DRAFT REPORT

Evaluation of
Southern California Edison
2015 Home Energy Efficiency
Survey Program

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California Public Utilities Commission

The Cadmus Group, Inc.

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Executive Summary

Southern California Edison (SCE) serves as a participating investor-owned utility (IOU) in the statewide Home Energy Efficiency Survey (HEES) Program, with DNV GL acting as the implementation contractor. The HEES Program offers residential utility customers an opportunity to complete home energy and water efficiency surveys (administered through mail, phone, and online) to document their home's characteristics, demographics, energy-using products for heating and cooling, and more. After analyzing each completed survey, DNV GL sends customers a report that contains recommendations for reducing that respondent's home energy use. The program seeks to promote adoption of energy-saving measures and behavioral practices, and to drive customer participation in other California DSM programs.

Research Questions and Evaluation Activities

To evaluate SCE's 2015 HEES Program impacts and behavioral influences, DNV GL (on behalf of the California Public Utilities Commission) subcontracted with Cadmus to answer the following research questions:

- What are the net kWh savings associated with the program?
- What actions did customers take (i.e., measures and practices) due to their participation in the program?
- Would customers have taken these actions in the program's absence?
- Did the HEES Program increase customer awareness of other California DSM programs?
- Did the HEES Program increase participation in other California DSM programs?

Cadmus conducted the following evaluation activities to address these research questions:

- Program materials review
- Regression analysis of participants' (treatment group) and matched nonparticipants' (control group) energy consumption to estimate kWh savings
- Online surveys with participants (treatment group) and matched nonparticipants (control group) to assess customer actions, attribution to the program, and awareness of other programs[1]
- Uplift analysis to determine if participation in other California DSM program increased among HEES participants

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[1] The survey asked questions about measure adoption and behavioral practice adoption that occurred during the past two years. By the time respondents answered the questions in the survey, nearly two years had passed since treatment group customers completed the home energy and water efficiency survey and/or received the recommendations report.

Conclusions and Recommendations

This section summarizes conclusions from the evaluation that address the research questions, and offers recommendations for consideration in future implementation of SCE's HEES Program. The body of the report provides additional details on the methodology used and key findings that support these conclusions and recommendations.

Cadmus presents the conclusions in the following order to narrate and corroborate the findings from the survey, uplift, and billing analysis evaluation activities.

Conclusion 1: **SCE's HEES Program customers had increased awareness of other California DSM programs.** A significantly higher proportion of treatment respondents (66%) reported familiarity with other California DSM programs compared to control respondents (60%). Treatment respondents showed greater awareness than control respondents of Save Power Days, Home Energy Efficiency Rebate, Home Energy Advisor, and Solar Thermal Rebate. For more information on how we collected this data, please see Appendix B.

Conclusion 2: **Participation in SCE's HEES Program increased customer participation and savings in other California DSM programs.** The program exhibited a positive overall participation rate increase of 5.5 per 1,000 customers (or 57.7%) in other programs. Savings uplift from the program resulted in each treatment group customer saving 3.56 kWh per year more through other energy efficiency programs than control group customers. Though a relatively small shift, the increase is statistically significant. The Plug Load and Appliances Program saw the highest savings uplift at 2.9 kWh per year and the Residential HVAC Program saw the highest participation rate uplift at 243%. Full details can be found in Table 15.

Conclusion 3: **Participation in SCE's HEES Program increased customer adoption of smart thermostat and efficient heating and cooling equipment, but did not affect adoption of other measures.** From self-reports of 11 energy-saving measures, treatment and control respondents showed similar measure adoption rates, except for two: smart thermostats and efficient heating and cooling equipment. These two measures align with the participation uplift exhibited by the Residential HVAC Program. For more information on how we collected this data, please see Appendix B.

Conclusion 4: **The evaluated energy savings associated with SCE's HEES Program totaled 4,974 MWh in 2015. The HEES Program achieved the greatest impact on customers with the highest baseline energy consumption. However, the realization rate for the 2015 HEES Program was 26.6%, comparing the evaluated *ex post* energy savings to the savings that were reported.** The evaluation team found that using multiple model specifications, including replicating the methods from used in the previous impact analysis, resulted in very similar overall savings estimates. Additionally, customers in the top quartile of baseline energy use appeared to achieve the largest savings through the program. Evaluated savings are an average of 56.3 kWh/yr. per participant. This value is less than the 211.8 kWh/yr. estimated in the 2010–2012 SCE HEES program evaluation. Given the increased awareness and penetration of energy efficient products, including lighting, and California marketing efforts to increase efficient behavior,

since the last evaluation period, we believe that this reduction is largely driven by changes in the efficacy of the program, as opposed to the original findings being too optimistic.

Conclusion 5: **Most SCE customers engaged in energy-saving behavioral practices prior to (or in the absence of) participating in the HEES Program; the program did not result in customers adopting additional energy-saving behavioral practices. The Home Energy Reports Program may be repeating and masking the efforts from the HEES Program.** From self-reports of eight energy-saving behavioral practices, treatment and control respondents started engaging in seven of the behavioral practices *prior* to the time period associated with the program. During the time period associated with the program, treatment respondents did not show any significant increase over control respondents in adopting behavioral practices. Both the HEES recommendations report and the Home Energy Reports include a similar homes comparison and offer the same variety of energy-saving tips. Cadmus' evaluation observed few significant differences between HEES treatment and control respondents in measure adoption and behavioral practices, suggesting that control customers may have received similar energy efficiency information as treatment customers. Within the suggestions for HEES Program improvement, 3% of responses revealed confusion with the Home Energy Reports or wanting the HEES recommendations report to resemble the Home Energy Reports. Around 220,000 SCE customers received the Home Energy Reports in 2015. Due to the lack of a Home Energy Reports indicator in SCE's tracking data, Cadmus could not further investigate the possible overlap between the HEES Program and the Home Energy Reports Program.

Conclusion 6: The HEES Program had not made progress on improving the customization of the recommendations report in 2015, but changes were implemented in 2016. On average, treatment respondents gave the HEES recommendations report a usefulness rating of 6.1 out of 10, a decrease from the previous evaluation's rating of 6.9. Both Cadmus' evaluation and the previous evaluation found respondents expressing dissatisfaction with the recommendations report's lack of customization. Among treatment respondents' suggestions for program improvements, 28% wanted more innovative or new tips, 16% wanted more customization in the recommendations, and 13% wanted more situation-applicable tips. Note that significant changes were made to the program in 2016 (not observed as part of this evaluation) that may have improved report customization.

Recommendation: Investigate the overlap and interactive effects of the HEES Program and the Home Energy Reports Program in future research. SCE should consider conducting further analysis on the ways that the two programs share strategies or compete for similar behavior change or measure adoption. The programs tend to offer similar recommendations to customers, and may ultimately be competing for shared savings. In depth comparisons between the programs' designs, including benchmarking and secondary research, could inform any decision-making regarding the future of the HEES Program.

Recommendation: **Consider redesigning the HEES Program to differentiate itself from the Home Energy Reports Program such as by targeting a different set of customers or offering a different report/service.** SCE sent the HEES' home energy and water efficiency survey to all residential customers

with active accounts rather than targeting certain customers and excluding the customers who receive the Home Energy Reports. Such targeting and exclusion would help SCE reduce the cost of mailing out the HEES surveys and isolate the savings attributable to the HEES Program. Another idea to reduce redundancy with the Home Energy Reports would be to develop a new report or service that uses a different way of motivating customers to save other than through normative comparisons and energy-saving tips (examples: gamification, an app, and social engagement activities).

Recommendation: **Consider applying a stronger marketing approach to the HEES Program to address the ongoing issue of customization.** Treatment respondents suggested more innovative or new tips, more customization in the recommendations, and more situation-applicable tips. Such personalized customer services could be achieved by employing marketing best practices, such as participant persona identification,[2] segmentation, and message personalization. AMI data analytics could also provide a tool for identifying customer specific tips. Note that significant changes were made to the program in 2016 that may have improved report customization and enhanced marketing but they were not observed as part of this evaluation. The effects of these changes should be considered before investing in additional marketing or customization.

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[2] Persona identification (sometimes called a marketing persona) develops character profiles that represent ideal customers. Persona identification helps hone in on target audiences and assigns that audience relatable, real-person attributes.

Introduction

This section describes the Home Energy Efficiency Survey (HEES) Program's design and implementation, and provides evaluation research objectives.

Program Description

Under the oversight of the California Public Utilities Commission (CPUC), Southern California Edison (SCE) participates in the statewide HEES Program, with DNV GL serving as its implementation contractor. The program aims to increase customer awareness of energy efficiency opportunities and to reduce energy usage by encouraging customers to adopt energy-efficient measures and behavioral practices, and to participate in other California DSM programs. The HEES Program at SCE operates as part of the Home Energy Advisor program umbrella, which includes the Home Energy Reports Program and the Home Energy Audit Tool.

The HEES Program sends a home energy and water efficiency survey to residential SCE customers with active service accounts. The survey asks customers to document the characteristics of their homes, demographics, and energy-using products for heating, cooling, and more. SCE offers the survey through mail, phone, and online; however, most customers (99.8%) complete the surveys over mail. Customers opt into the program by completing the survey. DNV GL then analyzes the completed surveys and sends customers a detailed report that provides the household's energy cost breakdown, comparisons to energy usage in similar homes, suggestions for energy-saving measures, and behavioral tips on ways to save energy. The recommendations report also promotes investor-owned utility (IOU) rebate programs and other energy efficiency opportunities.

SCE partners with Southern California Gas Company (SCG) on the HEES Program, distributing a free energy efficiency kit to customers who complete the survey. SCG distributes the kits, which contain a low-flow showerhead, a kitchen aerator, two bathroom aerators, a hot-water temperature card, and a filter whistle. SCE does not claim energy savings through the kit.

In 2015, SCE reported 90,723 customers participated in the HEES Program (i.e., returned the surveys).

Evaluation Research Questions

Cadmus evaluated the impacts and behavioral influences of SCE's 2015 HEES Program to address the following research questions:

- What are the net kWh savings associated with the program?
- What actions did customers take (i.e., measures and practices) because of their participation in the program?
- Would customers have taken these actions without the program?
- Did the HEES Program increase customer awareness of other California DSM programs?
- Did the HEES Program increase participation in other California DSM programs?

Methodology

Table 1 provides an overview of methods applied in the 2015 HEES Program evaluation, mapping tasks to research questions addressed. This section describes the tasks conducted.

The methodology described below aligned with the evaluation plan as closely as possible. The proposed regression analysis, however, resulted in substantially lower savings estimates than expected, with expected savings estimated based on results from the previous evaluation, conducted in 2013. To validate these results and demonstrate that changes in energy use (rather than regression model specifications) resulted in a large difference between program impacts in 2013 and 2015, the evaluation team applied the 2013 regression model specification to estimate savings.[3] The two model specifications resulted in the same estimates. The final savings for the 2015 HEES Program were estimated using the 2013 model specification. We explore possible reasons for differences between the impacts of the 2013 and 2015 HEES Program below.

Table 1. Methodology: Mapping of HEES Program Evaluation Research Questions to Tasks

Research Question	Program Design & Materials Review	Matched Control Group	Billing Analysis	Uplift Analysis	Behavior Change Survey
What are the net kWh savings associated with the program?		✓	✓		
What actions did customers take (i.e., measures and practices) due to participation in the program?	✓	✓		✓	✓
Would customers have taken these actions without the program?		✓		✓	✓
Did the HEES Program increase customer awareness of other IOU rebate and upstream programs?	✓	✓			✓
Did the HEES Program increase participation in other IOU rebate and upstream programs?		✓		✓	

Program Design and Materials Review

Cadmus reviewed the HEES Program design and implementation materials to inform the impact evaluation and the behavior change survey design. SCE responded to questions about program details and provided Cadmus with the following program materials:

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[3] The matching method Cadmus used (described in the Construction of a Matched Control Group section) was very similar to that used in the 2013 evaluation, although some of the covariates included in the propensity score models differed.

- The HEES Program Manual (effective from 2010 through 2016)

- A copy of the mail version of the 2015 Home Energy and Water Efficiency Survey

- A copy of the online version of the 2015 Home Energy and Water Efficiency Survey

- A copy of the 2015 Recommendations Report

- The list of items in the energy efficiency kit

Construction of a Matched Control Group

Typically, when behavior-based programs are implemented as randomized control trials (RCT) or randomized encouragement designs (RED), the evaluator estimates energy savings by comparing energy consumption in the treatment and control groups before and after program intervention. RCTs and REDs produce unbiased estimates due to randomization. Because the HEES Program was implemented as an opt-in program, rather than as an RCT or RED, participants and nonparticipants were not randomized into treatment and control groups.

Therefore, Cadmus used propensity score matching to identify a set of nonparticipants as a pseudo-control group for the evaluation,[4] relying upon methods described in Imbens and Rubin (2015).[5] To mitigate possible self-selection bias in the resulting savings estimate (e.g., customers that opted in to the program could be more likely to save energy or possibly already do), Cadmus matched participants to nonparticipants based on their propensity to participate in the program. We identified nonparticipants that were as likely to opt in as those who did opt in. Similar to the evaluation of the 2013 HEES Program, Cadmus modeled customers' propensity to participate based on observable customer characteristics, assigning participants to the treatment group and a sample of eligible nonparticipants to the pseudo-control group.[6]

First, for customers that received HEES Program home energy and water efficiency surveys (whether the customer participated in the HEES Program or not), Cadmus collected electricity consumption (billing data), DSM program participation data, and other customer-specific information (e.g., home types) available between January 2014 to June 2016. Using an indicator of whether or not each customer participated in the HEES Program in 2015 as the dependent variable, Cadmus used a regression model to estimate a propensity score for each customer, where the propensity score represented a customer's likelihood of participating in the HEES Program, conditional upon prior energy consumption, program participation, and customer characteristics. This step resulted in a propensity score for every HEES Program 2015 participant and the eligible control group customers.

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[4]   Propensity refers to the likelihood that a customer would participate in the HEES Program.

[5]   Imbens, Guido W., and Donald B. Rubin. *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*. Cambridge University Press, New York, NY, USA. 2015.

[6]   We included all participants and a sample of customers that did not participate for the analysis and matching.

Then Cadmus matched HEES Program participants to nonparticipants that had the closest propensity scores. The evaluation team applied a threshold to remove any nonparticipants from the matching pool with propensity scores that were much higher or lower than participants' scores. We implemented the propensity score matching for separately, depending on the month in which customers returned the survey.

Screening

Cadmus cleaned and prepared the data before conducting the propensity score matching. The raw data set included 88,188 customers who were HEES Program participants in 2015 (i.e., with complete mailing data) and 1,173,356 nonparticipant customers (i.e., with complete tracking data).

Cadmus removed customers for the following reasons:

- Premise with net-metering (e.g., customers with grid-connected residential solar arrays)
- Customer returned multiple surveys
- Earlier survey return date than survey sent date
- Survey return date appeared to be a data entry error (e.g., returned survey in the year 2027)
- Nonresidential customer (identified by the rate code)
- Incomplete customer information (e.g., missing housing type field)
- Incomplete billing data in the 12 months before HEES Program participation (e.g., removing any participant who returned a survey in May 2015 but had less than 12 months of billing data before that month and year; nonparticipants with less than 12 months of data were ineligible to be matched in that month, but could be included in a subsequent month when 12 previous months of data were available)

After these screens, 643,157 customers (66,362 participants and 576,795 nonparticipants) were eligible for matching. Of these, 132,676 customers (66,338 participants and 66,338 nonparticipants) were matched in the final treatment and control groups. The customer attrition due to incomplete or missing data was comparable to the 2013 evaluation and to Cadmus' evaluations of other similar programs.

Details of Propensity Score Model

Cadmus specified a logistic regression model to estimate propensity scores in each month of the 2015 program year. The process followed these steps:

- **Step 1: Identify base covariates.** Base covariates were variables included in the propensity score model and were exempt from the stepwise selection in subsequent steps as *a priori* they would influence customers' decision making about whether or not to participate in the HEES Program:

- Average daily energy consumption in each season (e.g., winter, spring, summer, fall) in the 12 months prior to the initial participation month.[7]

- **Step 2: Select additional linear terms from the other possible explanatory variables using stepwise selection** (an automated regression procedure for selecting covariates to include in the model specification). The additional variables entered the model one by one, and their significance determined whether they remained in or exited the model.[8] The set of candidate variables included all customer data available from SCE.[9] Notably, Cadmus requested but did not receive an indicator for home energy report (HER) program status. In Cadmus' prior evaluations of similar programs, HER program participation was often a significant determinant of participation that was selected for inclusion in most propensity score models. The effect of the omission of this variable upon energy savings estimates of the billing analysis is unclear, but it would likely have improved the accuracy of the propensity score models.

  Potential candidate variables included the following:

  - Manufactured home indicator

  - Multifamily indicator

  - California Alternate Rates for Energy or Family Electric Rate Assistance participating low-income customer

  - All-electric indicator (i.e., customer did not use SCG's natural gas service)

  - Customer-specific consumption trend in the six months prior to the HEES Program participation month[10]

  - DSM program participation indicator was set to "1" (if the customer participated in another SCE DSM program before participating in HEES Program) or "0" (if the customer did not)

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[7] Prior to the matching process, Cadmus standardized the billing and weather data for each customer, as described in the Data Preparation section.

[8] Cadmus used the significance level of the Wald chi-square score to determine each variable's inclusion or exit from the model specification. If the significance level of the Wald chi-square score was less than 0.05, the variable entered the model. If the significance level of any variable became greater than 0.20 during the stepwise selection, that variable exited the model. *A priori* variables selected in Step 1 were exempt from the stepwise selection process, and did not exit the model.

[9] Cadmus requested that SCE provide all market segmentation data available at the customer level. In addition to the above variables, the evaluation team received other variables of interest, including customer zip codes, an indicator of swimming pools at the premises, last bill payment methods, electric car charging, and a tract-home indicator. The team did not include these variables in the matching models as the fields often were missing, inconsistent, or irrelevant.

[10] Cadmus estimated this trend with the regression coefficient in per-customer regressions using data from the 12 month pre-period. The coefficient captured linear trends (upwards or downwards) in consumption during the six months before the participation month, after controlling for weather.

- Age of account (years since account activation)
- **Step 3: Select quadratic and interaction terms using stepwise selection**
    - Test quadratic terms for all variables selected in Steps 1 and 2
    - Test all pairwise interactions of all variables selected in Steps 1 and 2

Using the selected variables and resulting propensity score model for each month, Cadmus estimated a propensity score for each customer who opted in that month and each nonparticipant who was not previously matched. The team matched treatment group customers to nonparticipants with the closest propensity scores, performing this for matching 1:1 (one nonparticipant for each participant) and without replacement. Cadmus then removed matched customers from the next month's matching pool and repeated the process for the next month.

Post-Matching Quality Assurance and Quality Control

After completing the matching process for all months, Cadmus assessed the quality of the matches. First, this involved applying a quality criterion for the matches to remove any matched pairs with linearized propensity scores substantially lower than the others.[11] None of the matches satisfied this criterion, suggesting the propensity score matching effectively matched participants to nonparticipants with similar participation propensities. To further test the quality of the matches, Cadmus compared the normalized distributions of propensity scores between the treatment group and the matched control group, following the methods described in Imbens & Rubin (2015). Table 2 shows the test results.

Table 2. Post-Matching Normalized Differences Test: Propensity Scores

Mean of Propensity Scores		Absolute Difference	Normalized Absolute Difference (z)	Pr > |z|
Matched Control Group	Treatment Group			
0.074556	0.074557	< 0.000001	<0.00001	0.50

The test showed that the normalized difference in the means of propensity scores between the treatment group and the control group were not significantly different. This finding shows that the propensity score matching process effectively selected nonparticipants with very similar participation propensities to HEES Program participants.

Cadmus also compared average monthly consumption in the treatment group and the control group, as well as to unmatched nonparticipants (all other residential customers) in the months prior to each opt-in month, to assess differences in energy consumption in the absence of the program. Figure 1 shows average daily consumption of the treatment group, control group, and unmatched nonparticipants

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[11] Specifically, Cadmus flagged matched nonparticipants whose linearized propensity scores—defined as $\log(\frac{PS}{1-PS})$—were less than 0.1 below the minimum estimated propensity score among participants.

during the pre-period.[12] This plot indicates that unmatched nonparticipant pre-period energy use was much higher than treatment and matched control group customer energy use. It indicates that the 2015 HEES Program participants consumed less energy than nonparticipants did, even before participating in the program. Using propensity score matching, Cadmus selected nonparticipants similar to participants, with respect to pre-participation energy consumption.

Figure 1. Comparison of Participants, Matched Control Group, and Unmatched Customers
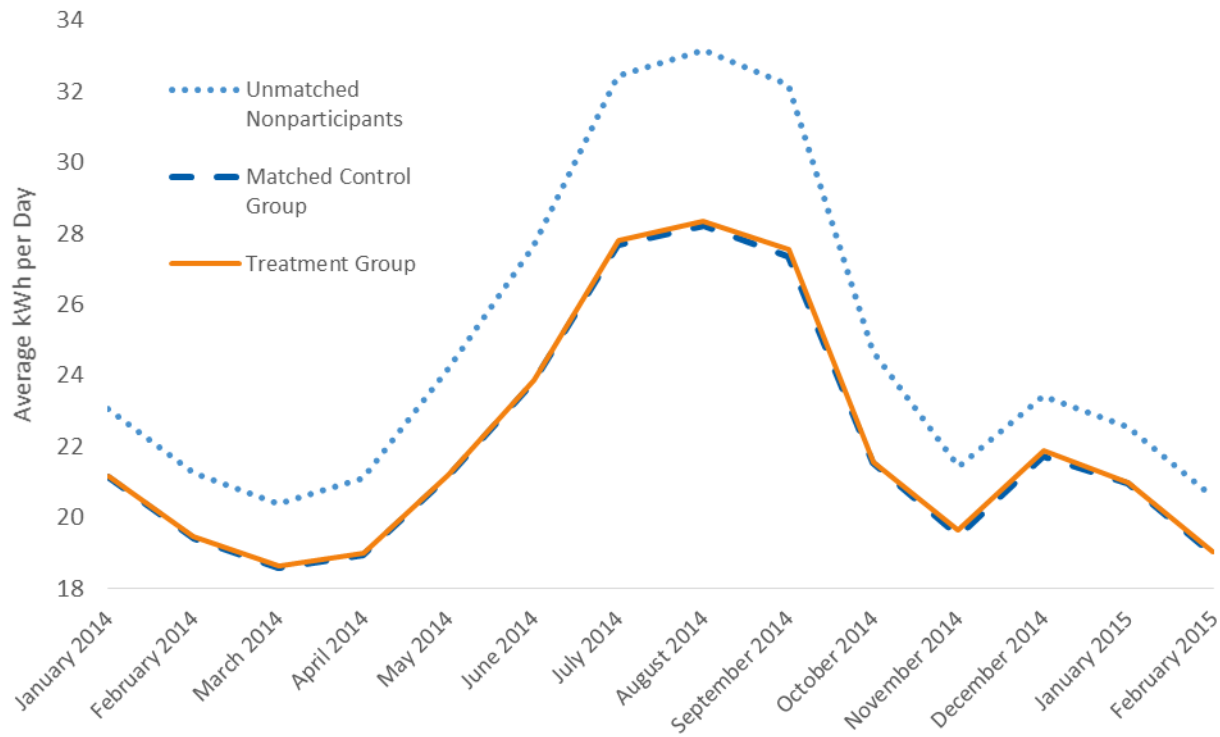
In addition to data visualization, Cadmus calculated the normalized difference in annual pre-period consumption to test whether or not annual pre-period consumption equaled, on average, between the two groups. Table 3 shows the test results.

Table 3. Post-Matching Normalized Differences Test: Annual Consumption

Pre-Treatment Period Annual Mean (kWh)		Difference (kWh)	Normalized Difference (z)	Pr > |z|
Matched Control Group	Treatment Group			
8,079.5	8,118.3	-38.8 (-0.5%)	-0.00977	0.50

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[12] Cadmus defined "pre-period" as the 12 months before each customer participated in the program. Cadmus defined "post-period" as all months after each customer's initial participation month. For greater detail, see Equation 1.

This test revealed a small and statistically insignificant difference of 38.8 kWh/year, or about one-half of a percentage point in the control group's consumption, between the treatment and control groups. This indicated that 2015 HEES Program participants in the treatment group consumed about 0.5% more energy annually during the pre-period than customers in the control group, although the difference was not statistically significant. Cadmus' previous test for differences in propensity scores showed the difference in mean consumption did not result from differences in propensity scores between the two groups. The regression analysis controlled for preexisting differences between treatment and control group energy consumption.

Based on these comparisons, Cadmus accepted the results of the propensity score matching process and continued to the regression analysis.

Regression Analysis

After completing the propensity score matching, Cadmus performed a regression analysis to estimate net energy savings. This used a difference-in-differences (D-in-D) regression of monthly billing data, with customer fixed effects, as recommended by SEE Action (2012) and the U.S. Department of Energy Uniform Methods Project (UMP) Behavior-Based Program impact evaluation protocols (2015).[13,14] This method accounted for effects of naturally occurring efficiency as well as other non-program impacts on energy use during the evaluation period. The fixed effects accounted for preexisting differences in average energy use between customers before opting into the program.

Data Preparation

Cadmus received 42,940,345 monthly billing records over the period January 2014 through June 2016 for 1,565,395 SCE residential electric customers. The evaluation team merged customer billing data with survey mailing tracking data and other customer information, and then performed additional data cleaning on the merged data, checking for possible errors and outliers.[15]

Cadmus collected daily weather data from the 30 National Oceanic and Atmospheric Administration weather stations nearest to each zip code within SCE's service territory. These weather data included average temperatures per day from January 2014 through June 2016, which Cadmus used to calculate

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[13]   SEE Action. *Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations*. May 2012. Available online:
    https://www4.eere.energy.gov/seeaction/system/files/documents/emv_behaviorbased_eeprograms.pdf

[14]   National Renewable Energy Laboratory. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*: Residential Behavior Protocol, Chapter 17. January 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

[15]   This included removing bills with erroneous zero usage, manually reviewing bills that were above the 99th percentile of usage, accounting for estimated reads, and addressing account closure dates.

daily heating degree days (HDDs) and cooling degree days (CDDs) for each customer's billing cycle.[16] Cadmus then calendarized the billing and weather data[17] (calendarization is the process of transforming monthly billing data observations, which often do not fit within a calendar month, into monthly calendar observations).

After the calendarization and matching process, Cadmus followed the screening process detailed in the 2013 evaluation.[18] Table 4 shows the results of each screening step. The first step required 12 months of pre- and post-data for each customer. The team classified the month directly following the month in which a customer returned the survey as the first month of the post-period. Every matched customer had 12 months of pre-period data, but approximately 50% of did not have 12 months of post-period data. Thus, they were removed from the analysis. Cadmus then removed any bill that fell outside of the 12-month pre- and post-period period window, followed by removing any customer with less than 40 kWh of consumption in a single month or three consecutive months of consumption of less than 80 kWh from the analysis. Finally, if a customer's highest monthly consumption value was 2.3 or more times greater than the lowest monthly consumption value within in any 12-month period,[19] Cadmus removed the customer from the analysis. These steps are the same as those outlined in the 2013 evaluation report. We believe these steps are appropriate for the data.

The combined screening steps resulted in an attrition rate of approximately 70% of control and treatment group customers. This resulted in data sets of approximately the same size (i.e., the same number of treatment and control customers) and statistically equivalent in terms of pre-period usage.

Table 4. Attrition Rates by Billing Data Preparation Step

Screen	Group	Remaining After Screening	Lost in Screening Step	Percent of Original Lost in Screening Step	Percent of Original Remaining After Screening

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[16]   Cadmus set HDD and CDD base temperatures to 65°F and 70°F, respectively.

[17]   Calendarization is also referred to as "monthly allocation."

[18]   Itron. *2010-12 CPUC HEES Impact Evaluation, Final Report*. July 8, 2013. See pages 104-108.

[19]   Although Cadmus used the 2013 evaluation screening approach, we believe that this 2.3 screen may have been set too arbitrarily and/or strictly. See Appendix A for more details on the differences with the standard Cadmus methodological approach. It should be noted that even using a more relaxed screen resulted in nearly identical findings.

Screen	Group	Remaining After Screening	Lost in Screening Step	Percent of Original Lost in Screening Step	Percent of Original Remaining After Screening
Initial Post-Matching Population	Control	66,338	-	-	-
	Treatment	66,338	-	-	-
12 Months Pre- and Post- Data	Control	32,423	33,915	51%	49%
	Treatment	33,024	33,314	50%	50%
Less than 40 kWh/Month	Control	32,318	105	<1%	49%
	Treatment	32,890	134	<1%	50%
Less than 80 kWh/Month (3 Consec. Months)	Control	32,290	28	<1%	49%
	Treatment	32,875	15	<1%	50%
Too Much Change (>2.3x)	Control	18,834	13,456	20%	28%
	Treatment	19,500	13,375	20%	29%
Final	Control	18,834	-	-	28%
	Treatment	19,500	-	-	29%

Regression Modeling

After Cadmus prepared the analysis data set, the evaluation team ran the D-in-D regression models. In a simple D-in-D comparison of sample means, suppose μ_{mt} represents the average energy use of home type *m* in period *t* where t represent time periods (t=0 before the program, and t=1 during the program) and m represents home type (m=0 for control group homes, and m=1 for treatment group homes). The D-in-D estimator would be:

$$(\mu_{11} - \mu_{10}) - (\mu_{01} - \mu_{00})$$

Here, the difference ($\mu_{11} - \mu_{10}$) is the difference in treatment group customers' usage before and after participating in the program, which includes both naturally occurring usage changes and the effects of the HEES Program. The difference ($\mu_{01} - \mu_{00}$) is the difference in control group customers' usage before and after participating in the program, which includes only the effects of naturally occurring usage changes. The difference between these two quantities is used to estimate the program effects, or savings.[20] A similar method was used to estimate cross-program participation uplift savings.

The analysis to estimate the effects of the HEES program was more complex than the illustration above as it uses a regression analysis to control for the effects of weather, usage trends, participation in other programs, and differences that already existed between the treatment and control group in the pre-period.

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[20] Also called the ATE, the D-in-D of the two elements—($\mu_{11} - \mu_{10}$) and ($\mu_{01} - \mu_{00}$)—served as the model's explanatory variable of interest, defined as the coefficients on PART * POST ($\beta_1 - \beta_3$).

Model Specification

Cadmus replicated the D-in-D model specification used in the previous impact evaluation ("2013 evaluation model"). This model compared average daily consumption (ADC) of treatment and control group customers before and after the program to estimate average daily savings and the persistence of savings at the quarter and midway mark of the program's effect in its first year. This model controlled for weather, monthly energy usage trends, individual customer fixed effects, and customer participation in other DSM programs. The model in Equation 1 provides the model specification, where ADC (kWh) of home 'i' in month 't' is the response variable:

<div align="center">

Equation 1

$$ADC_{it} = \beta_1 \, PART_i * POST1_{it} + \beta_2 \, PART_i * POST4_{it} + \beta_3 \, PART_i * POST7_{it}$$
$$+ \, W'\gamma + \alpha_i + \tau_t + EE_{it} + \varepsilon_{it}$$

</div>

Where:

β_1	=	Coefficient representing the conditional average treatment effect (ATE) of the program on electricity use (average kWh per home per day); this is the effect of the HEES program on energy use
β_2	=	Coefficient representing the additional ATE of the program on electricity use (average kWh per home per day) after three months
β_3	=	Coefficient representing the additional ATE of the program on electricity use (average kWh per home per day) after six months
$PART_i$	=	Indicator variable for program participation (equaling 1 if the home was in the treatment group and 0 otherwise)
$POST1_{it}$	=	Indicator variable for whether the month was pre- or post-period; this variable equaled 1 in all months following the month in which a customer returned the HEES Program survey and 0 otherwise
$POST4_{it}$	=	Indicator variable for whether the month occurred three months after the post-period started; this variable equaled 1 starting in the fourth month after the month in which a customer returned the HEES Program survey and 0 otherwise
$POST7_{it}$	=	Indicator variable for whether the month occurred after six months of after the post-period started; this variable equaled 1 starting in the seventh month after the month in which a customer returned the HEES Program survey and 0 otherwise
W	=	Vector using heating degree day and cooling degree day variables to control for the impacts of weather on energy use[21]
γ	=	Vector of coefficients representing the average impact of weather variables on energy use

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[21]   In the final weather vector (W), Cadmus used HDD, CDD, HDD squared, and CDD squared.

α_i	=	Average energy use in home 'i' that was not sensitive to weather or time; this variable controlled for non-weather-sensitive and time-invariant energy use, i.e., home fixed effects
τ_t	=	Average energy use in month 't' that accounted for unobservable factors specific to each month; this variable controlled for these effects, i.e., month-by-year fixed effects
EE_{it}	=	Indicator variable for whether or not home 'i' installed any measure from another DSM program; this variable equaled 1 starting the month after the home's earliest DSM installation and 0 otherwise
ε_{it}	=	Error term for home 'i' in month 't'

Cadmus ran the model in two stages:

- Including all treatment and control group customers

- Separately for four groups according to pre-period consumption quartiles

Evaluating the model for customers in different pre-period consumption quartiles allowed Cadmus to determine whether higher energy users saved energy at different rates than low energy users, as would be likely, providing a check on the reasonableness of the savings estimates.

Annualization of Savings Estimates

The above 2013 evaluation D-in-D model estimated three levels of ATE (overall post-period, third month persistence, and sixth month persistence). Cadmus combined these three savings coefficients (β_1, β_2, and β_3) to calculate average, total first-year savings. As the model estimated changes in average *daily* consumption, Cadmus multiplied each savings coefficient by its corresponding number of days in the year (i.e., 365 days for savings in the full post-period, β_1; 273.75 days for the POST4 savings estimate, β_2, etc.). The following formula shows the calculation for this combined first-year ATE using the model's coefficients:

Equation 2
First-Year ATE per Customer = $-\beta_1 *365 - \beta_2 *(3/4*365) - \beta_3*(1/2*365)$

In Equation 2, Cadmus included the savings coefficient if it was significant at the 90% confidence level; otherwise, it was set to zero to calculate savings. The evaluation team multiplied the three coefficients (β terms) by -1 because the model estimated changes in energy consumption, where negative estimates implied positive energy savings. After calculating first-year ATE per customer, Cadmus multiplied the per-customer savings by the total number of 2015 participants (customers who returned a mail-in survey in 2015) to estimate the total 2015 HEES Program's first-year net energy savings using the following equation:

Equation 3
2015 Total HEES Program First-Year Net Savings = First-Year ATE per Customer * N

Where:

> N   =   Total number of SCE customers who participated in the 2015 HEES Program by returning a mail-in survey

Net-to-Gross Ratio

Cadmus did not conduct a separate net-to-gross (NTG) savings analysis. The D-in-D approach, which accounted for changes in energy consumption in the control group as well as the treatment group, estimated net savings, implicitly accounted for freeridership and spillover.

Uplift Analysis

Cadmus conducted an uplift analysis to estimate the HEES Program's impacts on participation in other DSM programs and energy savings accrued from those programs. As the regression controlled for cross-program participation in the model (using the EE_{it} coefficient),[22] savings from non-HEES DSM programs were not double-counted. The uplift analysis, however, could provide important insights to aid program implementers in understanding whether the HEES Program caused participation in other DSM programs and, if so, to what extent.

To estimate savings from other efficiency program participation associated with HEES Program participation, Cadmus relied on the quasi-experimental design (treatment and matched control group). As an example, suppose an equal number of customers belong to each of the treatment and control groups, and through a separate program, the utility promoted installing Measure A to its customers. If customers in both the treatment and control group received the same marketing and incentives for Measure A installations, the effect of the HEES Program on customer installations can be estimated by comparing installation rates and/or resulting savings in the treatment and control group, as shown in Equation 4:

<div align="center">

Equation 4

HEES Program savings from installation of Measure A = $\Delta r_A * S_A$

</div>

Where:

> Δr_A =   Difference in Measure A installation rates between treatment and control group
>
> S_A =   Per-measure deemed savings

Cadmus requested tracking data (e.g., measure name, program, deemed yearly savings, installation date) for all downstream DSM programs in which HEES Program participants were involved.[23] The team defined participation uplift as the HEES Program's effect on HEES participants' participation rates in

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[22] See Equation 1.

[23] Cadmus did not receive tracking information for the SCE Home Energy Reports Program, and therefore could not test or control for its interactive effects.

other SCE DSM programs. The baseline participation rate represented the business-as-usual rate of customer participation in other programs and was defined as the number of control group customers who participated in at least one other energy efficiency program in the post-period, divided by the total number of control group customers. The baseline plus HEES participation rate was similarly defined among the treatment group customers.

Participation uplift equaled the difference between the treatment group customers' participation in other programs and the baseline participation rates. When this value was positive, the result indicated that treatment group customers participated at a higher rate in other programs than control group customers. The percentage participation uplift equaled the participation uplift divided by the baseline participation rate.

Cadmus also calculated the savings uplift to determine whether treatment customers *saved more energy* than control group customers by participating in other DSM programs. The average uplift savings value for treatment and control customers equaled the total savings, in post-period months, divided by the total number of customers in each group. Cadmus calculated the savings uplift difference as the average uplift savings per treatment customer, minus the average uplift savings per control customer. The total savings uplift was the difference multiplied by the total number of treatment customers.

Finally, the savings uplift percentage of program savings equaled the total savings uplift divided by the total HEES Program first-year net savings.

Behavior Change Survey

To provide some context to the impact evaluation results and to understand the degree of influence the HEES Program has on customers' behavior, Cadmus conducted an online survey with a sample of the treatment group (participants) and control group (matched nonparticipants).

Survey Design

To develop the behavior change survey instrument, Cadmus used information from the program design and materials review and reviewed the 2013 HEES evaluation report.[24] The first half of the survey asked the treatment and control groups identical questions to allow for statistical comparisons between the groups and to determine the program's influence on participants, as compared to nonparticipants. The second half of the survey asked the treatment group specific questions about the HEES Program. Table 5 lists the research topics and question sequence of the behavior change survey.

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[24]   Itron. *2010-12 CPUC HEES Impact Evaluation, Final Report*. July 8, 2013. Available online: http://calmac.org/publications/HEES_Final_Report_20130708.pdf

Table 5. Research Topics and Flow of Behavior Change Survey

Topic	Asked of Treatment Group	Asked of Control Group
Adoption of energy-saving behaviors	✓	✓
Adoption of energy-saving measures	✓	✓
Purchase and installation of efficient lighting (CFLs and LEDs)	✓	✓
Awareness of other California DSM programs	✓	✓
HEES Program recall and usefulness of content	✓	
Attribution of HEES Program on behaviors and measures	✓	
Installation of SCG kit items	✓	

Because surveys rely on self-reporting, validity issues and biases (e.g., self-selection and social desirability) could result. Cadmus constructed the behavior change survey to minimize such validity issues and biases using the following best practices:

- Drafted questions that were not leading, ambiguous, or double-barreled[25]

- Designed a single survey instrument and survey invitation message to order the survey flow identically for the treatment and control groups

- Moved identical group questions to the beginning of the survey and moved group-specific questions near the end of the survey

- Employed randomization of list-based survey items to reduce order effects

The behavior change survey asked questions about measure adoption and behavioral practice adoption that occurred during the past two years. Cadmus notes, however, that—by the time respondents answered the behavior change survey questions—nearly two years have passed since treatment group customers completed the home energy and water efficiency survey and/or received the recommendations report. Therefore, the team acknowledges the possible recall bias in the behavior change survey responses.

Cadmus administered the behavior change survey through the online survey platform Qualtrics during a one-and-a-half week period in October 2016 and offered a gift card lottery incentive to customers who completed the survey.

Sampling

The behavior change survey employed random sampling stratified by group and collected a total of 1,010 respondents—510 from the treatment group and 500 from the control group. Table 6 shows the survey sample design and achieved sample.

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[25]   Double-barreled questions ask about two or more unique concepts in the same question.

Table 6. Behavior Change Survey Sample

Group	Population in Impact Evaluation	Population with E-Mail Address	Target Survey Sample Size	Achieved Survey Sample Size
Treatment Group (Participants)	66,338	30,236	500	510
Control Group (Matched Nonparticipants)	66,338	27,707	500	500
Total	**132,676**	**57,943**	**1,000**	**1,010**

Data Analysis

To determine if treatment and control group responses were significantly different, Cadmus used a t-test and reported results at the 5% ($p \le 0.05$) and 10% ($p \le 0.10$) significance levels.

Findings

This section presents the detailed evaluation findings.

Energy Savings

This subsection shows the model's output of key variables of interest for the overall population and by quartile, and explains the results of annualizing the coefficients, calculating the total program savings, and obtaining the realization rate.

D-in-D Results

SCE distributed surveys to customers starting in the spring of 2015 and then continued to send them out in smaller waves through the rest of the year. Most customers returned the HEES Program survey in summer months, June and July. This could have implications in terms of the types of behaviors or measures these customers decided to adopt. Additionally, the customers who returned their surveys earlier, in the spring and summer months, were generally faster at returning them (i.e. waited fewer days between receiving the survey and returning them to SCE) than the customers who returned them later in the year. See Table 7 for more details.

Table 7. Survey Return Date Frequencies

Month	Number of Customers who Returned Mail-in HEES Survey to SCE	Mean Number of Days between Survey Received and Survey Returned
March	4,138	13.8
April	1,535	29.5
May	11,483	14.3
June	29,804	20.9
July	26,560	23.8
August	11,014	26.3
September	2,520	68.7
October	738	110.6
November	273	142.1
December	299	177.1
Overall	**88,364**	**24.4**

The results of the overall D-in-D model established statistically significant savings in the post-period of 0.15 kWh/day per customer, on average. The two persistence variables (POST4 and POST7) showed negative point estimates, indicating a decrease in savings at the four- and seven-month marks, although these decreases did not prove statistically significant at the 90% confidence level. The persistence estimates were not included in the annualization calculation because they were not statistically significant. The model also controlled for the average customer's savings from other SCE DSM programs, as shown in Table 8.

Table 8. Model Outputs for Full Dataset

Customer Set	Variable	Coefficient (Effect on ADC, kWh)	p-value	Standard Error
Full Data	PARTxPOST1*	-0.15	<.0001	0.04
	PARTxPOST4	0.05	0.19	0.04
	PARTxPOST7	0.02	0.47	0.03

*Variable was significant at the 90% confidence level and was included in the annualized savings calculation.

Cadmus also ran the model separately for each pre-period consumption quartile of customers to test whether higher energy users also saved at higher rates. Generally, this held true: the highest usage quartile saved the most (at 0.21 kWh/day) and received the highest savings from other programs during the observed study period (at 1.45 kWh/day). Quartile 3 followed and saved the next highest amount of energy per day (at 0.17 kWh/day).

The trend became less clear for the first two quartiles. Quartile 2 did not exhibit statistically significant savings and showed a point estimate lower than Quartile 1. Nonetheless, the first two quartiles remained below the mean savings value of 0.15 kWh/day, as shown in Table 9.

Table 9. Model Outputs by Quartile of Pre-Period Consumption

Customer Set	Variable	Coefficient (Effect on ADC, kWh)	p-value	Standard Error
Quartile 1 ≤ 6,188 kWh/yr. in pre-period	PARTxPOST1*	-0.10	0.04	0.05
	PARTxPOST4	-0.01	0.91	0.05
	PARTxPOST7	-0.04	0.29	0.04
Quartile 2 6,189-7,299 kWh/yr. in pre-period	PARTxPOST1	-0.07	0.18	0.05
	PARTxPOST4	-0.08	0.19	0.06
	PARTxPOST7	0.06	0.20	0.05
Quartile 3 7,300-9,101 kWh/yr. in pre-period	PARTxPOST1*	-0.17	0.01	0.06
	PARTxPOST4*	0.15	0.03	0.07
	PARTxPOST7	-0.03	0.56	0.06
Quartile 4 ≥ 9,102 kWh/yr. In pre-period	PARTxPOST1*	-0.22	0.03	0.10
	PARTxPOST4	0.04	0.73	0.11
	PARTxPOST7	0.12	0.16	0.08

*Variable was significant at the 90% confidence level and was included in the annualization calculation.

Annualized Savings

As shown in Equation 2, Cadmus calculated the average first-year savings using the significant coefficients from the model outputs and their corresponding number of days in the year. Overall, the 2015 HEES Program treatment customers saved 56.3 kWh in the first year. This is approximately 0.71% of the baseline usage during the post-treatment period, as defined by the control customers' mean consumption, as shown in Table 10.

Table 10. Annualized Savings for Full Dataset

Customer Set	Variable	Average Per-Customer Daily Savings (kWh/day)	# Days Applicable	Per-Customer Annualized Savings (kWh/yr.)	Percentage Savings*
Full Data	PARTxPOST1	0.15	365	56.3	-
	Total per customer**			**56.3**	**0.71%**
	(Confidence Interval)***			(35.1, 77.4)	(0.44%, 0.98%)

* Cadmus calculated percentage savings as the quotient of average per-customer savings divided by control customers' average usage during the post-period.

** As noted above, persistence estimates were not included in the annualized savings calculation because they were not statistically significant. Had their contribution been significant, it would have decreased savings by approximately 15-18 kWh/year per customer.

***Cadmus shows the 90% confidence intervals in parentheses, which use Huber-White robust standard errors clustered on customer account IDs.

The highest users saved the most in the first year, at approximately 79 kWh/year, or nearly 1% of the average control group usage. Although Quartile 3 showed the next highest savings value across all post-period months (POST1), its first persistence variable proved statistically significant and showed a negative sign, meaning Quartile 3's customers experienced a decrease in savings after three months. When accounting for this effect, Quartile 3 shows the lowest overall savings value, at 22 kWh/yr. Quartile 2's savings did not prove statistically significant, and Quartile 1 saved approximately 35 kWh/yr. or 0.44%, as shown in Table 11.

Table 11. Annualized Savings by Quartile of Pre-Period Consumption

Customer Set	Variable	Average Per-Customer Daily Savings (kWh/day)	# Days Applicable	Per-Customer Annualized Savings (kWh/yr.)*	Percentage Savings**
Quartile 1 ≤ 6,188 kWh/yr. in pre-period	PARTxPOST1	0.10	365	34.8	-
	Total per customer			**34.8**	**0.44%**
	(Confidence Interval)			(6.6, 62.9)	(0.08%, 0.79%)
Quartile 2 * 6,189-7,299 kWh/yr. in pre-period	PARTxPOST1	0.07	365	26.7	-
	Total per customer			**26.7**	**0.34%**
	(Confidence Interval)			(-5.8, 59.3)	(-0.07%, 0.75%)
Quartile 3 **** 7,300-9,101 kWh/yr. in pre-period	PARTxPOST1	0.17	365	63.3	-
	PARTxPOST4	-0.15	273.75	-41.0	-
	Total per customer			**22.3**	**0.28%**
	(Confidence Interval)			(20.1, 106.5)	(0.25%, 1.34%)
Quartile 4 ≥ 9,102 kWh/yr. In pre-period	PARTxPOST1	0.22	365	78.8	-
	Total per customer			**78.8**	**0.99%**
	(Confidence Interval)			(19.7, 137.8)	(0.25%, 1.74%)

*Cadmus shows the 90% confidence intervals in parentheses, which use Huber-White robust standard errors clustered on customer account ID.

**Cadmus calculated percent savings as the quotient of average per-customer savings divided by control customers' average usage during the post-period.

***Although Quartile 2 did not have statistically significant savings at the 90% confidence level, meaning that the group's savings were indistinguishable from zero, Cadmus showed the point estimate here for illustrative purposes.

****Cadmus included the POST4 variable in the annualization calculation for the Quartile 3 customer group since it was significant at the 90% confidence level.

Cadmus estimated that the 88,378 participants in the 2015 HEES Program saved a total of 4,974 MWh in their first year, as shown in Table 12.

Table 12. 2015 Total HEES Program First-Year Savings

Per-Customer Annualized Savings (kWh/yr.)	2015 Participant Population	Total 2015 First-Year Savings (MWh)	Lower 90% Confidence Interval (MWh)	Upper 90% Confidence Interval (MWh)
56.3	88,378	4,974	3,790	6,158

Realization Rate

The 2013 impact evaluation of the HEES Program mail-in survey reported average per-customer first-year annualized savings of 211.8 kWh/yr.[26] This was used to inform per-participant ex ante savings. The realization rate is calculated as the *ex post* savings divided by the reported savings. As shown in Table 13, the program's 2015 realization rate was 26.6%.

Table 13. 2015 HEES Program Realization Rate

2015 Per-Customer Annualized *Ex Post* Savings (kWh/yr.)	Reported Per-Customer Savings (kWh/yr.)	Realization Rate
56.3	211.8	26.6%

Uplift Analysis Results

Cadmus found that the HEES Program resulted in a positive uplift in participation rates in other programs of 57.7%, shown in Table 14. The baseline participation rate is the number of customers in the control group that participated in at least one other program during the post-period, which was 9.6 customers out of every 1,000. In the treatment group, 15.1 per 1,000 customers participated in at least one other program during the post-period. Thus, approximately 5.5 more customers per 1,000 in the treatment group participated in at least one other program after returning their HEES surveys. Table 15 provides additional details on participation rates and uplift by SCE DSM program.

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[26] Itron, Inc. Prepared for California Public Utilities Commission. *2010-2012 CPUC HEES Impact Evaluation, Final Report*. July 8, 2013. Available online here: http://calmac.org/publications/HEES_Final_Report_20130708.pdf. See Table ES-7 on page 19.

Table 14. Participation Rate Uplift Summary

Baseline Participation Rate (per 1,000 Customers)	Treatment Group Participation Rate (per 1,000 Customers)	Participation Uplift (Treatment Effect on Participation Rate)	Percentage Participation Uplift
9.6	15.1	5.5	57.7%

Table 15. Participation Rate Uplift by Program

Program	Baseline Participation Rate (per 1,000 Customers)	Treatment Group Participation Rate (per 1,000 Customers)	Participation Uplift (Treatment Effect on Participation Rate)	Percentage Participation Uplift
California Advanced Homes	0.015	0.030	0.015	100.0%
Comprehensive Manufactured Homes	1.296	2.517	1.221	94.2%
Energy Upgrade California	0.377	0.904	0.528	140.0%
Plug Load and Appliances Program	9.030	14.396	5.366	59.4%
Residential HVAC Program	0.106	0.362	0.256	242.9%
Multifamily Energy Efficiency Rebate	2.367	1.191	-1.176	-49.7%

Cadmus found positive savings uplift as well. HEES participants saved 3.56 kWh/year more through their participation in other energy efficiency programs than nonparticipants did during the post-period, resulting in 236 MWh total savings uplift. This represented approximately 4.7% of the HEES Program's total first-year net savings. Results are provided in Table 16 and Table 17.

Table 16. Savings Uplift Summary

	SCE HEES Uplift
Average Uplift Savings per Treatment Customer (kWh/yr.)	9.50
Average Uplift Savings per Control Customer (kWh/yr.)	5.94
Cross-Program Savings Uplift Difference per Treated Customer (kWh/yr.)	3.56
Total Savings Uplift in (MWh/yr.)*	**236**
Savings Uplift's Percentage of HEES Program Savings**	4.7%

*Total savings uplift is the product of the uplift difference and the total number of treatment group customers.

**Calculated as the total savings uplift divided by the total HEES Program first-year net savings (4,974 MWh).

Table 17. Savings Uplift by Program*

Program	Treatment Group Per-Customer Annual Energy Savings (kWh/yr.)	Control Group Per-Customer Annual Energy Savings (kWh/yr.)	Delta: Per-Customer Annual Energy Savings (kWh/yr.) **
California Advanced Homes	0.03	0.01	0.02
Comprehensive Manufactured Homes	0.58	0.28	0.30
Energy Upgrade California	0.33	0.06	0.27
Plug Load and Appliances Program	8.28	5.38	2.90
Residential HVAC Program	0.17	0.06	0.11
Multifamily Energy Efficiency Rebate	0.09	0.13	-0.04
Total	**9.50**	**5.94**	**3.56**

*The units in this table equal average per-customer annual energy savings (kWh/yr.) across all treatment or control group customers, per program.

**Delta (Δ) is the simple difference between the two customer groups' mean per-customer savings values, representing the program's savings uplift.

Comparison of 2015 Results to 2013 Results

In the 2015 evaluation, Cadmus replicated the data preparation and regression modeling approach used in the 2013 impact evaluation,[27] which was also used to estimate the reported savings. The evaluation team concluded that the 2015 realization rate of 26.6% reflected changes in energy consumption among SCE customers at large, rather than any variation in the evaluation methodology.[28] In an assessment of baseline energy consumption, we see that SCE residential customers reduced their average electricity consumption since 2013 (details below). Cadmus researched efficiency and conservation awareness in California and attributed this trend to factors outside of the HEES Program, including participation in other programs and general increases in efficiency and conservation awareness and the success of other energy efficiency programs in California (details below). Because baseline efficiency improved, the HEES Program may have had lower energy savings potential than in the past and resulted in smaller energy savings.

Baseline Energy Consumption

Customers observed a substantial reduction in baseline consumption from the previous evaluation to the current. Average household pre-period monthly consumption was 838 kWh in the 2013 evaluation,

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[27] Ibid.

[28] Note that Cadmus does discuss possible improvements and changes to the methodological approach that had been used previously. However, using these methods still results in a significantly smaller realization rate than found in 2013. See Appendix A for further discussion.

based on 2009 pre-period data, and was 669 kWh in the current evaluation, based on 2014 pre-period data, nearly a 20% decrease.

In addition to the lower baseline, customers who did not participate in the HEES Program continued to decrease their usage in the post-period. In short, control group customers continued to improve their efficiency in parallel with treatment group customers, resulting in lower energy savings than would have resulted had the control group customers' efficiency not continued to improve.

Efficiency and Conservation Awareness in California

Possible drivers of the decrease in baseline consumption include other SCE program offerings and other influences. A number of SCE customers participated in other efficiency programs in the absence of the HEES Program. As discussed in the Uplift Analysis section, the baseline participation rate was 9.6 customers per 1,000, saving 394 MWh in total from their participation in other downstream efficiency programs. Customers in the control and treatment groups could also have participated in upstream efficiency programs during either the pre- or post-period, but data were not available to study this. Pre-period program were not available to compare program participation rates year over year.

In addition, a number of program, policy, and market changes since 2013 have made it easier for Californians overall to reduce their energy consumption. For example, Energy Upgrade California—a statewide marketing program that encourages California citizens to reduce their energy footprint— provides tips and product recommendations similar to those provided by the HEES Program, including turning off lights when not in use, adjusting thermostats, purchasing energy efficient lighting and appliances, and other energy-saving behaviors and purchases.

Between 2012 and 2014, the federal Energy Independence and Security Act (EISA) also took effect across the United States. Title 20 appliance standards, however, allowed California to implement EISA requirements one year earlier. Thus, from 2011 to 2013, California phased in efficiency standards that affected residential lighting, transforming the market and greatly improving efficiency and reduced lighting energy use during this time – most CFLs and LEDs achieve nearly 80% energy savings over incandescent lighting. The effect of these changes contribute the decrease in baseline energy consumption, largely eliminating inefficient light bulbs, and contributing to the decreased potential of the HEES program by removing lighting as a measure that previously resulted in relatively large and easily implemented savings in previous program years.

This change in efficiency has implications for the HEES program savings. The data indicate that over the seven years since the previous evaluation's pre-period in 2009, SCE residential customers have become more efficient. Although the HEES Program continues to result in energy savings, the low realization rate may be driven by customer participation in other programs as well as updates to California's codes and standards and other policy and market changes. In summary, savings opportunities that the HEES Program has historically relied upon could have been captured by other initiatives and are less readily available to the HEES program.

Behavior Change Survey

Cadmus conducted a brief survey to answer key research questions around customer behavior change due to the HEES Program. Because treatment customers received the HEES recommendations report, we would expect to see higher measure adoption and behavioral adoption rates among the treatment customers than the control customers. Below, we describe the results. All references to significant findings in this report section indicate statistically significant findings at the 5% (p≤0.05) or 10% (p≤0.10) level. For the most part, Cadmus did not compare survey results to the 2013 HEES Program evaluation survey results because of major differences in survey question design, response choices, and the inclusion of a control group in our survey. Nonetheless, in a few instances (usefulness rating and customization suggestions), we made comparisons.

Self-Reported Adoption of Energy-Saving Measures

Based on self-reported adoption of 11 energy-saving measures, treatment and control respondents had similar measure adoption rates for most measures, as shown in Figure 2. However, they differed significantly in the adoption of three of the measures. Treatment respondents reported a significantly higher adoption rate than control respondents for water-saving products (e.g., low-flow showerheads and aerators), smart thermostats, and efficient heating/cooling equipment.[29] This result was expected in particular for water-saving measures because the HEES Program distributed an energy efficiency kit that included a low-flow showerhead and aerators.

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[29]   Significant difference at the 5% level (p≤0.05).

Figure 2. Self-Reported Adoption of Energy-Saving Measures

		Yes	No	Don't know/not applicable	No answer
CFLs or LEDs	Treatment	92%	8%		
	Control	88%	9%	2%	
Low-flow showerhead, faucet head, or aerator	Treatment	77% ++	21%	2%	
	Control	65%	30% +	4%	
ENERGY STAR® or high-efficiency appliance	Treatment	68%	27%	4%	
	Control	68%	25%	5%	
Sealed air leaks, cracks, or other gaps around the house	Treatment	53%	38%	9%	
	Control	53%	38%	7%	
Smart thermostat	Treatment	44% ++	45%	10%	
	Control	32%	53% ++	14%	
High-efficiency doors or windows	Treatment	42%	51%	7%	
	Control	40%	50%	9%	
ENERGY STAR® or high-efficiency heating or cooling equipment	Treatment	39% ++	47%	13%	
	Control	31%	52% +	15%	
Two-speed or variable-speed pool pump	Treatment	8%	16%	75%	
	Control	9%	16%	74%	
Insulated pool cover	Treatment	7%	19%	74%	
	Control	5%	20%	73%	
Hybrid gas-electric heat pump water heater	Treatment	6%	76%	17%	
	Control	5%	74%	19%	
Solar panels or a photovoltaic system	Treatment	4%	86%	9%	
	Control	2%	86%	10%	

++Significant difference at the 5% level (p≤0.05).

+Significant difference at the 10% level (p≤0.10).

Question: "We'd like to know about home improvements you made in the past 2 years. Tell us if you have done the following…" (Treatment Group n=510, Control Group n=500).

Self-Reported Adoption of Energy-Saving Behavioral Practices

Cadmus asked respondents if and when they began the energy-saving behavioral practices shown in Figure 3. The results indicated that a large majority of treatment and control customers began engaging in these practices more than two years prior to receiving the home energy and water efficiency survey.

Cadmus found significant differences in adoption of behavioral practices in in only two categories. The control customers had significantly higher adoption rates for water-heating temperature settings and turning lights off. Control respondents (11%) kept water-heating temperatures to 120 degrees,[30] whereas treatment respondents (6%) did. Control customers also reported turning off lights in unoccupied rooms at a higher rate (8%) than treatment customers (5%).[31]
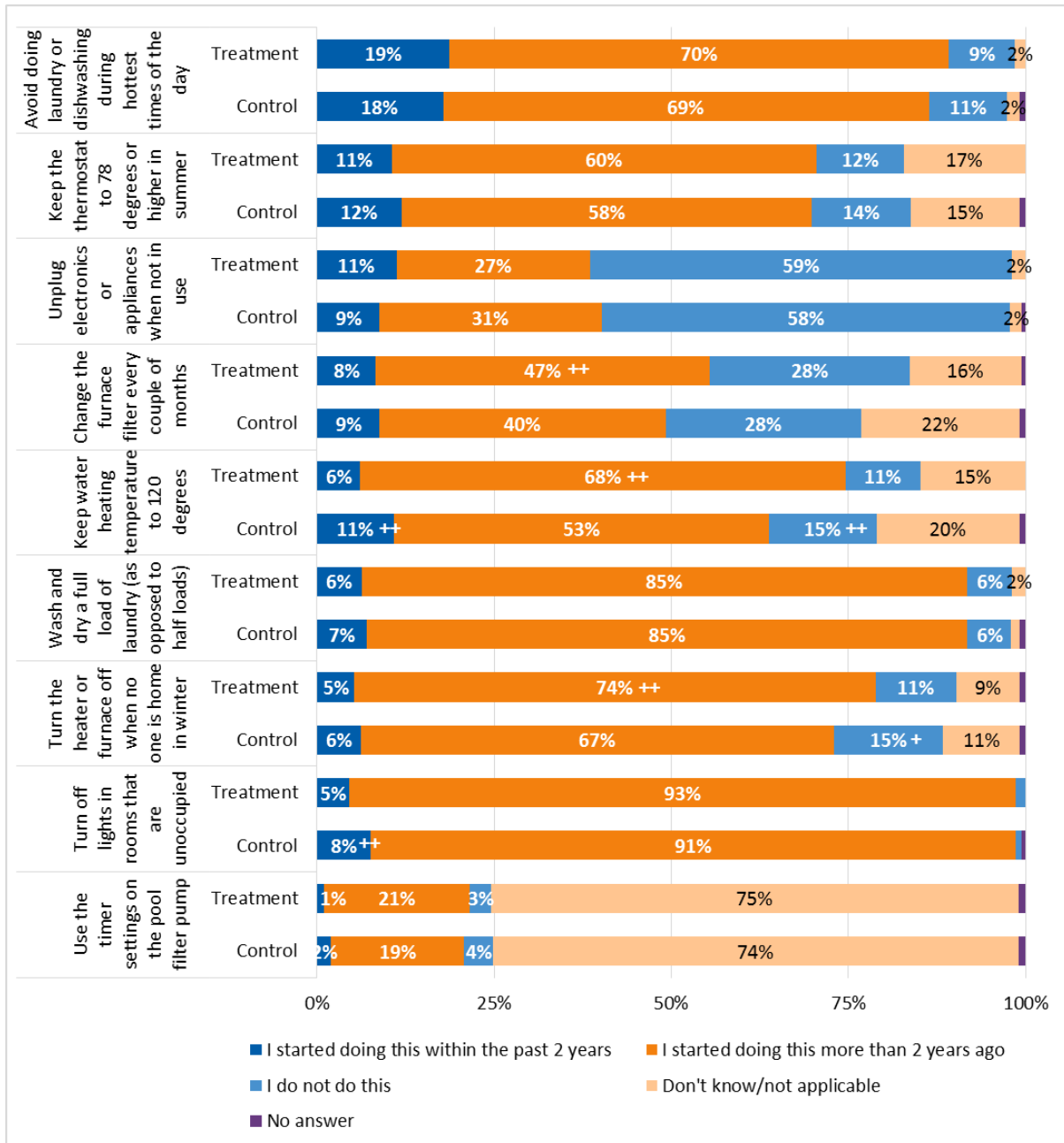
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[30]   Significant difference at the 5% level (p≤0.05).

[31]   Significant difference at the 5% level (p≤0.05).

Figure 3. Self-Reported Adoption of Energy-Saving Behavioral Practices

Figure 3. Self-Reported Adoption of Energy-Saving Behavioral Practices

The chart presents the following data by category and group:

Avoid doing laundry or dishwashing during hottest times of the day
- Treatment: 19%, 70%, 9%, 2%
- Control: 18%, 69%, 11%, 2%

Keep the thermostat to 78 degrees or higher in summer
- Treatment: 11%, 60%, 12%, 17%
- Control: 12%, 58%, 14%, 15%

Unplug electronics or appliances when not in use
- Treatment: 11%, 27%, 59%, 2%
- Control: 9%, 31%, 58%, 2%

Change the furnace filter every couple of months
- Treatment: 8%, 47% ++, 28%, 16%
- Control: 9%, 40%, 28%, 22%

Keep water heating temperature to 120 degrees
- Treatment: 6%, 68% ++, 11%, 15%
- Control: 11% ++, 53%, 15% ++, 20%

Wash and dry a full load of laundry (as opposed to half loads)
- Treatment: 6%, 85%, 6%, 2%
- Control: 7%, 85%, 6%

Turn the heater or furnace off when no one is home in winter
- Treatment: 5%, 74% ++, 11%, 9%
- Control: 6%, 67%, 15% +, 11%

Turn off lights in rooms that are unoccupied
- Treatment: 5%, 93%
- Control: 8% ++, 91%

Use the timer settings on the pool filter pump
- Treatment: 1%, 21%, 3%, 75%
- Control: 2%, 19%, 4%, 74%

Legend:
- I started doing this within the past 2 years
- I started doing this more than 2 years ago
- I do not do this
- Don't know/not applicable
- No answer

++Significant difference at the 5% level (p≤0.05).

+Significant difference at the 10% level (p≤0.10).

Question: "We'd like to understand your everyday energy-using habits during the past 2 years. For each item, please select the statement that best describes your energy-using habits." (Treatment Group n ranges=510, Control Group n=500).

Purchase and Installation of Efficient Lighting

Cadmus compared the uptake of upstream lighting measures between the treatment and control groups by asking about purchases and installations of CFLs and LEDs during the past two years. Respondents

who said "yes" to the question about adoption of CFLs and LEDs (Figure 3**Error! No bookmark name iven.**, above) were asked additional follow-up questions about how many CFL and LED bulbs they purchased and installed. As shown in Figure 4, respondents purchased and installed about the same number of CFLs and LEDs with no significant difference between groups.

Figure 4. Purchase and Installation of Efficient Lighting
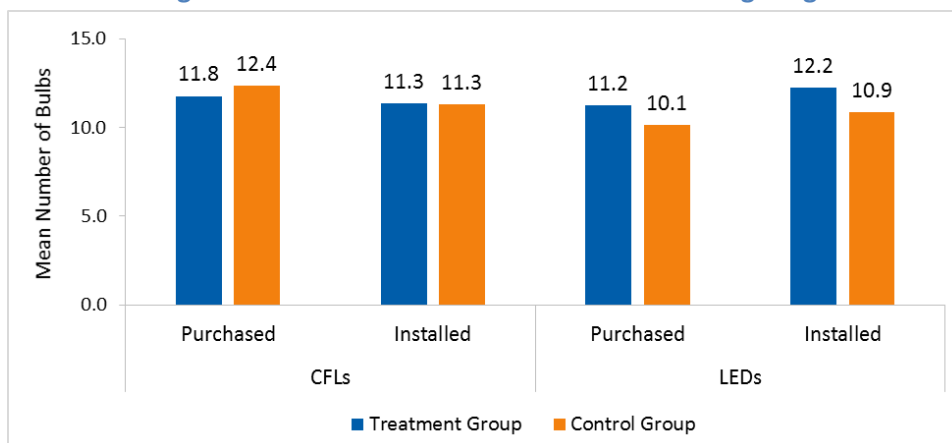
Question: "Using your best guess, about how many CFL/LED bulbs did you purchase in the past 2 years? Please count the number of individual bulbs." (Treatment Group CFL n=463, Control Group CFL n=434; Treatment Group LED n=461, Control Group LED n=430). Question: "Of the [insert response] CFL/LED bulbs you purchased, how many are currently installed in your home?" (Treatment Group CFL n=377, Control Group CFL n=364; Treatment Group LED n=367, Control Group LED n=333).

Awareness of Other California DSM Programs

To determine if the HEES Program increased customer awareness of other California DSM programs, Cadmus asked customers about their familiarity with energy efficiency rebates and programs offered by SCE. As shown in Figure 5, a significantly higher proportion of treatment respondents (66%) said they were familiar with rebates and programs compared to control respondents (60%).[32] The significant difference occurs when categories were collapsed into familiar, including *very familiar* and *somewhat familiar*, and not familiar, including *not too familiar* and *not at all familiar*. There were no significant differences between treatment and control at the more granular level: 18% of treatment respondents said *very familiar* compared 16% of control respondents; 48% of treatment respondents said *somewhat familiar* compared to 44% of control respondents.

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[32]   Significant difference at the 10% level (p≤0.10).

Figure 5. General Familiarity with Other California DSM Programs
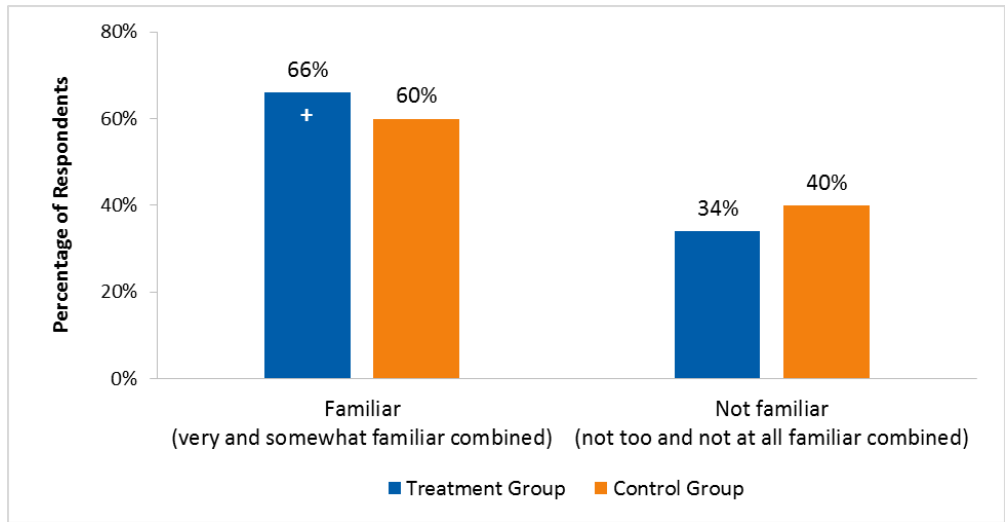
[+] Significant difference at the 10% level (p≤0.10).
Question: "How familiar are you with SCE's energy-efficiency rebates and programs?"
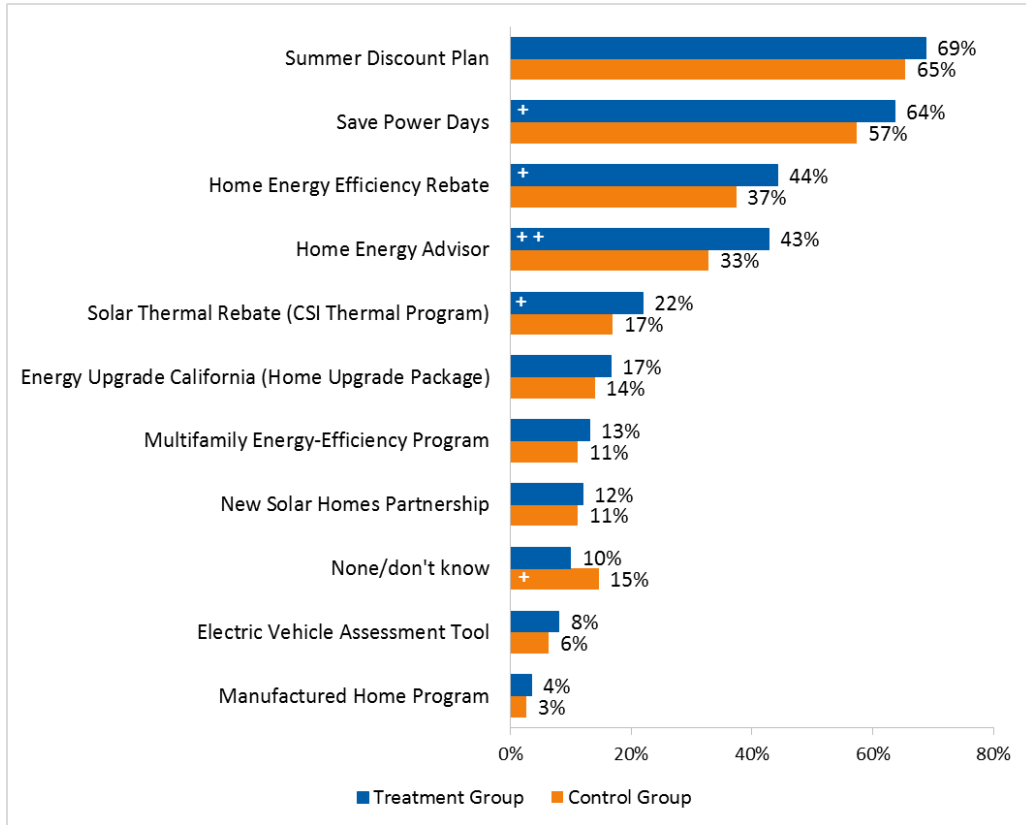(Treatment Group n=503, Control Group n=492)

When asked to identify specific programs, treatment and control customers significantly differed in their awareness. For the California DSM programs shown in Figure 6, treatment respondents consistently had greater awareness than control respondents and for four programs in particular: Save Power Days, Home Energy Efficiency Rebate, Home Energy Advisor, and Solar Thermal Rebate.[33] Higher awareness of other programs among treatment customers supports the positive participation uplift findings.

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[33]   Significant differences at the 10% level (p≤0.10) or 5% level (p≤0.05).

Figure 6. Awareness of Specific California DSM Programs

Summer Discount Plan: Treatment Group 69%, Control Group 65%
Save Power Days: Treatment Group 64% (+), Control Group 57%
Home Energy Efficiency Rebate: Treatment Group 44% (+), Control Group 37%
Home Energy Advisor: Treatment Group 43% (++), Control Group 33%
Solar Thermal Rebate (CSI Thermal Program): Treatment Group 22% (+), Control Group 17%
Energy Upgrade California (Home Upgrade Package): Treatment Group 17%, Control Group 14%
Multifamily Energy-Efficiency Program: Treatment Group 13%, Control Group 11%
New Solar Homes Partnership: Treatment Group 12%, Control Group 11%
None/don't know: Treatment Group 10%, Control Group 15% (+)
Electric Vehicle Assessment Tool: Treatment Group 8%, Control Group 6%
Manufactured Home Program: Treatment Group 4%, Control Group 3%

■ Treatment Group ■ Control Group

+ Significant difference at the 10% level (p≤0.10).
++ Significant difference at the 5% level (p≤0.05).
Question: "Which of these energy-efficiency rebates and programs from SCE have you heard about? (Select all that apply)" (Treatment Group n=509, Control Group n=500)

Recall of HEES Program and Usefulness of Recommendations Report

Cadmus asked treatment customers about completing the HEES survey and the utility of the report they received. The majority of treatment customers recalled completing the HEES survey (76%, n=481) and the subsequent recommendations report (75%, n=339). Customers indicated that they found the recommendations report *moderately useful* in helping them save energy in their homes. On average, customers who recalled receiving the recommendation report scored it with a usefulness rating of 6.1 (n=333) on a ten-point scale, where scores increased from one (*not at all useful*) to ten (*very useful*). The usefulness mean rating (6.1) decreased from the previous evaluation's mean rating of 6.9.[34] The decrease in the recommendations report's usefulness may be due to the issue with customization (more details in next section).

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[34] Itron. *2010-12 CPUC HEES Impact Evaluation, Final Report*. July 8, 2013. See page 100.

Suggestions for Improvement

Respondents provided suggestions on ways to improve the recommendations report. Cadmus categorized individual responses and we provide an example of selected quotations below (n=104).

- **Innovate or update tips** (28%): "Make [the report] less generic. Pretty much everyone knows to seal windows and doors and replace incandescents with LEDs."

- **Customize** (16%): "Mostly recommendations didn't apply or had already been implemented. Surveys should be tailored to the age of the home."

- **Housing type-specific tips** (13%): "[Provide] more info that applies to rental units/apartments. There is not much we can do (regarding windows, sealing cracks, solar, etc.) when in a rental unit."

- **Rebate and program information** (11%): "More detailed information about rebate programs and subsidies provided by Edison and/or the State would be useful."

- **Affordable tips** (10%): "More choices and suggestions … Especially for people with a limited income."

In the 2013 HEES Program evaluation, the survey found respondents who were dissatisfied with the HEES recommendations were dissatisfied due to the recommendations being generic and lacking customization; therefore, that evaluation recommended increasing the customization of the HEES recommendations report.[35] Based on the respondent comments above from Cadmus' survey, the HEES Program has not made progress on addressing the issue of customization; 16% of respondents suggested customization and 28% suggested innovative tips.

Furthermore within the suggestions for improvement, 3% of respondents (n=104) gave comments that suggest customer confusion with the Home Energy Reports or wanting the HEES recommendations report to resemble the Home Energy Reports. This is not surprising, considering the HEES recommendations report and the Home Energy Reports both include a similar homes comparison and energy-saving tips. Respondent quotations follow:

- "Better comparisons to similar households (same zip code, household size, house size, etc.)."
- "SCE keeps sending reports on neighbor comparison of energy use."
- "I don't know. I live alone and it says I use more energy than any of my neighbors. I don't know why."

SCE noted that in 2015, around 220,000 customers received the Home Energy Reports. Due to the lack of a Home Energy Reports indicator in SCE's tracking data, Cadmus could not determine who in our

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[35] Itron's evaluation did not report the number of respondents who indicated in the open-end comments that the HEES recommendations were generic/not specific. Itron. *2010-12 CPUC HEES Impact Evaluation, Final Report*. July 8, 2013. See page 100.

survey sample received the Home Energy Reports. Having had the indicator, this evaluation could have further investigated the possible overlap between the HEES Program and the Home Energy Reports.

Perceived Attribution of HEES Program on Measure and Behavior Adoption

Cadmus asked treatment respondents who previously answered that they had adopted energy-saving measures and behavioral practices within the past two years a couple of follow-up questions about how important the recommendations report was in helping them make these changes. Respondents rated the importance level on a 10-point scale, where 1 meant *not at all important* and 10 meant *very important*. On average, respondents rated the importance of the recommendations report at 5.6 (n=465) for the adoption of the energy-saving measures and a 6.3 (n=195) for the adoption of the behavioral practices.

Installation of SCG Kit Items

Cadmus asked customers about receiving energy efficiency kits from SCG and installing those measures. A large majority of treatment customers remembered receiving a kit from SCG (84%, n=457). Of these, 23% (n=377) reported not installing or using any of the items. Among the customers who installed items, most of them installed low-flow showerheads and aerators. Fewer customers installed or used hot-water temperature cards or filter whistles. Table 18 shows the installation rates for each kit item.

Table 18. Installation Rates of SCG Kit Items*

Low-Flow Showerhead	Aerators Combined	Kitchen Aerator	One Bathroom Aerator	Two Bathroom Aerators	Hot-Water Temperature Card	Filter Whistle	Did Not Install/Use Anything
63%	49%	27%	11%	31%	17%	9%	23%

*Percentages based on respondents who recalled receiving the kit (n=377).

Summary

The evaluation team conducted a thorough impact analysis of SCE's HEES Program. Using methods largely similar to the ones used in the last evaluation cycle, we found significantly smaller per person energy savings. We also found evidence that the program was increasing interest and awareness in other energy efficiency programs, as well as uplift for certain programs and energy saving measures. While the program appears to be showing savings, we recommend that SCE consider redesigning the program to increase its per-person savings, and targeting the program at customers most likely to be impacted by program recommendations.

Appendix A. Methodological Approach

In addition to using the model and data preparation approach from the previous 2013 HEES Program evaluation (the 2013 evaluation model), Cadmus also used its standard data preparation and differences-in-differences (D-in-D) model specification to analyze energy consumption (referred to as the Cadmus full model). The Cadmus full model involves estimating variations of the D-in-D model specification. Combined with the 2013 evaluation model specification, similarity in the results provides evidence that the resulting estimates are robust.

The standard Cadmus data preparation differed from the 2013 approach in the following ways:

- Cadmus included customers with fewer than 12 months of post-period billing history, i.e. late adopters, in the analysis dataset. Using the 2013 evaluation method, these customers (approximately 38% of the study population) were excluded. Cadmus found that the number of post-months in the matched treatment and control groups was balanced and that the month-year fixed effects control for any differences.[36]

- Cadmus evaluated and removed outliers in the consumption data on a bill-by-bill basis. The 2013 evaluation method removed customers with a single high or low bill from the analysis dataset. Because of the matching, Cadmus expected both groups to contain the same distribution of high and low energy users and the D-in-D approach to estimate unbiased energy savings. However, because single bills could contain data errors, it was important to review them on a case-by-case basis.

- Cadmus annualized savings coefficients using the number of treatment days. The 2013 evaluation method used 365 days of the year regardless of customer account inactive dates within the final month of post-period data.

The Cadmus full model is similar to the 2013 model specification. Both compare treatment and control group customers' pre- and post-period energy consumption. The models differ in the following ways:

- The Cadmus full model did not include terms to estimate four- and seven-month persistence, as the 2013 model did; the Cadmus model used a single post-period flag to estimate the average change in consumption.

- Cadmus calculated uplift outside of the D-in-D model, instead of using an indicator variable as in the 2013 model. The Cadmus method subtracted final savings uplift from the modeled savings estimates rather than accounting for it in the D-in-D model.

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[36] Cadmus also tested the model using the "paired months" method, in which individual customers were allowed to keep only the pre-period bills that were matched in the post-period. Keeping more customers in the final dataset results in more precise results and mitigates potential bias that could result from excluding late adopters.

The Cadmus full model assumed that average daily energy consumption (kWh) of home 'i' in month 't' would be estimated as follows:

$$ADC_{it} = \beta_1 \, PART_i * POST_{it} + W'\gamma + \alpha_I + \tau_t + \varepsilon_{it}$$

Where:

β_1	=	Coefficient representing the conditional ATE of the program on electricity use (average kWh per home per day); this was the HEES Program effect on energy use
PART	=	Indicator variable for program participation (equaling 1 if the home was in the treatment group and 0 otherwise)
POST	=	Indicator variable for whether the month was pre- or post-period; this variable equaled 1 in all months following the month in which a customer returned the HEES Program survey and 0 otherwise
W	=	Vector using heating degree day and cooling degree day variables to control for the impacts of weather on energy use[37]
γ	=	Vector of coefficients representing the average impact of weather variables on energy use
α_i	=	Average energy use in home 'i' that was not sensitive to weather or time; this variable controlled for non-weather-sensitive and time-invariant energy use, i.e., home fixed effects
τ_t	=	Average energy use in month 't' that accounted for unobservable factors specific to each month; this variable controlled for these effects, i.e., month-by-year fixed effects
ε_{it}	=	Error term for home 'i' in month 't'

Cadmus estimated its full model (Equation A-1) using the analysis dataset resulting from the Cadmus data preparation step, by quartile.[38]

Table A-1 presents the results of the Cadmus full model and standard data preparation. Table A-2 presents results using the Cadmus full model with paired-months data preparation. The resulting point estimates were similar to the 2013 evaluation model results and within their 90% confidence intervals. The consistency in results over a number of different model specifications provided the team with high confidence in the savings estimates. Further, it provided evidence that the choice of evaluation methodology was not the driver of the low realization rate in this evaluation.

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[37]   In the final weather vector (W), Cadmus used HDD, CDD, HDD squared, and CDD squared.

[38] Cadmus also used the paired-months approach which resulted in similar estimates.

Table A-1. Cadmus Full Model Results

Customer Set	Variable	Average Per-Customer Daily Savings (kWh/day)	# Days Applicable	Per-Customer Annualized Savings (kWh/yr.)	Percentage Savings*
Full Data	PART$_i$ * POST$_{it}$	0.15	365	55.4	-
	Total per customer			**55.4**	**0.71%**
	(Confidence Interval)**			(42.2, 68.6)	(0.53%, 0.86%)

*Cadmus calculated percentage savings as the quotient of average per-customer savings divided by control customers' average usage during the post-period.

**Cadmus shows the 90% confidence intervals in parentheses, which use Huber-White robust standard errors clustered on customer account ID.

Table A-2. Cadmus Paired Months Model Results

Customer Set	Variable	Average Per-Customer Daily Savings (kWh/day)	# Days Applicable	Per-Customer Annualized Savings (kWh/yr.)	Percentage Savings*
Full Data	PART$_i$ * POST$_{it}$	0.10	365	37.1	-
	Total per customer			**37.1**	**0.47%**
	(Confidence Interval)**			(23.3, 50.8)	(0.29%, 0.64%)

*Cadmus calculated percentage savings as the quotient of average per-customer savings divided by control customers' average usage during the post-period.

**Cadmus shows the 90% confidence intervals in parentheses, which use Huber-White robust standard errors clustered on customer account ID.

Figure A-1 shows the point estimates and confidence intervals for the three model specifications.
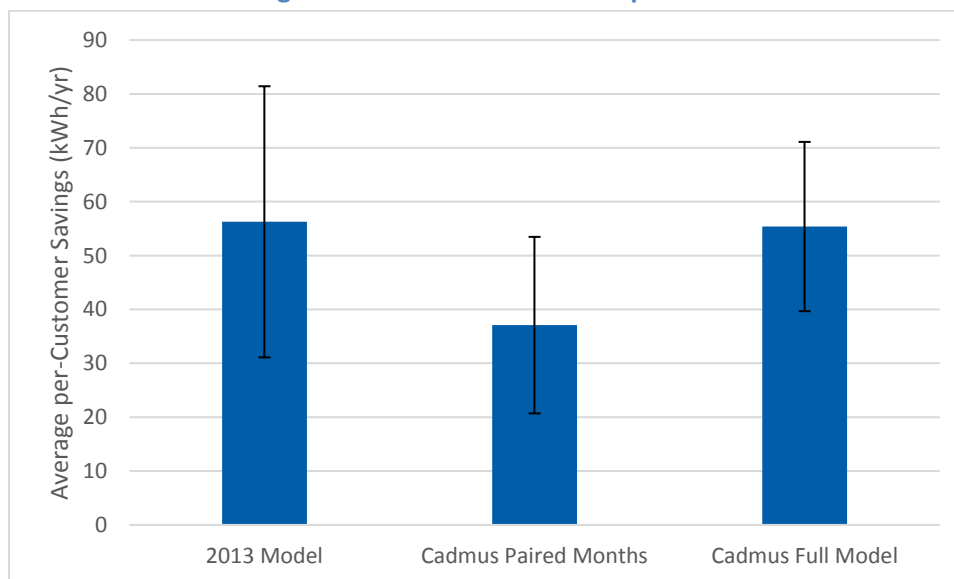
Figure A-1. Model Results Comparison

Table A-3 presents results from model fit tests performed for each model specification. Although the models yielded similar savings estimates, the Cadmus full model resulted in savings estimates with better relative precision (at 24% in comparison to 37% and 38%) than the other methods. Its adjusted R-squared was also higher, which indicates a better linear fit.

Table A-3. Model Fit Tests

Model	Adjusted R-squared	F-stat	Absolute Precision @ 90% Confidence	Relative Precision @ 90% Confidence
Cadmus full model	0.3735	<.0001	0.0361	24%
Cadmus paired month	0.3657	<.0001	0.0377	37%
2013 evaluation model	0.3095	<.0001	0.0579	38%

Appendix B. Survey Instrument

Home Energy Efficiency Survey Program
Behavior Change Survey

Survey Topics/Research Areas	Items	Asked to Treatment Group	Asked to Control Group
Adoption of energy-saving behaviors	C1	✓	✓
Adoption of energy-saving measures	D1	✓	✓
Purchase of efficient light bulbs (upstream lighting lift)	E1-E4	✓	✓
Awareness of SCE/IOU rebates and programs	F1-F2	✓	✓
HEES recall and usefulness of content	G1-G4	✓	
Attribution	H1-H2	✓	
Installation rates of SoCalGas kit items	I1-I2	✓	

Sampling Plan

Target Quota = 1,000 completes
- Treatment Group (Participants) = 500 completes
- Control Group (Nonparticipants from Matched Control Group) = 500 completes

Stratum	Estimated Pop. Count	Estimated E-Mail Count	Random Sample Frame	Target Quota
Treatment Group	44,190	17,250	8,000	500
Control Group	44,190	17,250	8,000	500

A. Survey Invitation E-Mail Message (for Treatment and Control)

To: [EMAIL ADDRESS]
From: CPUC & Cadmus
Subject: Take the home energy survey and win a gift card

Dear [FIRST NAME]:

Would you please answer some questions today about how your household uses energy? The California Public Utilities Commission (CPUC) and its research partner Cadmus want to hear from Southern California Edison customers like yourself. The purpose of this study is to learn about your level of interest in and efforts to conserving electricity, gas, and water. We know your time is valuable, so by completing the survey, you will be entered in a drawing for a chance to win a **$100 Visa gift card**. Three winners will be randomly selected. Your input is very important to us and your responses will be kept confidential. This survey will take 8 minutes to complete.

Follow this link to the Survey: [SURVEY LINK]
Or copy and paste this URL into your internet browser: [SURVEY LINK]

If you have any questions about the survey, please feel free to contact me. Thank you in advance!

Sincerely,
Peter Franzese
California Public Utilities Commission

B.   *Survey Start Screen*

Welcome! This survey will take 8 minutes to complete. Your responses will remain confidential and will only be used for research purposes.

C.   *Energy-Saving Behaviors*

[ASK TREATMENT AND CONTROL]

C1.   We'd like to understand your everyday energy-using habits during the **past 2 years**. For each item, please select the statement that best describes your energy-using habits: [RANDOMIZE ORDER] [MATRIX WITH RESPONSE CHOICES FOR EACH ITEM: 1=I STARTED DOING THIS WITHIN THE PAST 2 YEARS, 2=I STARTED DOING THIS MORE THAN 2 YEARS AGO, 3=I DO NOT DO THIS, OR 4=DON'T KNOW/NOT APPLICABLE]

   A.   Turn off lights in rooms that are unoccupied [Lighting]
   B.   Unplug electronics or appliances when not in use [Other]
   C.   Keep the thermostat to 78 degrees or higher in summer [HVAC]
   D.   Turn the heater or furnace off when no one is home in winter [HVAC]

E. Change the furnace filter every couple of months [Space Heating]

F. Keep water heating temperature to 120 degrees [Water Heating]

G. Wash and dry a full load of laundry [Water, Laundry]

H. Use the timer settings on the pool filter pump [Pool]

I. Avoid doing laundry or dishwashing during hottest times of the day [Laundry, Water]

D. Energy-Saving Measures

[ASK TREATMENT AND CONTROL]

D1. We'd like to know about home improvements you made in the **past 2 years**. Tell us if you have done the following: [MATRIX WITH RESPONSE CHOICES FOR EACH ITEM: 1=YES, 2=NO, 3=DON'T KNOW] [RANDOMIZE ORDER]

A. Installed energy-efficient light bulbs (CFLs or LEDs) [Lighting]
B. Installed ENERGY STAR® or high-efficiency heating or cooling equipment [HVAC]
C. Installed a smart thermostat [HVAC]
D. Sealed air leaks, cracks, or other gaps around the house [Building Envelope]
E. Installed high-efficiency doors or windows [Building Envelope]
F. Installed a low-flow showerhead, faucet head, or aerator [Water]
G. Installed a hybrid gas-electric heat pump water heater [Water Heating]
H. Installed an ENERGY STAR® or high-efficiency appliance (refrigerator, washer, dryer, dishwasher) [Other]
I. Installed solar panels or a photovoltaic system [Other]
J. Installed an insulated pool cover [Pool]
K. Installed a two-speed or variable-speed pool pump [Pool]

D2. Were there any other home improvements you made in the past 2 years?

1. Yes [Please describe]
2. No
3. Don't know

E. Efficient Lighting Purchases

[ASK TREATMENT AND CONTROL, AND IF D1A=YES]

E1. You mentioned that you installed CFLs or LEDs. Using your best guess, about how many **CFL bulbs** did you purchase in the **past 2 years**? Please count the number of individual bulbs, not the number of boxes or packs. If you did not purchase any CFLs, please enter a zero.
[OPEN-END NUMERIC 0-99]

E2.   Of the [INSERT RESPONSE FROM E1] CFL bulbs you purchased, how many are currently installed in your home? If you have not installed any, please enter a zero.
[OPEN-END NUMERIC: CANNOT BE GREATER THAN RESPONSE FROM E1]

[ASK TREATMENT AND CONTROL, AND IF D1A=YES]
E3.   Using your best guess, about how many **LED bulbs** did you purchase in the **past 2 years**? Please count the number of individual bulbs, not the number of boxes or packs. If you did not purchase any LEDs, please enter a zero.
[OPEN-END NUMERIC 0-99]

[ASKI IF RESPONSE FROM E3>0]
E4.   Of the [INSERT RESPONSE FROM E3] LED bulbs you purchased, how many are currently installed in your home? If you have not installed any, please enter a zero.
[OPEN-END NUMERIC: CANNOT BE GREATER THAN RESPONSE FROM E3]

F.   *Awareness of Energy Efficiency Rebates and Programs*

[ASK TREATMENT AND CONTROL]
F1.   How familiar are you with Southern California Edison's (SCE) energy-efficiency rebates and programs?
1.   Very familiar
2.   Somewhat familiar
3.   Not too familiar
4.   Not at all familiar
5.   Don't know

[ASK TREATMENT AND CONTROL]
F2.   Which of these energy-efficiency rebates and programs from SCE have you heard about? (Select all that apply) [RANDOMIZE ORDER FOR ITEMS 1-10]
1.   Home Energy Advisor: offers information on your home energy usage and tips on ways to conserve
2.   Electric Vehicle Assessment Tool: a guide to making the right decisions about purchasing and charging your electric vehicle
3.   Save Power Days: reduce electricity use on scheduled days and receive up to $100 in bill credits
4.   Home Energy Efficiency Rebate (HEER): rebates for ENERGY STAR® refrigerators, hybrid electric water heaters, variable speed pool pumps, evaporative coolers and cooling systems

5. Solar Thermal Rebate (CSI Thermal Program): installation of solar panels and enrolling in net energy meter

6. New Solar Homes Partnership: provides financial incentives and other support to homebuilders that encourage the construction of new, energy-efficient solar homes

7. Energy Upgrade California® (Home Upgrade Package): receive up to $6,500 for making comprehensive, whole-house energy-efficient upgrades and improvements

8. Summer Discount Plan: voluntarily allow SCE to shut off your AC for up to 6 hours on scheduled days and receive up to $200 in bill credits

9. Multifamily Energy-Efficiency Program: provides no-cost energy-saving products (LEDs, window evaporative coolers, aerators, and low-flow showerheads) and rebates for qualifying new products

10. Manufactured Home Program: a comprehensive assessment and installation of energy-saving products specifically for mobile homes

11. None of the above/don't know [ANSWER LOGIC: CANNOT BE SELECTED ALONG WITH OTHER ANSWERS]

G.   HEES Recall and Content

[ASK TREATMENT]

G1.   Our records show that your household completed SCE's home energy survey by mail or online back in 2014. Do you remember this survey?

1. Yes
2. No
3. Don't know

[ASK TREATMENT]

G2.   After completing the home energy survey, your household should have received a
        recommendations report from SCE with energy-saving tips and cost estimates for your home. Do
        you remember receiving this recommendations report?
            1.   Yes
            2.   No
            3.   Don't know
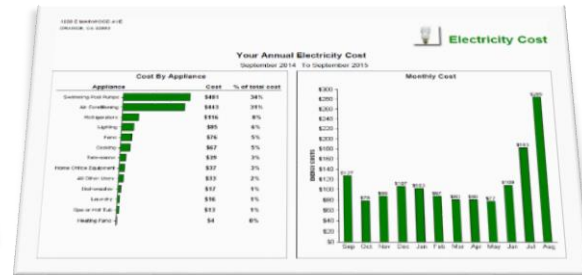
G3.   How useful was the recommendations report in helping you save energy in your home? Please rate
        on a scale from 1 to 10 where "1" means *not at all useful* and "10" means *very useful*.
            1.   1 – not at all useful
            2.   2
            3.   3
            4.   4
            5.   5
            6.   6
            7.   7
            8.   8
            9.   9
            10.   10 – very useful
            11.   Don't know

G4.   How could SCE improve the home energy survey and recommendations report? Please tell us what
        you'd like to see.
        [OPEN END]

H.   Attribution

H1.   Earlier you mentioned that you started taking energy-saving habits within the past 2 years. How important would you say SCE's recommendations report was in helping you make the habit change? Please rate on a scale from 1 to 10 where "1" means *not at all important* and "10" means *very important*.

1.   1 – not at all important
2.   2
3.   3
4.   4
5.   5
6.   6
7.   7
8.   8
9.   9
10.   10 – very important
11.   Don't know

H2.   Earlier you mentioned that you made some energy-saving improvements to your home. How important would you say SCE's recommendations report was in helping you make the energy-saving home improvements?

1.   1 – not at all important
2.   2
3.   3
4.   4
5.   5
6.   6
7.   7
8.   8
9.   9
10.   10 – very important
11.   Don't know

I.   Installation of Kit Measures

I1.   SoCalGas, in partnership with SCE, sent your household a free kit containing energy-saving products. Products included a low-flow showerhead, aerators, a hot-water temperature card, and a filter whistle. Do you remember receiving this kit from SoCalGas?

    1.   Yes
    2.   No
    3.   Don't know/I did not receive a kit

I2.   Which of the products from the kit have you installed or used? (Select all that apply)

    1.   Low-flow showerhead
    2.   Aerator(s)
    3.   Hot water temperature card
    4.   Filter whistle
    5.   Did not install or use any of the products
    6.   Don't know [ANSWER LOGIC: CANNOT BE SELECTED ALONG WITH OTHER ANSWERS]

I3.   The kit came with three aerators. Which of the three aerators have you installed? (Select all that apply)

    1.   Kitchen aerator
    2.   Only one of the bathroom aerators
    3.   Two of the bathroom aerators
    4.   Don't know [ANSWER LOGIC: CANNOT BE SELECTED ALONG WITH OTHER ANSWERS]

J.   Finish Line

J1.   Those are all the questions we have. Please provide your mailing address if you would like to be entered into a drawing for a chance to win one of three $100 Visa gift cards. This information will only be used for mailing gift cards. We will notify winners by email and deliver the gift card by mail in 4 to 6 weeks.

    Name
    Address 1
    Address 2
    City
    State
    Zip

[END OF SURVEY SCRIPT] Your responses have been submitted. Thank you!

Appendix AA. Standardized High Level Savings

The tables in Appendix AA summarizing natural gas savings make use of the unit MTherms- 1,000 Therms-rather than MMTherms- 1,000,000 Therms- for formatting purposes.

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Evaluation GRR
SCE	Survey Residential Mail	56,077	56,077	1	100%	
SCE	Survey Residential Online	1	1	1	100%	
SCE	Survey Residential Phone	84	84	1	100%	
SCE	Total	56,162	56,162	1	100%	
	Statewide	**56,162**	**56,162**	**1**	**100%**	

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	31,957	14,900	0.47	0	0.57	0.27	0.57	0.27
SCE	Survey Residential	0	0	0.42	0	0.64	0.27	0.64	0.27
SCE	Survey Residential	49	22	0.46	0	0.58	0.27	0.58	0.27
SCE	Total	32,006	14,922	0.47	0	0.57	0.27	0.57	0.27
	Statewide	**32,006**	**14,922**	**0.47**	**0**	**0.57**	**0.27**	**0.57**	**0.27**

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Evaluation GRR
SCE	Survey Residential Mail	27.0	27.0	1.00	100%	
SCE	Survey Residential Online	0.0	0.0	1.00	100%	
SCE	Survey Residential Phone	0.0	0.0	1.00	100%	
SCE	Total	27.0	27.0	1.00	100%	
	Statewide	**27.0**	**27.0**	**1.00**	**100%**	

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	15.4	7.2	0.47	0	0.57	0.27	0.57	0.27
SCE	Survey Residential	0.0	0.0	0.42	0	0.64	0.27	0.64	0.27
SCE	Survey Residential	0.0	0.0	0.46	0	0.58	0.27	0.58	0.27
SCE	Total	15.4	7.2	0.47	0	0.57	0.27	0.57	0.27
	Statewide	**15.4**	**7.2**	**0.47**	**0**	**0.57**	**0.27**	**0.57**	**0.27**

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass	Evaluation GRR
SCE	Survey Residential Mail	0	0	1	100%	
SCE	Survey Residential Online	0	0	1	100%	
SCE	Survey Residential Phone	0	0	1	100%	
SCE	Total	0	0	1	100%	
	Statewide	**0**	**0**	**1**	**100%**	

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	0	0						
SCE	Survey Residential Online	0	0						
SCE	Survey Residential Phone	0	0						
SCE	Total	0	0						
	Statewide	**0**	**0**						

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Evaluation GRR
SCE	Survey Residential Mail	18,692	18,692	1.00	100%	
SCE	Survey Residential Online	0	0	1.00	100%	
SCE	Survey Residential Phone	28	28	1.00	100%	
SCE	Total	18,721	18,721	1.00	100%	
	Statewide	**18,721**	**18,721**	**1.00**	**100%**	

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	10,652	4,967	0.47	0	0.57	0.27	0.57	0.27
SCE	Survey Residential	0	0	0.42	0	0.64	0.27	0.64	0.27
SCE	Survey Residential	16	7	0.46	0	0.58	0.27	0.58	0.27
SCE	Total	10,669	4,974	0.47	0	0.57	0.27	0.57	0.27
	Statewide	**10,669**	**4,974**	**0.47**	**0**	**0.57**	**0.27**	**0.57**	**0.27**

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Evaluation GRR
SCE	Survey Residential Mail	9.0	9.0	1.00	100%	
SCE	Survey Residential Online	0.0	0.0	1.00	100%	
SCE	Survey Residential Phone	0.0	0.0	1.00	100%	
SCE	Total	9.0	9.0	1.00	100%	
	Statewide	**9.0**	**9.0**	**1.00**	**100%**	

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	5.1	2.4	0.47	0	0.57	0.27	0.57	0.27
SCE	Survey Residential Online	0.0	0.0	0.42	0	0.64	0.27	0.64	0.27
SCE	Survey Residential Phone	0.0	0.0	0.46	0	0.58	0.27	0.58	0.27
SCE	Total	5.1	2.4	0.47	0	0.57	0.27	0.57	0.27
	Statewide	**5.1**	**2.4**	**0.47**	**0**	**0.57**	**0.27**	**0.57**	**0.27**

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass	Evaluation GRR
SCE	Survey Residential Mail	0	0	1	100%	
SCE	Survey Residential Online	0	0	1	100%	
SCE	Survey Residential Phone	0	0	1	100%	
SCE	Total	0	0	1	100%	
	Statewide	**0**	**0**	**1**	**100%**	

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Evaluation Ex-Ante NTG	Evaluation Ex-Post NTG
SCE	Survey Residential Mail	0	0						
SCE	Survey Residential Online	0	0						
SCE	Survey Residential Phone	0	0						
SCE	Total	0	0						
	Statewide	**0**	**0**						

Appendix AB. Standardized Per Unit Energy Savings

Per Unit (Quantity) Gross Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr.)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
SCE	Survey Residential Mail	1	0.0%		3.0	635.4	211.8	211.8
SCE	Survey Residential Online	1	0.0%		3.0	110.1	36.7	36.7
SCE	Survey Residential Phone	1	0.0%		3.0	845.4	281.8	281.8

Per Unit (Quantity) Gross Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr.)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
SCE	Survey Residential Mail	1	0.0%		3.0	0.0	0.0	0.0
SCE	Survey Residential Online	1	0.0%		3.0	0.0	0.0	0.0
SCE	Survey Residential Phone	1	0.0%		3.0	0.0	0.0	0.0

Per Unit (Quantity) Net Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr.)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
SCE	Survey Residential Mail	0	0.0%	0.0%	3.0	168.8	56.3	56.3
SCE	Survey Residential Online	0	0.0%	0.0%	3.0	29.3	9.8	9.8
SCE	Survey Residential Phone	0	0.0%	0.0%	3.0	224.6	74.9	74.9

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr.)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
SCE	Survey Residential Mail	0	0.0%	0.0%	3.0	0.0	0.0	0.0
SCE	Survey Residential Online	0	0.0%	0.0%	3.0	0.0	0.0	0.0
SCE	Survey Residential Phone	0	0.0%	0.0%	3.0	0.0	0.0	0.0

Appendix AC. Recommendations

Study ID	Study Type	Study Title	Study Manager		
Res_12	Impact	Evaluation of Southern California Edison 2015 Home Energy Efficiency Program	CPUC		

Recommendation	Program	Summary of Findings	Additional Supporting Information	Recommendation	Recommendation Recipient
1	SCE HEES	Investigate the overlap and interactive effects of the HEES Program and the Home Energy Reports Program in future research.		SCE should consider conducting further analysis on the ways that the two programs share strategies or compete for similar behavior change or measure adoption.	SCE / DNV-GL
2	SCE HEES	Consider redesigning the HEES Program to differentiate itself from the Home Energy Reports Program such as by targeting a different set of customers or offering a different report/service.		SCE sent the HEES' home energy and water efficiency survey to all residential customers with active accounts rather than targeting certain customers and excluding the customers who receive the Home Energy Reports. Such targeting and exclusion would help SCE reduce the cost of mailing out the HEES surveys and isolate the savings attributable to the HEES Program.	SCE / DNV-GL
3	SCE HEES	Consider applying a stronger marketing approach to the HEES Program to address the ongoing issue of customization.		Treatment respondents suggested more innovative or new tips, more customization in the recommendations, and more situation-applicable tips. Such personalized customer services could be achieved by employing marketing best	SCE / DNV-GL

				practices, such as participant persona identification,[39] segmentation, and message personalization. AMI data analytics could also provide a tool for identifying customer specific tips. Note that significant changes were made to the program in 2016 that may have improved report customization and enhanced marketing but they were not observed as part of this evaluation. The effects of these changes should be considered before investing in additional marketing or customization.	
4	SCE HEES	SCE's HEES Program customers had increased awareness of other California DSM programs.	Please see Figure 5 on page 34	A significantly higher proportion of treatment respondents (66%) reported familiarity with other California DSM programs compared to control respondents (60%). Treatment respondents showed greater awareness than control respondents of Save Power Days, Home Energy Efficiency Rebate, Home Energy Advisor, and Solar Thermal Rebate. For more information on how we collected this data, please see Appendix B.	SCE / DNV-GL
5	SCE HEES	Participation in SCE's HEES Program increased customer participation and savings in	Please see Table 15 on page 25	The program exhibited a positive overall participation rate increase of 5.5 per 1,000 customers (or 57.7%) in other programs. Savings	SCE / DNV-GL

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[39] Persona identification (sometimes called a marketing persona) develops character profiles that represent ideal customers. Persona identification helps hone in on target audiences and assigns that audience relatable, real-person attributes.

		other California DSM programs.		uplift from the program resulted in each treatment group customer saving 3.56 kWh per year more through other energy efficiency programs than control group customers. Though a relatively small shift, the increase is statistically significant. The Plug Load and Appliances Program saw the highest savings uplift at 2.9 kWh per year and the Residential HVAC Program saw the highest participation rate uplift at 243%.	
6	SCE HEES	Participation in SCE's HEES Program increased customer adoption of smart thermostat and efficient heating and cooling equipment, but did not affect adoption of other measures.	Please see Figure 2 on page 30	From self-reports of 11 energy-saving measures, treatment and control respondents showed similar measure adoption rates, except for two: smart thermostats and efficient heating and cooling equipment. These two measures align with the participation uplift exhibited by the Residential HVAC Program. For more information on how we collected this data, please see Appendix B.	SCE / DNV-GL
7	SCE HEES	The evaluated energy savings associated with SCE's HEES Program totaled 4,974 MWh in 2015. The HEES Program achieved the greatest impact on customers with the highest baseline energy consumption. However, The realization rate for the 2015	Please see Table 12 on page 25	The evaluation team found that using multiple model specifications, including replicating the methods from used in the previous impact analysis, resulted in very similar overall savings estimates. Additionally, customers in the top quartile of baseline energy use appeared to achieve the largest savings through the program. Evaluated savings are an average of 56.3 kWh/yr. per participant. This value is less than the 211.8 kWh/yr. estimated in the 2010–2012 SCE HEES	SCE / DNV-GL

		HEES Program was 26.6%, comparing the evaluated ex post energy savings to the savings that were reported.		program evaluation. Given the increased awareness and penetration of energy efficient products, including lighting, and California marketing efforts to increase efficient behavior, since the last evaluation period, we believe that this reduction is largely driven by changes in the efficacy of the program, as opposed to the original findings being too optimistic.	
8	SCE HEES	Most SCE customers engaged in energy-saving behavioral practices prior to (or in the absence of) participating in the HEES Program; the program did not result in customers adopting additional energy-saving behavioral practices. The Home Energy Reports Program may be repeating and masking the efforts from the HEES Program.	Please see Figure 3 on page 32	From self-reports of eight energy-saving behavioral practices, treatment and control respondents started engaging in seven of the behavioral practices prior to the time period associated with the program. During the time period associated with the program, treatment respondents did not show any significant increase over control respondents in adopting behavioral practices. Both the HEES recommendations report and the Home Energy Reports include a similar homes comparison and offer the same variety of energy-saving tips. Cadmus' evaluation observed few significant differences between HEES treatment and control respondents in measure adoption and behavioral practices, suggesting that control customers may have implemented similar energy savings strategies as treatment customers. Among the suggestions for HEES Program improvement, 3% of respondents described confusion with the Home Energy	SCE / DNV-GL

| | | | | Reports or wanting the HEES recommendations report to resemble the Home Energy Reports. Around 220,000 SCE customers received Home Energy Reports in 2015. Due to the absence of a Home Energy Reports indicator in SCE's tracking data, Cadmus could not further investigate the possible overlap between the HEES Program and the Home Energy Reports Program. | |
| 9 | | SCE HEES | The HEES Program had not made progress on improving the customization of the recommendations report in 2015, but changes were implemented in 2016. | | On average, treatment respondents gave the HEES recommendations report a usefulness rating of 6.1 out of 10, a decrease from the previous evaluation's rating of 6.9. Both Cadmus' evaluation and the previous evaluation found respondents expressing dissatisfaction with the recommendations reports' lack of customization. Among treatment respondents' suggestions for program improvements, 28% wanted more innovative or new tips, 16% wanted more customization in the recommendations, and 13% wanted more situation-applicable tips. Note that significant changes were made to the program in 2016 (not observed as part of this evaluation) that may have improved report customization. | SCE / DNV-GL |