount Program. Customers can earn bill credits for reducing their electricity use during peak times, and be notified before each power-saving event (by text, e-mail, or phone) in order to prepare to take advantage of the incentives. The combination of a simple and completely online enrollment process, automatic event reminders, and automatic rewards appears to drive online sign-ups for these programs. Figure 17 shows the percentage of participants that reported signing up for SCE programs while visiting the HEA website.

Figure 17. Percentages of Participants Signing Up for SCE Programs While Visiting HEA Website (n = 224, multiple responses per participant)



Energy Saving Behavior and Actions

Before visiting the HEA website, eighty-five percent of participants reported taking some or many steps to save energy in their homes. After visiting the HEA, most (85%) of the HEA survey respondents said that the HEA improved their ability to take actions to save energy in their homes and 94% of participants said that their understanding of how they use energy has improved.

Table 15 shows participants' self-reported actions taken to save energy in their homes, in response to an open-ended question. According to the survey, 52% of HEA participants took actions to purchase and install home energy-efficiency products and make energy-efficiency upgrades to their homes as a result of the HEA audit. An additional 45% of participants changed their behaviors to reduce peak time or overall home energy use as a result of using the HEA. Some (3%) participants reported that they used SCE energy tips or participated in SCE programs or events as a result of the audit.

Table 15. Participant Self-Reported Energy-Efficiency Actions Taken as a Result of Using the HEA*

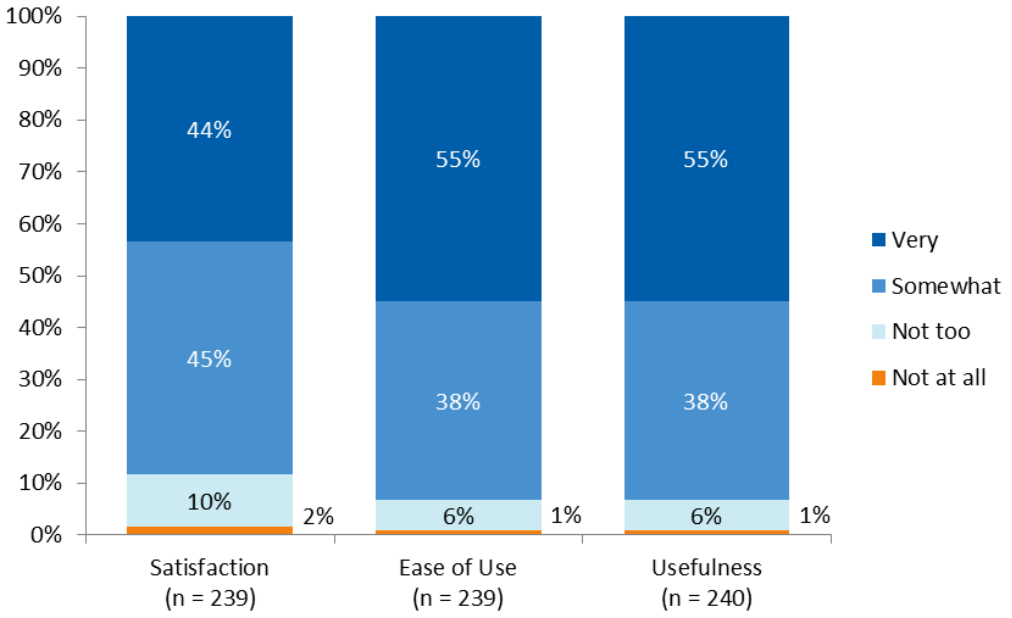
Participant Self-Reported Actions**	Energy Actions (n = 177 respondents)
SCE Programs	**3%**
Use SCE energy tips	**1**
Participate in low-income energy-efficiency (EE) program	**1**
Apply for energy-efficiency rebates	**2**
Participate in SCE energy-efficiency event	**2**
Sign up for SCE program	**5**
Home Energy-Efficiency Upgrades/Retrofits	**52%**
Install energy-efficient lights	**61**
Install solar panels/roof/system	**43**
Purchase energy-efficient or ENERGY STAR appliance(s)	**23**
Other (e.g., lighting controls, upgrade HVAC, improve home ventilation, weatherization, purchase smart strips.)	**55**
Behavior Change	**45%**
Reduce peak time energy usage	**50**
Reduce home energy use (general)	**13**
Turn off unused lights/appliances	**19**
Adjust thermostat (heating and/or cooling temperature)	**23**
Unplug electronics/appliance when not in use	**23**
Other (e.g., remove extra refrigerator, reduce hot water use, change mindset about energy use)	**27**
TOTALS	**348**

* Responses were hand coded and categorized by Cadmus
** E4. "What actions have you taken in your home as a result of using the Home Energy Advisor?" (n = 177, multiple responses per participant, open-ended question)

Satisfaction with the HEA

Cadmus asked respondents to rate their level of satisfaction with the HEA overall, to rate the ease of use, and to rate the usefulness of the information they obtained. Most were somewhat to very satisfied with their overall experience (87%), and said that the HEA was easy to use (89%) and that the information provided was useful (92%). Most participants (81%) reported that they would recommend the HEA to others. Figure 18 shows participant satisfaction with these aspects of their experience.

Figure 18. Participant Satisfaction with Their Experience Using the HEA (n ≥ 239)



Participants who were very satisfied with their experience said that they learned something new, saved money, and found the audit helpful and easy to use. One very satisfied participant said it helped him or her become a more informed consumer, saying, "I'm more informed than ever and knew exactly the size system I needed for my home by using *your* recommendation and not the salesman." Another respondent reported being very satisfied with his or her experience using HEA "Because they [gave] me many ways to save energy, especially in the summertime when I use the most and my bills are the highest."

Of respondents who were somewhat satisfied with their HEA experience, most said that they learned something new, found the audit to be helpful, and saved money. Some of these participants added that "there is always room for improvement," and that their experience "doesn't warrant a *very satisfied*."

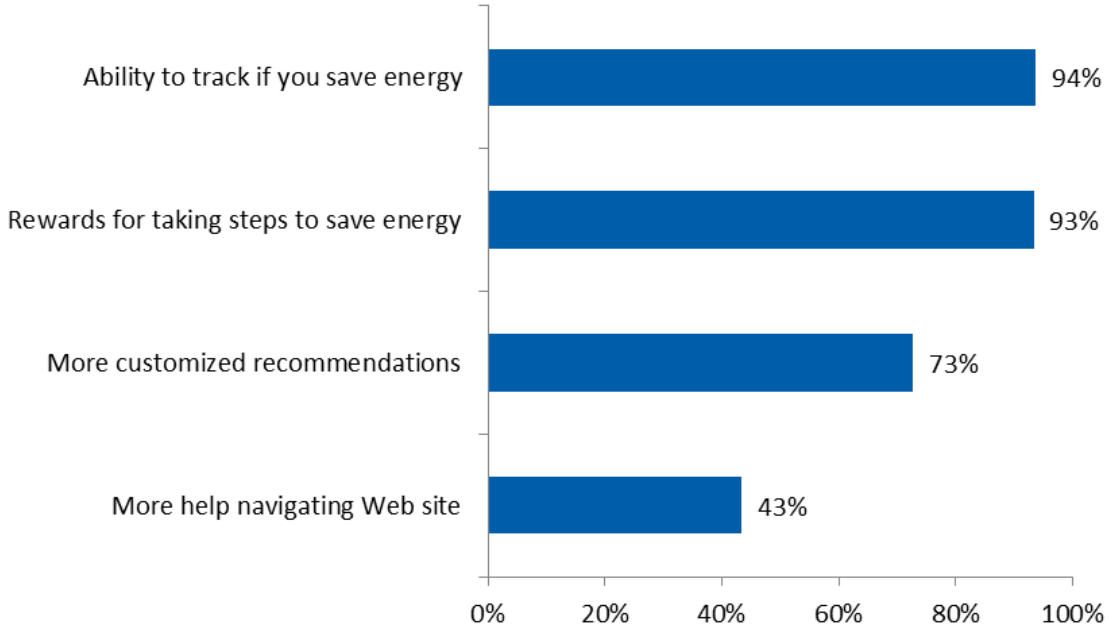
Reasons provided by participants for being less than very satisfied with the HEA are these:

- Participants did not see an easy way to obtain significant energy or monetary saving;
  - "I thought the savings would be greater."
  - "You can make incremental savings, but without spending a lot of money on upgrades, there is no real way to save big money."
- The tool was difficult/confusing to use
  - "Gaining knowledge and awareness is very useful but can sometimes cause confusion if there is too much of it."
  - "[The HEA] told me things I already knew. It also seemed to lead me in circles on the webpage," and it was a "complicated website to navigate."

  - "The site was too hard to access, and the info [too] vague. [HEA] should link to your SCE account and it doesn't tell you how to change your baseline. All new appliances are ENERGY STAR, and some people can't turn their A/C off."
- The advice/recommendations did not apply to their situation
  - "The options did not apply to my type of household which is low income; we do not have the means for these upgrades, repairs, etc."
  - "I already knew most of the items advised [and] many items did not apply to me because I did not own the property."
  - "As someone who rents, very few incentives applied to my energy use or to assist me in reducing my power bill. Those that do did not provide steps beyond those I already do to reduce usage."
  - "The information was general and not very specific to me. It didn't provide me with any new information on ways to save energy and reduce my electric bill that I didn't already know. I would like more specifics on my energy usage and more specific, realistic, ways to reduce costs."
- The HEA did not consistently allow users to track their energy use
  - "[The HEA] does not show recent energy use."
  - "[The HEA] takes several clicks to check daily usage, estimated bill, etc."

Most respondents (over 93%) thought they would be more likely to visit HEA again if there were rewards for taking steps to save energy or if they had the ability to track whether they saved energy. Some participants (73%) said that they were more likely to visit again if they received more customized recommendations, and 43% of participants said they would visit again if they had more help navigating the website. Figure 19 shows the percentage of participants that would visit the HEA website again for each proposed improvement.

Figure 19. Improvements to HEA that Could Encourage Participants to Visit Website Again (n = 242)



Some participants provided additional thoughts about the improvements noted in Figure 19. Participant suggestions for improving the ability to track energy savings and for providing customized recommendations and rewards to customers for savings are these:

- "If I could track my savings and know what they are, I could increase it for better savings. [It would] be great to have more custom recommendations to also increase savings."
- "There's a section at the top that says money saved, kWh saved, lbs. CO2 saved, which shows all *0*s--it would be better if it actually said how much was saved. Also, the usage analysis shows that appliances consume a lot of electricity but doesn't specify what appliances use how much. That would actually be the most useful improvement of all."
- "A personalized report that shows what's true and what's not true in someone's individual situation would be extremely useful."
- "Show actual saving to compare to new and old."
- "[Provide] more discounts for savers."
- "I would like to know where I was saving energy and keep track of it. Also, if rewards would be given that would be great…maybe more ways to save."

Other participants provided additional suggestions for improvements that they said would encourage them to visit the HEA website again, such as reminders to participate, simplification of application for SCE rebates online, providing tips for low-income households and renters, and increasing services provided by HEA or in connection with using the HEA.

Table 16. Other Improvements Suggested by Customers to Encourage Return Visits (n = 60)

Customer Suggestions
Provide reminders to participate
"Text alerts for different programs relevant to programs"
"Weekly updates on saving on my bill."
"Remind me to use it - maybe when you send a bill? Mailers in the mail work for me too - I get tons of junk e-mail - paper mail is almost easier."
Streamline applications for rebates online
"Ability to submit rebates online if possible."
Simplify the information provided in the tool
"Reduce confusion. Simplification is always best. Some items have similar-sounding descriptions and can be confusing to some."
Provide tips and ideas for low-income households and renters
"You recommend [doing] different things to save energy but if I can't afford them what good is it? I think solar is great but I cannot afford the program. Those of us that live on a fixed income cannot afford 99.9% of the programs. The other problem I have is the new meters are great but when I use excessive amount of electric I still don't know where I used it from."
Provide more personalized service
"Offer an actual home review on-site that ties into the Home Energy Advisor, to help both understanding and clarity."
"[An] in-home inspection to make recommendations would be helpful."
"Recommendations on how to save for people with a lot of children. How to get your house weatherized."
Simplify customer access to Green Button data
"The number one improvement is for SCE to authorize third-party Green Button Application vendors to receive SCE customer Green Button Data so consumers do not have to manually download Green Button Data. One question for SCE is, what do you think your customers can actually do with the CSV or XML File that is available? Allow customers to be able to receive their Green Button Data using the available option that other utility providers such as SDGE provide."

OBG Assessment

OBG Overview

Following project planning,[12] SCE launched the Online Buyers Guide (OBG) in 2010 and has assessed and changed it at various developmental stages. The OBG is one component of a suite of on-line educational tools on SCE's website (SCE.com) designed to help customers take steps to better manage their home energy use. The OBG's webpages provide information and advice to help viewers make informed decisions about buying and installing energy-efficient products, such as heating and ventilating equipment.

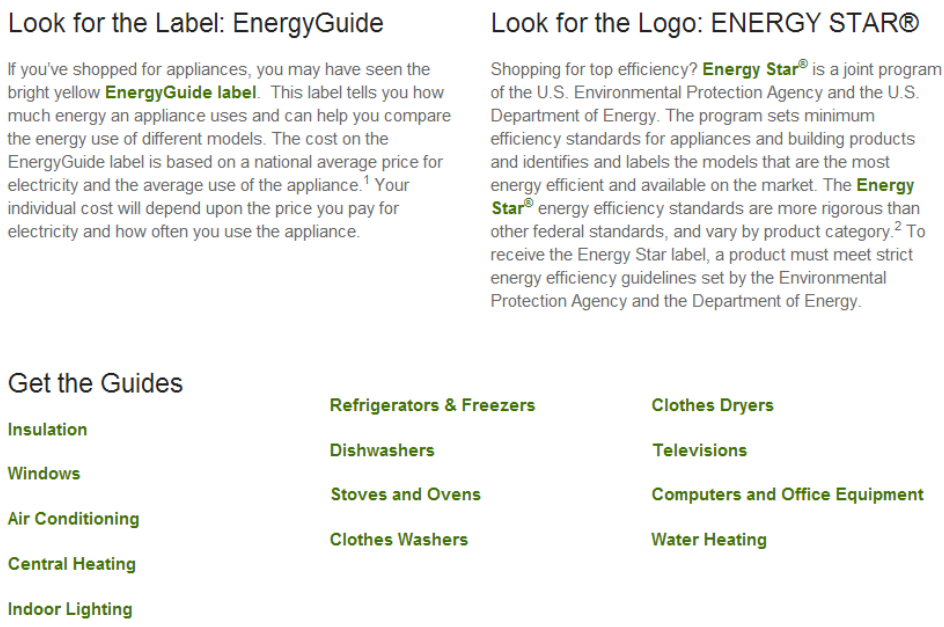
The OBG is embedded in SCE.com's *Home Energy Guide* (introduced under the tab called *Making Your Home More Energy Efficient* as shown below in Figure 20) that provides broader information to help customers reduce their home's energy use. Figure 20 also shows where the OBG is housed on the SCE.com website. Please note that no separate tab for the OBG exists, but that its name is introduced under the *Buyer's Guides* tab.

Figure 20. Accessing the Buyer's Guides' on the SCE Website

[12] See Burmester, Chris, Jun Furuta, and Celina Stuart Stratton, Residential Online Buyers Guide Project Plan, October 27, 2010.

When the *Buyer's Guides* tab is clicked, the visitor is taken to a page called *Buyer's Guide to Lower Energy Costs* (Figure 21). The top of that page discusses the EnergyGuide label and ENERGY STAR® logo; the bottom of that page has a heading *Get the Guides* and visitors can then click on each of thirteen *Buyer's Guides*. In addition to providing information about how to buy efficient products, the OBG web pages connect customers to SCE energy-efficiency rebates, discounts, and services; help them compare costs and savings for products; and link them to outside energy-efficiency websites.

Figure 21. Screenshot of *Buyer's Guide to Lower Energy Costs*



Research Objectives and Methodology

The initial goal for the OBG evaluation was to assess its influence on customers taking energy-efficiency actions and, thus, to assess its savings impacts.

To determine if these effects could be measured based upon the current capabilities of the OBG, Cadmus conducted an evaluability assessment. We visited the OBG website pages, spoke multiple times with program staff, and reviewed the following background materials:

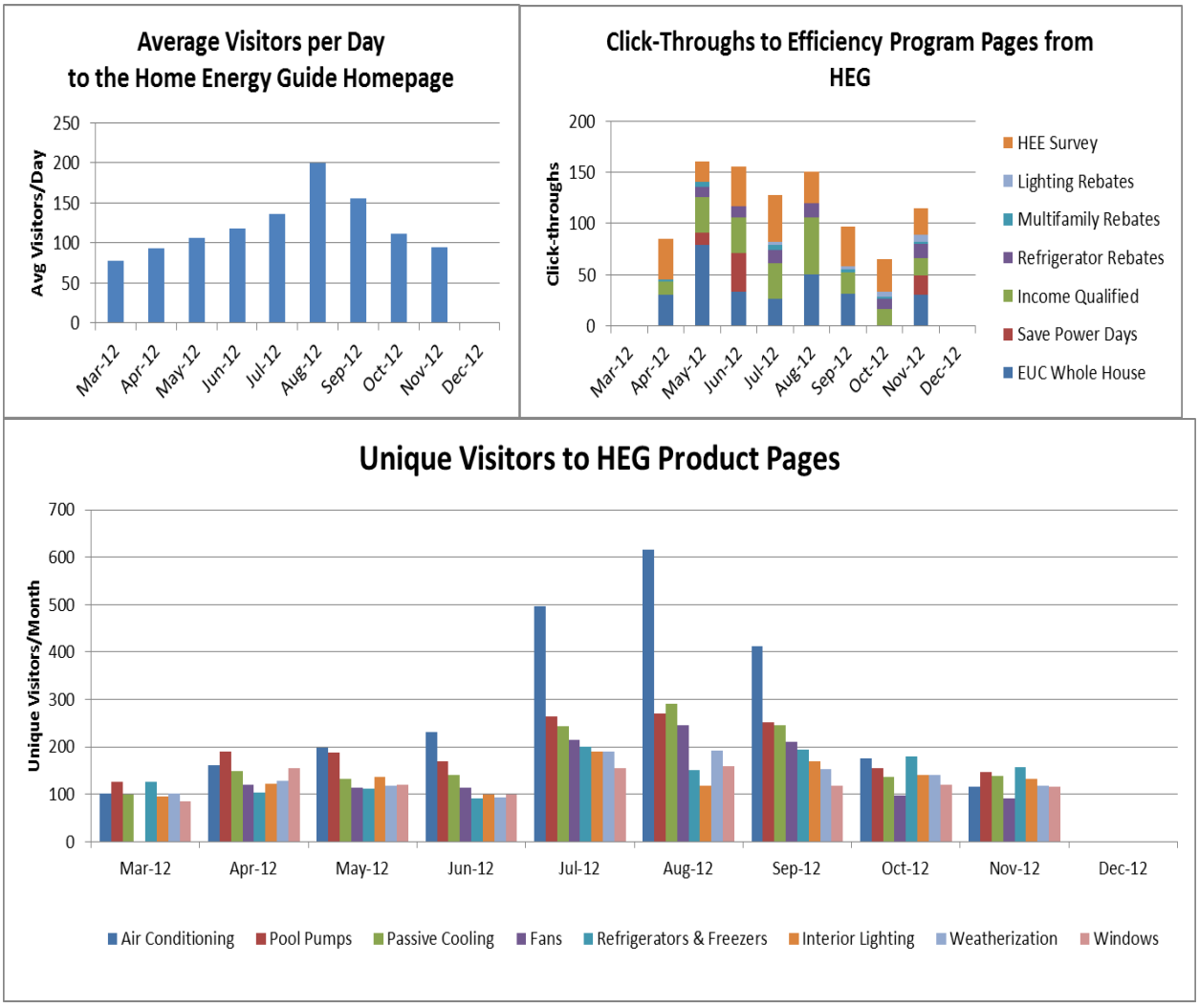
- *Residential Online Buyers Guide Project Plan,* October 27, 2010
- *SCE Residential Energy Efficiency Buyer's Guide: Vision, Audience, Goals, Objectives, and Metrics Statement V1.1*, January 31, 2011
- *Home Energy Guide Evaluation Report*, December 17, 2012
- *Southern California Edison's Online Buyer's Guide/Home Energy Guide Usability Test Report*, December 2012
- OBG monthly reports and website analytics summaries

Initial Evaluability Results

Based upon this review, Cadmus determined the OBG tool would require more advanced tracking capabilities to capture its influence on further energy-efficiency actions for these three reasons:

- The OBG is not represented as a program on the website and visitors would not be able to recall the Buyer's Guide pages as a program they participated in.
- Even if the OBG could be identified as a program (for instance, using an on-line evaluation approach that would direct customers to the OBG and asking them assess it), customers could assess its usefulness and potential influence, not its actual influence on subsequent energy efficiency actions.
- While it is possible to track click-throughs from the *Home Energy Guide* (HEG) to program sites, these tools do not reveal if the click-throughs came from the OBG or from another spot in the guide, nor do they track actual program participation, as shown in Figure 22.

Figure 22. Output of Home Energy Guide Analytics Tracker



Revised Assessment Approach for OBG

Thus, instead of assessing the impact of the OBG, Cadmus identified what OBG enhancements would be needed to evaluate the tool's impacts, answering the following research questions:

1. Why was the OBG designed as a standalone resource and not integrated into the HEA?
2. What type of program elements would the OBG need to enable evaluation of energy impacts?
3. What type of program elements would the OBG need to make process improvements?
4. What type of elements would OBG need to track participants' activities at various contact points?
5. What type of recommended products, tips, and measures should be tracked, at what detail level, and at what time?
6. How might OBG leverage its marketing and outreach channels to improve delivery?

Assessment Results

This section addresses each of the six research questions, using data gathered from conversations with SCE staff and review of the OBG materials listed above.

Why was the OBG designed as a standalone resource and not integrated into the HEA?

The development of the OBG webpages and the HEA on-line tool were on separate time trajectories, were focused on different goals, and were under the auspices of separate contractors. While the OBG program documents, interviews with SCE staff members, and links on some of the Buyer's Guides suggest the OBG was intended to work with the HEA, currently the OBG is only partially integrated with the audit tool (i.e., not all Buyer's Guide pages have links to HEA and the HEA does not link back to the OBG).

Although the OBG's vision statement lists many metrics for success, most of these metrics relate to these topics: increased awareness and knowledge when purchasing more energy-efficient products; greater customer satisfaction; increased web presence; increases in customer self-service; the ability of the site to address user needs based on knowledge levels; and creating a site accessible to customers with disabilities.[13]

Only one set of metrics is related to the OBG increasing energy-efficiency program participation; these include taking the HEES survey (not HEA), visiting energy-efficiency programs pages on SCE.com and participating in programs, and greater participation in other SCE-sponsored programs. The intent was to

[13] See SCE Residential Energy Efficiency Buyer's Guide: Vision, Audience, Goals, Objectives, and Metrics Statement V1.1, January 31, 2011, pp 8-13.

generate increased traffic to energy-efficiency program web pages and to measure any increase via click-through tracking.

What type of program elements would the OBG need to enable evaluation of energy impacts?

As described above, the OBG is not presented as a program, provides most visitors with information prior to purchase, and its click-throughs to other sites are not cross-referenced with actual program sign-ups. Thus, the OBG needs to be presented as a more explicit program experience and the tracking mechanisms linking OBG to energy-efficiency actions need to be improved.

To be considered a more explicit program, OBG would need to be more prominent on SCE.com with clear messaging that drives visitors to other programs and to take action. Follow-up capabilities that thank customers for visiting the OBG and prompt them to continue their product search or purchase would be useful; these are strategies that retailers often use for their web-based marketing. For example, visitors to the refrigerator site could be sent a follow-up email asking the visitor if they might still be looking for an energy-efficient refrigerator; if so, remind them that rebates are still available; and provide a link back to the OBG site or to the program site. The promise of rewards – monetary or otherwise – could be incorporated into these prompts.

Customer tracking mechanisms will need to allow the click-throughs from OBG to rebate sites to then be matched with program sign-ups. Currently, if a visitor clicks through to the rebate program site from the OBG, he or she still needs to read that program information and apply for the program. At that point, the individual program tracking (and attribution) takes over and the connection between the OBG and eventual program participation appears to be severed. The credit or attribution for sign-ups would then need to be resolved between the OBG and the various programs.

There does not appear to be a straightforward way for SCE to track energy-efficient purchases completed outside of SCE rebate programs.

What type of program elements would the OBG initiative need to make process improvements?

While the Home Energy Guide Evaluation Report from December 2012 showed that customers consider the website useful and navigable, both for increasing their ability to buy an energy-efficient refrigerator and for becoming more energy-efficient overall, they also suggested improvements. Customers said the interactive saving features could be improved, the site should be less cluttered, easier to navigate, and more personalized, and that it should include a guide for renters.

Most importantly, about one-half of responding customers did not notice the links to rebates, even though customers gave this as an important reason to visit the website. At the moment, a revolving kiosk at the top of each Buyer's Guide suggests program sites that visitors might be interested in and allows click-throughs to these sites. However, the revolving nature of the kiosk does not allow visitors to

easily see all the program options available. The need to improve the visibility of the rebate links is crucial to process improvements for the OBG.

Finally, a pop-up survey, to collect feedback about customer thinking, about the OBG pages, and suggestions for how to improve it could be added. These pop-up surveys are typical for many service-oriented websites.

What type of elements would OBG need to track participants' activities at various contact points?

As suggested in the Home Energy Guide Evaluation Report, customers would like more interactive mechanisms and personalization of the site. Each of these points of engagement could then be tracked and customers, in addition, could provide greater information to SCE that could, in turn, allow for further interaction and personalization. For instance, when someone enters the Home Energy Guide, they could be personally greeted, reminded of resources they had used before, and provided with suggestions of what to do next. In essence, the website could remember them and their interests or preferences. The website could then notify them about special events, programs, or rewards.

The downside to this approach would be yet another set of customer logins and passwords that visitors must remember and provide before the personalization could occur.

What type of recommended products, tips, and measures should be tracked, at what detail level, and at what time?

Any key enhancements made to the OBG, either short- or long-term, should be tracked for customer acceptance and use. For instance, if more interactivity is introduced, these tools should be pre-tested and assessed after being introduced. It would also be possible to introduce an improvement, such as an interactive buying tool, to one Buyer's Guide, market that Buyer's Guide strongly, and then measure the level of hits to that particular guide and click-throughs to rebate programs compared to the other guides. Again, pop-up surveys can be used to track key OBG elements, using a rotating list of questions, keeping each survey very short (and telling potential respondents that it is short), and potentially offering a reward.

How might the OBG leverage its marketing and outreach channels to improve the tool's delivery?

As described in answer to several of the questions above, effective marketing and outreach require multiple channels and changes in approach. Thus, if the OBG is to become a program in its own right, it needs to be given more visibility on the SCE.com website and through other SCE marketing channels, such as in collateral materials, social media, and advertising. If the OBG is not available in Spanish, this could limit its ability to penetrate ethnic communities, which represent a significant market in SCE territory.

Conclusions and Recommendations

Drawing from findings across the research tasks, we have grouped our conclusions and recommendations into the following categories:

- The state of UAT system integration
- Assessment of HEA
- OBG's role in the UAT

The State of UAT System Integration

These conclusions and recommendations are based upon interviews we conducted with SCE staff in June 2013. Since SCE has reviewed our initial analysis of these interviews, it may have begun to address some the conclusions and recommendations presented here.

Conclusion: At the time of the interviews, which occurred after a major reorganization at SCE that included staff departures and moves to new positions, about one-half of key SCE staff had limited knowledge about the UAT requirements and HEA's development status and an organization-wide consensus did not exist regarding the objectives for UAT integration.

Recommendation: SCE management should further develop and communicate to key staff a clear understanding of the UAT requirements, the status of HEA development, and objectives for UAT integration and policies supporting these activities.

Conclusion: UAT and HEA face major challenges that include: the lack of a direct link between HEA and SCE's main customer account website; how to link a large number of SCE customer websites with HEA and each other; and how to meet CPUC near-term milestones in the midst of a long-term effort.

Conclusion: UAT and HEA face major challenges that include: the lack of a direct link between HEA and SCE's main customer account website; how to link a large number of SCE customer websites with HEA and each other; and how to meet CPUC requirements during a time when technologies are changing rapidly. [14]

Recommendation: SCE should develop a thorough list of challenges to HEA development and UAT implementation and prioritize them for resolution. The existing roadmap, including short- and longer-term milestones, should be updated based on this analysis and then used to guide the process.

[14] CPUC requirements included, for example, that the UAT shall (1) utilize customer-specific energy consumption data, (2) combine energy audit findings with appropriate solar calculator results, (3) provide a comprehensive list of cost-effective DSM measures applicable to that site, and (4) provide payback analysis or IRR for individual EE and solar measures, listed in ascending order of fastest payback or descending order of return on investment, and aggregate savings of bundled measures. CPUC D.09-09-047, Section 5.9.2, at pp. 214-215 and Appendix C.

Assessment of HEA

This assessment draws upon the SCE key staff interviews, a comparison with SCE's alternative residential audit tool (HEES), analysis of customer usage data, and a survey of HEA users.

Inputs, Outputs, and Placement

Conclusion: HEES requires more detailed information than HEA for appliances. Thus, HEES can pinpoint individual appliance energy use, while HEA provides only aggregate appliance energy use estimates. Survey responses suggest some customers may prefer more detail on individual appliance usage, while others may prefer fewer inputs and a more aggregated approach.

Recommendation: Give users the flexibility to vary the amount of information they input depending on how much detail they want in their outputs. Provide default values for inputs customers choose to not enter. Give customers the option of returning to the audit tool and providing more detail later.

Conclusion: HEA provides only limited information that would inform customers on how to make energy-efficiency purchase decisions.

Recommendation: HEA measure recommendations should emphasize practical tips for selecting the right product or service provider. In addition, the site could provide a phone number or form for requesting an in-person audit or further technical assistance from SCE staff.

Conclusion: Based on the testing we were able to conduct, HEA outputs do not always vary with changes in customer inputs as expected. In some cases, we also found inconsistent information on energy savings.

Recommendation: SCE's HEA vendor should conduct validation tests of its online audit tool, providing results to SCE, to ensure that it provides reliable results when customer inputs change.

Conclusion: Having HEA outside of the SCE website limits the opportunities that could come from integration with a customer's existing account page.

Recommendation: Allow customers to access HEA using their SCE website account to increase the data available to both customers and SCE, and to eliminate a step – and multiple passwords – for customers.

Customer Response to HEA

Conclusion: Customer use of and engagement with the HEA is low for many reasons. Only about 7,000 customers had used HEA between its official roll out in December 2012 and September 2013 and only stayed on the site for an average of 6 minutes, hardly long enough to complete a home energy audit. Despite customers' relatively high satisfaction ratings of the HEA (87% of survey respondents were somewhat to very satisfied), only 10% of customers returned to use the site again. These findings are consistent with the views of key staff, with Cadmus' initial review of website elements, and with user feedback that HEA and the UAT needs to be much more customer-centric to successfully engage with customers. The small number of customers who interacted with the HEA is attributed to the fact that it

was not easily accessible from the main SCE website and because SCE did not have a robust marketing campaign to drive customers to the HEA website in 2013 since SCE was in the process of rebidding the HEA software vendor.

Conclusion: Customers who had linked to their billing data had taken about twice as many energy-efficiency actions in the past than those using proxy data. Customers linked to billing data viewed about 70% more actions than those using proxy data, but neither group viewed very many actions offered on the site (0.79 vs. 0.48, on the average).

Recommendation: In the next iteration of the HEA, SCE should increase marketing efforts, HEA accessibility, and conduct customer research to better understand how to enhance the customer experience and increase HEA engagement. At a minimum, the research should focus on these specific areas that this study identified as important to customers:

- **A more personalized HEA experience.** HEA participants want more face-to-face interaction and more targeted recommendations that fit their specific circumstances.
    - **Research Question**: What will personalize customer experience, including the use of linked billing data, tailoring recommendations to those most valid and achievable for the customer, and face-to-face interactions?

- **A more user-friendly HEA experience.** Findings suggest that providing individual appliance energy use, having a dashboard, and presenting advice on how to purchase efficient products may be important to customers. In addition, some results suggest customers want to have their efficiency investments rank ordered according to return on investment or solving ongoing problems.

    - **Research Question:** What type of information, and in what format and in what quantity, is most helpful and engaging for customers?
- **Inclusion of milestones and rewards.** The vast majority of respondents (93%) thought getting rewards for taking energy-saving steps and being able to track their savings against goals would entice them to visit HEA again. Both stakeholders and customers said that rewards, such as bill credits, coupons, and special offers, would engage customers.
    - **Research Question:** What types of milestones and rewards would most engage and motivate customers to use HEA and take actions?

- **Increased feedback and use of prompts.** Customers report they need more reasons and better prompts to help them engage more with HEA. Reminders need to link easily back to HEA, emphasize customer benefits, and encourage further engagement. For instance, a prompt could help customers remember seasonal HVAC tune-ups, offer a link back to HEA for a special rebate for the tune-up, and provide local contractors for performing tune-ups.

    - **Research Question:** What types of feedback and prompts would most motivate and engage customers

- **Having personal help available.** The energy-efficiency hotline, along with easy access to personalized home energy audits, features that can strengthen the connection between SCE and its customers.
    - **Research Question:** What types of more personal help do customers want to augment their engagement through HEA?

- **Gathering information to ensure a 'better fit.'** Carefully worded questions could identify more detailed insights about customer situations, such as property ownership status, whether they plan to move in the near future, and whether they meet income-qualified-program requirements.[15] Responses could then be used to adjust recommendations.
    - **Research Question:** What further information are customers willing to provide that will help ensure the analysis and recommendations best fit their situation and needs

OBG Assessment

Conclusion: In its current state, the OBG is a non-resource, educational offering. The lack of the OBG name on the core list of tabs under *Making Your Home More Energy Efficient* and the separate *Buyer's Guides* tabs prevents customers from seeing the OBG as a distinct program. SCE.com would require restructuring to make the OBG a stand-alone program. If established as a program, the OBG would need much greater integration with HEA (which is outside of SCE.com) and efficiency programs, along with the adoption of on-line feedback mechanisms and tracking of customer actions, to measure its influence.

Recommendation: Retain the OBG as a non-resource support for other DSM programs. Improvements to the OBG should focus on improving its presence and usefulness to customers as an educational and referral tool. The visibility and usefulness of the OBG and *Buyer's Guides* should be increased (for instance, have more consistent naming, more interactivity and clear links within the guides). Consider use of pop-up surveys[16] to gather feedback, better tracking from the site to program sign-ups, and Spanish language versions.

[15] The HEA already asks for the number of occupants and household income, which are required for determining eligibility for income qualified programs.

[16] Pop-up surveys should be kept short (three easy to answer questions) to minimize disturbance to the OBG user.