research/into/action inc

Final Report

Home Area Network Pilots Process Evaluation

Study ID: SDG0259.01

Funded By:

SDGE

A Sempra Energy utility

Prepared By:

research/into/action inc

Research Into Action, Inc.

May 15, 2012

ACKNOWLEDGEMENTS

The evaluation team gratefully acknowledges Brenda Gettig for her project management support and guidance. We would also like to thank the SDG&E program staff that supported and managed the various aspects of technology deployment, communication, tracking, and marketing required to launch and run these pilot programs. Specifically, we would like to thank Joshua Chasse, Tishmari Lewis, Julia Mendoza, Tyler Sybert, William English, and Thomas Van for their patience and time in describing their experiences and providing details about how the pilots were implemented.

Finally, this research would not have been possible without the cooperation of the participants enrolled in these pilot programs. We appreciate their willingness to respond to our requests for information and feedback and for their candid comments about their experiences.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Residential Automated Controls Technology (RACT) Pilot, the Low-Income In-Home Display (IHD) Pilot, and the Low-Income Programmable Communicating Thermostat (PCT) Pilot were among several Demand Response pilot programs launched by San Diego Gas and Electric (SDG&E) in the summer of 2011 to test different mixes of enabling technologies, rewards, notification and conservation messages. All relied on SDG&E's Home Area Network (HAN) technologies and the services of a third-party vendor, Tendril, to test and evaluate customer response to several energy management devices. Through these pilots and other Smart Grid Initiatives, pilot staff, Low-Income program staff, the HAN team members, and Tendril worked together on efforts designed to leverage the benefits of near real-time energy use and price information. The pilots made this price and usage data accessible through customer-facing communication devices. Pilot participants received program technologies at no charge. The programs did not offer incentives for energy or demand savings that the participants achieved.

This report presents the results of a process evaluation conducted to inform the RACT and Low-Income program staff. In September 2011, SDG&E contracted with Research Into Action to conduct research to: 1) document and assess the implementation process and identify opportunities to improve effectiveness of each pilot, and 2) assess customer perceptions and response to installed technologies, event and conservation messages, and recommend opportunities for improvement.

RACT

The RACT pilot sought to raise participant awareness of energy use and motivate energy conservation and demand response behaviors through access to enabling technologies, which provided a combination of energy use information and automatic load curtailment. RACT divided participants into two sub-groups, a TECH group and an IHD group, which received different mixtures of devices. All RACT participants received an IHD capable of displaying near real-time energy use and cost information. Those assigned to the TECH group also received additional enabling technology, including PCTs that allowed SDG&E to remotely set back the thermostat temperature during a Reduce Your Use (RYU) event, and plug load controllers that SDG&E could trigger remotely—turning off whatever equipment was plugged into them at the time. Participants in the IHD group received only the IHD. Both groups had access to a special energy management website and were invited to participate in the Biggest Energy Saver (BES) contest.

LOW INCOME

The two Low-Income Pilots differed in the technology they offered and in their goals. The IHD pilot provided participants with an IHD capable of displaying near real-time energy use and cost

information. By making this information available at a central location within a participant's home, the program sought to raise participant awareness of energy use and motivate energy conservation behaviors.

The PCT pilot provided participants with a thermostat that was both programmable and communicating. The PCT allowed SDG&E to increase the set point on central air conditioners by four degrees during a demand response event.

SUMMARY OF FINDINGS

As part of this evaluation, we assessed participants' perceptions of the enabling technologies, RYU events, and the pilot as a whole. We also assessed SDG&E's experience with pilot management and the lessons learned in the process of integrating two-way communication devices and automatic curtailment with the utility's HAN and Smart Grid capacity.

Overall, we found that the pilots were effectively launched and that SDG&E staff were able to navigate HAN pilot roll out activities that included identification and recruitment of eligible households, installation of a variety of technology devices in participant homes, and establishment of communication processes whereby participants would be informed of RYU days and have automatic curtailment devices triggered. In order to coordinate the diverse activities associated with these pilot programs, the HAN team established regular communication with Tendril, SDG&E information technology teams, and the program staff.

Customers appreciated the program opportunity, and a majority of customers in each of the sub-pilots reported wanting to continue their involvement. Customers appreciated having an increased ability to monitor energy use and commonly reported an increased understanding of how their household uses energy.

RACT participants reported taking action during event days; however as we did not have access to their load impact or performance data, we cannot link specific patterns of responses with measured performance. Survey responses indicate widespread awareness among pilot participants of issues around peak load and the need to reduce one's energy use on specific days, but contacts also noted a lack of information about how to effectively use Plug Load Controllers (PLC) devices.

Low Income pilot participants reported a relatively high level of engagement with their IHDs, but program data and survey responses indicate this population had more difficulty keeping their IHD communicating and their gateway portal online.

Because both the RACT and Low-Income pilots operated with screening criteria and an opt-in model that recruited only a fraction of the potentially qualified homes, it is reasonable to assume that participants in both pilots possess higher than average motivation to use enabling devices and perhaps a higher than average desire to reduce their energy use. Because of this, any issues encountered or dissatisfaction with specific program elements among this cohort of participants would likely be magnified if identical services were provided to the general population.

CONCLUSIONS

Information is valuable.

The information provided by the IHDs was valued by participants for facilitating increased awareness and providing new visibility into how participant households used energy. Participants reported taking action to reduce their energy use since receiving their IHD.

Related survey findings:

- In in-depth interviews, a majority of RACT participants (18 of 30) cited the increased awareness and understanding of their energy use as the best part of the program. Similarly, all Low-Income IHD pilot interviewees mentioned either actionable information or increased awareness of their energy use as the best part of the program.
- Three-fourths of both RACT and Low-Income IHD participants (80% and 75%, respectively) agreed that the IHD helped them save money.
- Over half of Low Income IHD participants (62%) reported that the frequency with which they use their IHD has stayed constant or increased over time.
- In in-depth interviews, a majority of participants in both pilots (26 of 30 in RACT, 10 of 10 in Low-Income IHD) said that the devices had affected their energy use.
- Nearly all participants (91% of RACT, 90% of Low-Income IHD) reported conservation efforts since receiving the technologies.

We found evidence that participants use information in different ways and seek different levels of detail:

- The most common program suggestion from RACT participants was for more communication and/or supporting information to help them understand what to do (13 of the 30 email survey respondents who offered comments).
- When giving feedback about the IHD, several email survey respondents mentioned desiring additional functionality (9 of 49 in RACT, 7 of 26 Low-Income IHD offered these comments).
- Participants used the devices to monitor their energy use in different ways: real time experimentation (16 of 30 RACT; 4 of 10 Low-Income IHD) and tracking energy costs and use over time (11 of 30 RACT; 5 of 10 Low-Income IHD).

Participants are using the information and requests from SDG&E to support or trigger both conservation and demand response activities.

The feedback devices and access to information provided by the HAN team could be a potentially valuable mechanism for engaging customers with energy efficiency programs and increasing overall awareness about household energy use. Participants reported using the information from their HAN program experience to take action on RYU days, as well as to support ongoing conservation behaviors. Explanations of both appeared informed and legitimate.

Related survey findings:

- Ninety-four percent of RACT participants reported receiving RYU day messages; 68% of participants reported taking additional actions on event days.
- Most (83% of RACT; 10 of 10 LI-PCT interviewees) intend to participate in future event days.
- Most common event day actions include turning off lights, postponing laundry, and adjusting air conditioning temperature.
- In in-depth interviews, two thirds of the RACT-Tech group participants (9 of 15) reported that they continue to use their plug-load controllers.
- Nearly all (90% of LI-IHD, 91% of RACT) participants reported undertaking conservation efforts since receiving the technologies.
- When asked about general conservation actions, participants reported turning off the lights, increasing the air conditioning temperature, and turning off unused electronics.

Participants may have had unrealistic expectations for their PCT.

While participants found value in having access to more detailed information about their household's energy use, it will be important to manage participant expectations about automatic energy use or bill reductions from device installation. The presence of an IHD, or even a PCT, does not automatically lower household energy use unless the household changes energy use patterns because of the devices. Expectation management is particularly important for participants receiving a PCT without an IHD, where the risk of optimistic expectations of savings from programming alone is greatest. A programmable thermostat will not save energy unless it is programmed more conservatively than its predecessor, and the small number and short duration of demand response events mean that auto-curtailment events are unlikely to have discernible effects on participant energy bills.

Related survey findings:

- In in-depth interviews, just two of the ten Low-Income PCT participants interviewed said the program met their expectations.

- Among those participants who did not previously have a programmable thermostat, the most frequently mentioned best part of the Low-Income PCT program (4 of 10) was the PCT's programmability.
- Four of ten Low-Income PCT participants agreed that the PCT helped them save money.
- In the email survey, half of Low-Income PCT participants responding (10 of 20) reported manually adjusting their thermostat at least once a week, indicating that the PCT was either not programmed, or was not programmed sufficiently to meet household expectations.

Technology improvements could facilitate a higher level of engagement with feedback devices.

Participant complaints and suggestions for improvements centered on addressing problems with the devices themselves. Some of these complaints were about the functionality and attractiveness of the hardware itself, while others focused on perceived inaccuracies of the devices. The complexities of displaying tiered pricing meant that IHDs were programmed to display projected end-of-the month tiers rather than the actual current pricing tier causing participants to think that their IHD was inaccurate. Similarly, PCTs were only remotely adjustable when the thermostat was in the cooling mode—limiting participant ability to change their settings from "off" to "cool" or vice versa.

Related survey findings:

- Across both the RACT and Low Income pilots, 20 participants mentioned that the IHD did not work as it was supposed to, including several people who specifically mentioned inaccurate tier information that did not re-set at the beginning of the month.
- Eight participants commented that the IHD was hard to use.
- Twenty-three participants mentioned disliking the device aesthetics and/or design.
- Over half of participants had complaints about the PCT (6 of 10 Low-Income PCT interviewees; 51% of RACT-TECH). These complaints included comments that the PCT was hard to understand, that there were multiple steps for simple functions, that it was hard to program, and that they had technical issues.

RECOMMENDATIONS

SDG&E should continue efforts to expand customer access to detailed information about household energy use.

Increasing access to IHDs for households that desire more information would enable additional households to experience better visibility into how they use energy. It could also help SDG&E

continue to test and refine communication messages about reducing energy and demand—messages tailored to the energy use patterns of a given household. IHDs might be made available for check out at local libraries or provided on a limited-time basis to households requesting help lowering their energy bills.

The HAN team will likely have opportunities to support or leverage other initiatives, such as Green Button, the Google power meter, and more detailed website features to expand access to this information.

Look for opportunities to provide more detailed or customized information to households that seek it.

Responses indicate that participants sought different levels of information, and program data indicate that some contest participants were particularly attuned to their household energy use. Surveys, contests, and web analytics could help identify these households, as could tracking those that request or purchase an IHD, or check one out if that option is made available. Continue efforts to provide information at the level of detail desired by customers, and be prepared to ratchet up visibility and granularity when customers seek it.

Continue to monitor those with IHDs to understand the extent to which these households reduce their energy use and respond to requests for curtailment.

More research may be needed to determine whether it is more beneficial to use these devices to promote energy efficiency, demand response, or both. While the feedback devices appear to increase household awareness around everyday energy use, the communication and alert features are also valuable for communicating extra-ordinary curtailment events. SDG&E should continue to monitor the conservation effect with billing analysis focused on houses with feedback devices. If the overall energy reduction is more prominent than load impacts from demand response requests, the utility may want to re-consider the overall objective of providing near real-time feedback devices.

Manage participant expectations with regards to the PCT.

Programmable thermostats are valuable to households that do not already have them; however, the communicating component is of particular value to SDG&E, not necessarily to participant households. In promoting the installation of PCTs, SDG&E will need to avoid communicating that the thermostat will somehow automatically lead to lower energy bills without more conservative temperature setting behavior.

Review procurement guidelines to ensure that they explicitly include acceptable failure rates and measures of user interface usability.

The development of specific curtailment devices and device features and interface is outside of SDG&E's control. However, as SDG&E continues to procure devices or recommend devices available at retail, it will be important to have procurement guidelines that clearly prioritizes usability, durability, and design.

Ensure that the information displayed is understandable and accurate.

Communicating the tiered pricing structure for SDG&E customers is complicated; however, for those that are pursuing information and attempting to adjust behaviors to lower their electricity bills, the simpler "projected" tier caused confusion. If the device displays "current tier," it should be the current tier, while "projected bill" should show projected tier.

1 INTRODUCTION

The Residential Automated Controls Technology (RACT) Pilot, the Low Income In-Home Display (IHD) Pilot, and the Low Income Programmable Communicating Thermostat (PCT) Pilot were among several Demand Response pilot programs launched by San Diego Gas and Electric (SDG&E) in the summer of 2011 to test different mixes of enabling technologies, rewards, notification and conservation messages. Both of these pilot programs relied on SDG&E's Home Area Network (HAN) technologies and the services of a third party vendor, Tendril, to test and evaluate customer response to several energy management devices. Through these pilots and other Smart Grid Initiatives, pilot staff, HAN team members, and Tendril staff worked together on efforts designed to leverage the benefits of near real-time energy use and price information. The pilots made this price and usage data accessible through customer-facing communication devices.

While the exact mix of technologies differed by pilot and population, as a whole, the HAN pilots provided participants with one or more of the following:

- An In-Home Display (IHD)
- One or more Programmable Communicating Thermostats (PCT)
- One or more Plug Load Controllers (PLC)
- Access to an energy management website hosted by Tendril
- An invitation to participate in a Biggest Energy Saver (BES) contest that ranked participants by kWh energy savings relative to the previous year

RESEARCH OBJECTIVES

Two main objectives guided this study:

- Document and assess the enrollment and implementation processes; and identify opportunities to improve the effectiveness of each
- Assess customer perceptions and response to installed technologies, events, and conservation messages; and recommend opportunities for improvement

Approach

The research team relied on several data collection activities to obtain the information needed to conduct this evaluation:

- In-depth interviews were conducted with program staff at SDG&E and with representatives from Tendril.
- Post-event email surveys sent to all RACT and LI IHD pilot participants within a week of a Reduce Your Use event.
- Follow up in-depth interviews with a subset of participants in RACT and in both of the LI pilots.
- Review program collateral and analyze databases including information about those with "offline" devices and website analytics.

GENERALIZABILITY OF FINDINGS

To ensure that our survey findings are generalizable to the population of pilot participants, we randomly sampled pilot participants. Randomly sampling from the pilot participant population allowed us to gather a representative sample, and provides the ability to draw inferences about the pilot populations without weighting or stratification. Table 1 summarizes our level of confidence in the precision of our estimates. These values are not intended to provide specific estimates of pilot population characteristics or views, but just to justify why we feel confident in our ability to draw some general inferences about the pilot participants as a whole, based on the results of the surveys.

Table 1: Sample Confidence and Precision

PILOT	CONFIDENCE / PRECISION
RACT IHD	90/10
RACT Tech	90/10
RACT Overall	***Exceeds 95/10***
LI IHD	90/10
LI PCT	90/15
LI Overall	***Exceeds 95/10***

Note that while random sampling allows us to draw some inferences about the pilot participants based on the responses of the surveyed sample, we do not draw inferences about the population of SDG&E residential customers as a whole. In fact, we believe customers who opted into these technology pilots are likely more engaged with their energy use than the SDG&E customer base as a whole.

THIS REPORT

The complete sampling and disposition for each population is described in the population-specific chapters that follow. Chapter 2 presents a description of the RACT pilot and results of

the process evaluation work for that pilot. Chapter 3 describes the Low Income pilot and presents the process evaluation results for that pilot. The last chapter presents our summary, conclusions and recommendations.

2 RACT PILOT

PILOT DESCRIPTION

The RACT Pilot divided participants into two sub-groups: a TECH group and an IHD group (Table 2). While all of the devices and services described in Chapter 1 were provided through the RACT pilot, the actual mixture of technology a participant received varied by sub-group. Those assigned to the TECH group received enabling technology in addition to the IHD, including PCTs that allowed SDG&E to remotely set back the thermostat temperature during a Reduce Your Use (RYU) event, and plug load controllers that SDG&E could trigger remotely—turning off whatever equipment was plugged into them at the time. Participants in the IHD group received only the IHD. Both groups had access to a special energy management website and were invited to participate in the Biggest Energy Saver contest.

Table 2: RACT Pilot Components

FEATURE PROVIDED	TECH	IHD
In-Home Display	Yes	Yes
Programmable Communicating Thermostat(s)	Yes	No
Plug-Load Controller(s)	Yes	No
Day-Ahead Event Notification	Yes	Yes
Tendril Presentment Website access	Yes	Yes
Biggest Energy Saver Contest Invitation	Yes	Yes

RACT participants received program technologies at no charge. The program did not offer incentives for energy or demand savings that the participants achieved.

Target Population

The RACT pilot sought to enroll approximately 100 accounts in each sub-pilot and targeted customers in owner-occupied, single-family homes with high energy usage (defined as an average monthly usage of 700 kWh or more). In addition to living in high-usage, owner-occupied, single-family homes to be eligible to participate in the pilot, customers had to:

- Pay a residential domestic service rate; customers on medical baseline, or life support rates, and those identified as temperature sensitive were ineligible.
- Not be involved in certain other demand response and renewable energy programs, including other load research efforts, SDG&E's Summer Saver program and net metering. SDG&E employees were also ineligible.

- Be stable in their homes; customers who had moved to their current home within the past two years or who were planning to move within the next six months were ineligible.
- Have the necessary equipment and internet connection capabilities: participation required a smart meter with - at a minimum - Hardware 2.0, System Release 2.0, Service Pack 5.1, a high-speed internet connection with a modem and a router with an open port, a home computer, and an email account.
- Have a working central air conditioner.

Recruitment

Using its database of customer emails, SDG&E identified approximately 14,000 customers who were potentially eligible to participate in the program. Using electronic marketing materials, pilot staff contacted potentially eligible households to invite them to participate. Recruitment email messages focused on the benefits of the program-provided technology and the potential to control energy bills. The program did not offer participants an incentive beyond the technology they received at no charge.

The program sent recruitment emails in batches to specific geographic regions in order to facilitate the installation process. Tendril received applications from these interested customers and worked with RACT staff to verify applicant eligibility. After verifying that a household was eligible, the program sent an acceptance email, and Tendril would follow up to schedule device installation.

Program contacts estimate that, of the 14,000 potentially eligible customers to whom RACT actively marketed through email, approximately 4% responded and were screened for eligibility. Ultimately, RACT was able to enroll approximately 100 accounts in each of the two RACT groups, the enrollment goal for the pilot.

Program Implementation Roles

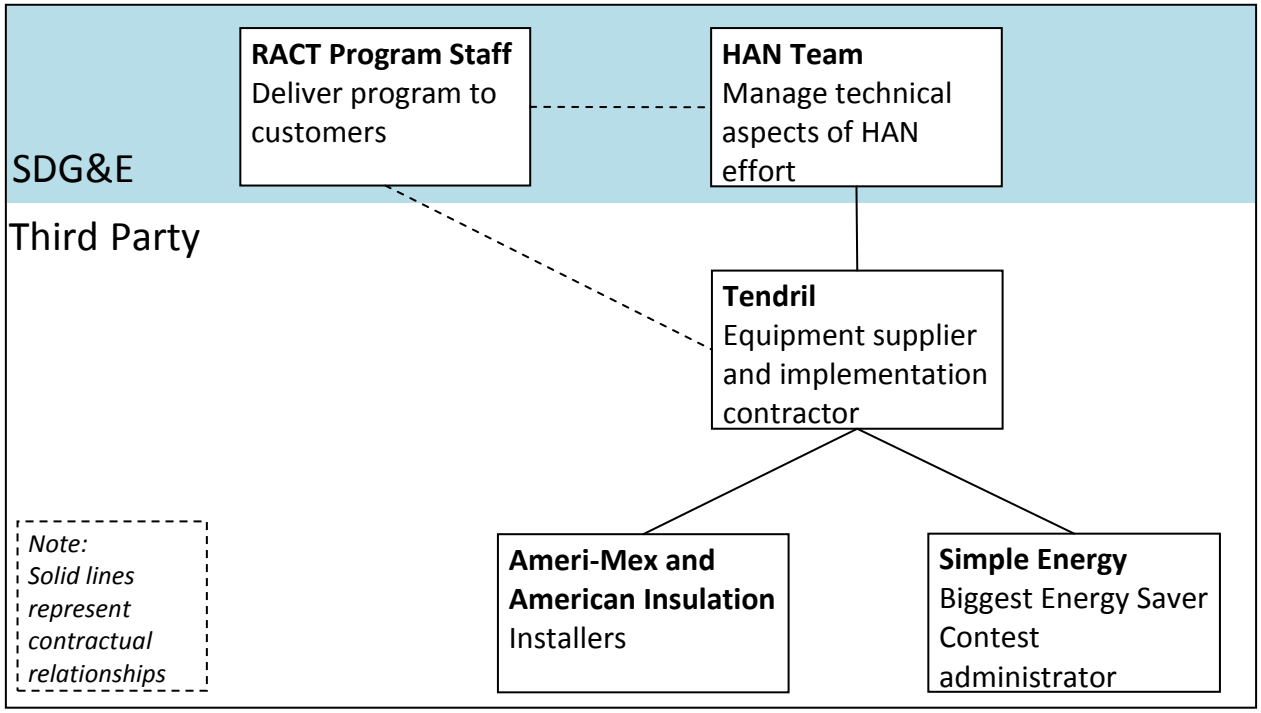
Three groups were involved in the implementation of the RACT pilot:

- SDG&E's **RACT program staff** were responsible for overall program delivery. They coordinated with other groups involved in the program, oversaw program marketing, and were involved in recruitment and verification of eligibility of participants.
- SDG&E's **HAN team** managed the technical aspects of SDG&E's HAN technology integration efforts. They tested and selected the technologies offered by the pilot and supported the technologies from SDG&E's end. The HAN team selected Tendril as a technology vendor and managed Tendril's contract. For the RACT Pilot, they worked closely with Tendril to coordinate the installations. The HAN team also sent device and website messages notifying customers of event days. Finally, the HAN team played a role in coordinating between HAN pilots in order to standardize processes.

- **Tendril** is a third-party vendor that played a dual role, acting both as an equipment supplier and as an implementation contractor. As an equipment supplier, Tendril provided the technology the RACT pilot offered and sub-contracted for equipment installation. As an implementation contractor, Tendril managed the program's technical support and other contact with participants. In this role, Tendril processed participant applications, scheduled equipment installation, and sub-contracted for administration of the program's Biggest Energy Saver contest. Tendril also managed a customer-facing website, which provided an energy consumption "dashboard," and responded to customer requests for assistance.

All three groups involved in implementing the RACT pilot worked closely together. The HAN team and RACT program staff worked together to determine whether demand forecasts warranted calling an event day. Tendril staff reported daily contact with installers when equipment was actively being installed and noted that SDG&E staff participated in these calls. Tendril staff also attended weekly meetings with RACT program staff and information technology staff at SDG&E to address pilot marketing and information technology issues, installation scheduling, status updates, and technology performance. Figure 1 illustrates the interaction between the groups responsible for implementing the RACT pilot.

Figure 1: Groups Involved in RACT Implementation



Installation

Tendril contracted with two independent contractors to provide participants with IHDs, as well as PCTs and PLCs, for the TECH group. Device installation took place between early June and mid-August 2011. While installing the devices, installation contractors showed participants how to use them, including how to override the automated set back during an event. Table 3 provides details about where Tendril and program staff instructed installers to place each program device.

Table 3: Device Installation Approaches

DEVICE	INSTALLED LOCATION
In Home Display (IHD)	• Participant ultimately decides • Installer told to place in a location easily seen at a glance
Programmable Communicating Thermostat (PCT)	• Replaces existing thermostat
Plug Load Controllers (PLCs)	• Unclear; installer may plug in and register device or leave for participant to install • Participant can change location

Demand Response Events

The program notified RACT participants of five demand response events between August 26, 2011, and October 13, 2011 (Table 4).

Table 4: RACT Events Called in 2011

DATE	START TIME	END TIME
Friday, August 26	2:00 PM	5:00 PM
Tuesday, September 6	3:00 PM	5:00 PM
Wednesday, September 7	2:00 PM	6:00 PM
Thursday, September 8*	2:00 PM	NA
Thursday, October 13	2:00 PM	5:00 PM

* SDG&E was affected by a widespread power outage affecting Southern California, Arizona and parts of Mexico on September 8, 2011.

.

RACT program staff and the HAN team worked together to determine whether to call an event based on the following day's load forecasts. The program provided 24-hour advance notification for each of the events called in 2011, although program staff can notify participants of an event the same day if unanticipated problems with the electrical grid make an event necessary at short notice.

Participants received notification of events by email and through messages sent to their IHDs and PCTs. In informing participants of an event, the program sends a message that the next day will be a "critical energy usage day" or a "reduce your use" day and asks participants to conserve energy between specific hours. The program also informs participants in the TECH group that their PCTs will be set back; raising the cooling target temperature by four degrees, and their plug load controllers will be activated, cutting power to the devices connected to them. During the event, customers can override these changes either by pressing a button on the device or through the program's web portal.

Other Experiences

In interviews, program contacts reported encountering several implementation and technical issues as installation occurred. Table 5 describes the issues staff and contractors became aware of during the course of the pilot.

Table 5: Device Installation Experiences

DEVICE	ISSUES ENCOUNTERED
In Home Display (IHD)	• Misconception among some participants that IHD itself saves energy/money
Programmable Communicating Thermostat (PCT)	• Initially, installer did not program • In response to participant feedback, Tendril directed installers to program settings equivalent to participant's existing thermostat
Plug Load Controllers (PLCs)	• Staff were unsure what devices participants connect • Staff emphasized that participants should not use PLCs with major appliances (e.g. refrigerators)

Staff interviews suggest that, among the devices installed, the PCT generated the largest amount of customer feedback. Tendril staff reported receiving calls from customers complaining that the PCT did not function in the same way as the thermostat it replaced, in some cases, because of differences in the settings. Tendril staff also noted that some potential participants expressed misgivings about taking part in the program because of concerns about the extent to which the utility could control their thermostat.

Program staff also recounted some technical issues with the devices. For example, some devices showed very high usage or daily costs (in two cases $29 million). This issue was corrected when it was identified. Staff also identified periods where gateways were offline and thus unable to communicate with the IHD. Finally, due to reliability issues with the network, staff noted that not all devices (IHDs and PCTs) received demand response messages or curtailment triggers on event days.

In addition to the operability and accuracy issues described above, program staff had to wrestle with how best to communicate participants' rate tier. Program staff decided to have IHDs show participants' projected end-of-month rate tier, rather than the current rate tier. Thus, although the rate tier resets to Tier 1 at the beginning of each billing cycle, participants' IHDs continued to

show their projected end-of-month tier, based on current electricity use. Since RACT participation criteria included high electricity use, many RACT participants saw only Tier 3 or Tier 4 on their IHD.

PARTICIPANT FINDINGS

Methods and Disposition

To inform this process evaluation, we conducted two rounds of data collection with RACT participants:

- An email post-event survey sent out to all RACT participants
- A follow-up in-depth interview conducted with a subset of participants who had completed the email survey

In both data collection efforts, we tracked the number of TECH group and IHD group participants separately to ensure we received responses from both program groups.

Working with SDG&E staff, the research team developed a post-event email survey that could be rapidly deployed after a curtailment event occurred. On October 21, eight days after a curtailment event on October 13, 2011, we sent survey invitation emails out to the entire population of 99 TECH group participants and 108 IHD group participants. This survey ran from October 21 to November 2. Ultimately, 89 participants submitted a survey (Table 6).

Table 6: Disposition of Email Surveys by Group

	TECH GROUP		IHD GROUP		TOTAL	
	Count	Percent	Count	Percent	Count	Percent
No Response	60	61%	58	54%	118	57%
Complete	34	34%	48	44%	82	40%
Partial Complete	5	5%	2	2%	7	3%
RACT Population	**99**	**100%**	**108**	**100%**	**207**	**100%**

Because the post-event survey focused on obtaining information rapidly after a curtailment event, we planned to conduct in-depth follow-up interviews with a subset of those that responded to the post-event email survey. All post-event survey respondents were asked if they were willing to be re-contacted for a more in-depth follow-up conversation. Of the 89 participants that responded to the email survey, only six opted out of follow-up interviews. Between December 19, 2011, and January 9, 2012, we completed 30 follow-up in-depth interviews, 15 with each program group.[1]

[1] Each participant that completed an in-depth interview was offered $40 in exchange for their participation.

Chapter Structure

Because of the use of two samples, and because not all contacts answered all questions in the email survey, the sample size varies throughout the chapter, and has been noted for each question. Where appropriate, results from the in-depth interviews are used to provide context and additional detail for responses to the email survey.

All results are unweighted. Except where otherwise noted, contacts in both the TECH and IHD groups were asked all questions. Any notable differences between the TECH and the IHD groups have been noted.

Program Expectations

To understand what participants hoped to get out of the program, we asked in-depth interviewees about what convinced them to sign up for the RACT program. The 30 in-depth interview contacts reported a variety of reasons for signing up, (most contacts reported more than one reason for enrolling) but the most frequent reasons given were the ability to track their energy use (generally, as well as instantaneously, and on individual outlets or appliances, 21 mentions), and the opportunity to save money on bills (13 mentions). Six contacts noted that they were attracted by the opportunity to get new technology, and three contacts reported that they had used similar technology previously.

A majority of these in-depth interviewees (21 of 30) indicated that the program had met or exceeded their expectations. These responses were similar for the two pilot groups. Among the nine contacts who said that elements of the program did not meet their expectations, the most common reasons given concerned technical issues, such as the IHD reporting the wrong tier, broken equipment, or poor technical support. Because the IHD had been programmed to display the projected end of the month rate tier and there were cases in which the IHD was inaccurate, it is impossible for us to confirm whether or not a given participants' IHD was inaccurate or if it was simply estimating the projected end of the month rate tier. One contact reported expecting that enrollment would automatically reduce their energy bill.

In the email survey, nearly all contacts (91%) agreed (rated a "4" or "5" on a 5-point scale) that they would like to continue to be in the program. A third of email survey respondents (30 of 89, or 34%) also provided suggestions for ways to improve the program (Table 7). Suggestions varied, but the most common suggestion, mentioned by 43% (13 of 30) of these contacts, was the desire for more communication and supporting information to make better energy use decisions. The additional information desired included better understanding of rate tiers and pricing information, the rationale behind when RYU days were called, and more information on specific ways to reduce energy use. Other suggestions included better technical support for devices (7 of 30, or 23%) and other suggestions for improving RYU days, including better notification and incentives for participating (7 of 30, or 23%).

Table 7: Program Improvement Suggestions (n=30; Multiple Responses Allowed)

COMMENT	PERCENT
More communication, supporting information	43%
Better technical support for devices	23%
RYU day suggestion	23%
Smartphone app	17%
Remote access to more devices	10%
Other ideas to improve program	13%

In in-depth interviews, contacts further reflected on their overall experience with the program. When asked about the best part of the program, the most frequent response was the increased awareness and understanding of household energy use that participants had gained through the program (18 of 30; Table 8). Ten contacts also specifically mentioned the technologies provided. This includes five who mentioned the IHD, and five who mentioned the website (four of the five contacts who mentioned the website were TECH group participants.) Five contacts also called out the cost savings or reduced energy use as the best part. Other topics mentioned included the Biggest Energy Saver contest, the educational value to their children, and the projected bill function.

Table 8: In-Depth Interviewees' Evaluation of the Best Part of the Program (n=30)

ELEMENT	MENTIONS
Increased awareness and understanding of energy use	18
Website	5
IHD	5
Cost savings and reduced energy use	5
Other	8

In discussing program improvements, contacts' descriptions of their least favorite parts of the program varied, echoing the suggestions given by email respondents. Four contacts said that they liked everything about the program. Eight contacts made comments about the limitations of the website and software. These comments included inaccuracies about tier information and projected usage, including two contacts who reported that their current displayed daily cost read $29 million.[2] Other contacts appreciated additional functionality or visibility, including a way to look at usage associated with pool pump controls and access to historical usage data. Technical support and connectivity issues were a negative point for four contacts. Five of the 15 TECH group contacts said their least favorite program element was the thermostat, another three mentioned the aesthetics of the devices (both thermostat and IHD), and two mentioned not

[2] Program staff contacts confirmed that this was an issue for some participants, and noted that once staff became aware of the issue, IT staff was able to resolve it.

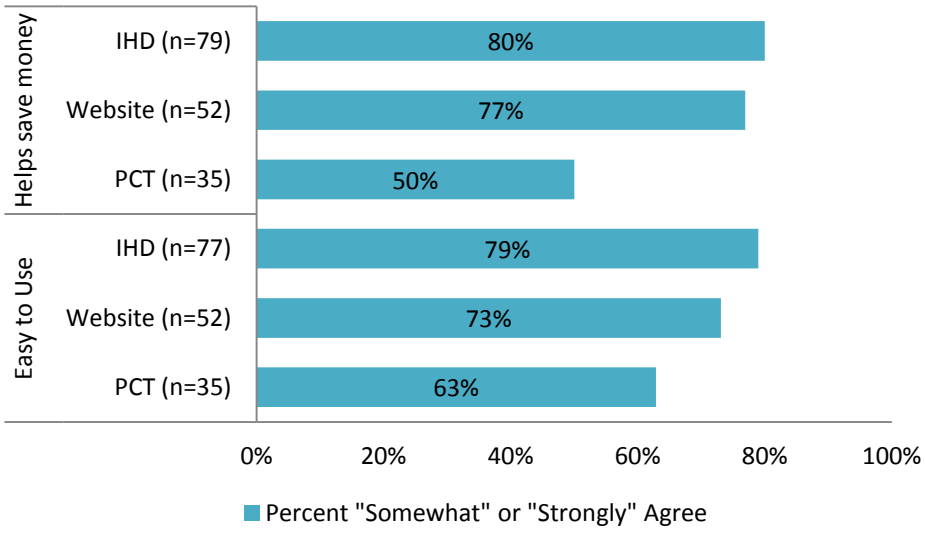
knowing where to put their IHDs. Two contacts said that they wished they had had more time to try out the equipment they were given.

Comments made by in-depth interviewees called out the different household member relationships with the technology. Of the 14 contacts who specified who in the household interacted with the device(s), about half indicated that multiple family members interacted, and half indicated that they were the only ones who interacted with the device. Two contacts volunteered that their spouse or kids had become more interested in energy savings because of the devices, while others mentioned that they were *"the only one that knows how to use it or is interested."*

EXPERIENCE WITH TECHNOLOGY

Both email and in-depth interview contacts gave their impressions of the technologies installed through the program, and both TECH group and IHD group participants were asked about the IHD and website. TECH group participants were also asked about the PCT and PLCs they received, and about the accompanying ability to control these devices through the energy management website. Figure 2 shows an overview of email survey respondents' views on the ease of use and helpfulness in saving money of the IHD, the website, and the thermostat—in both cases the thermostat earned the lowest rating.

Figure 2: Email Survey Respondents' Views on Technology Helpfulness and Ease of Use



In in-depth interviews, contacts were asked whether they would be willing to pay for the technologies they had received, and how much they might be willing to spend. A slight majority of contacts in the IHD group (8 of 15) reported they would not pay for an IHD; the rest reported willingness to pay prices ranging from two dollars a month up to $100 to purchase the IHD

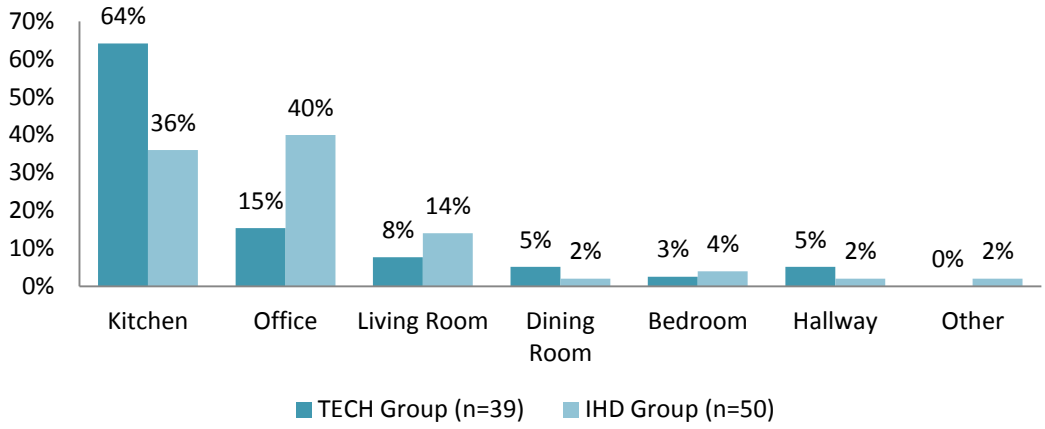
outright. TECH group participants received multiple devices, while the IHD group only received an IHD. Perhaps because of this, contacts in the TECH group were more likely to be willing to pay for the package of devices they received, with only three of the 15 contacts reporting they would not pay for the devices. TECH group participants reported willingness to pay prices ranging from less than $25 to $200. Six TECH group contacts were willing to pay over $100, including three who were willing to pay $200.

The In-Home Display

Typical Usage

In the email survey, nearly all respondents (86, or 87%) reported that their IHD had been plugged in all the time since it was installed and that it was currently working. Among respondents in the TECH group, a majority had their IHD in the kitchen (64%), while among the IHD group, the most common location was the office (40%; Figure 3). A few in-depth interviewees mentioned that having their IHDs in a frequently-used area like the kitchen ensured that respondents remembered to look at them.

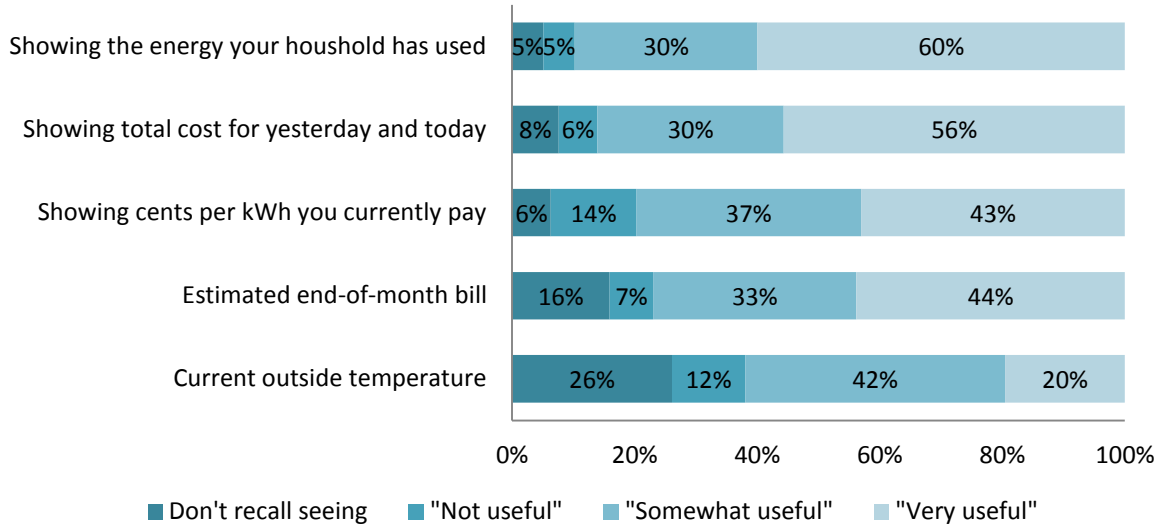
Figure 3: Location of IHD in Home, by Group



Opinions of IHD

In the email survey, participants found most of the information provided on the IHD to be useful overall. A majority of email respondents either somewhat agreed or strongly agreed that the IHD is easy to use (79%) and that the IHD helps identify how to save energy (80%; See Figure 2). Contacts also appreciated many of the features on the IHD. A majority of contacts appreciated that their IHD provided information about household energy use and/or the cost of that energy on a daily basis (Figure 4). Quite a few contacts indicated that showing the cents per kWh and the estimated end-of-month bill was very useful (43% and 44%, respectively).

Figure 4: Usefulness of Information Displayed on IHD (n=82)*



*Due to rounding, items may not sum to 100%.

When asked what participants liked the least about their IHD, 55% (49 of 89) of email survey respondents provided comments. One third of these contacts (16 of 49, or 33%) mentioned that the device was not working properly, 27% (13 of 49) mentioned the design of the device, and 18% (9 of 49) wanted additional features (Table 9).

Table 9: Email Survey Complaints about IHD (n=49; Multiple Responses Allowed)

COMPLAINT	PERCENT
Does not work as it should	33%
Aesthetics/ device design	27%
Desired additional functionality	18%
Hard to use	16%
Not useful	10%
Other	12%

Among those who reported that the device was not working properly, the most frequent topics were incorrect tier pricing displayed (five mentions),[3] or periods where the device did not retrieve information (nine mentions). Some contacts appeared to understand that their device had gone offline: *"I had a hard time getting it to work reliably, despite several calls to Tendril. I*

[3] As noted previously, program staff wrestled with the technical and communication considerations around how the IHD should display current tier pricing and ultimately decided to have the IHDs display projected end-of-month tier rather than current tier. Participants could have perceived this as inaccurate information.

finally moved the transport device closer to the meter [gateway] and have it working okay." Others, though, did not understand that the device had gone offline: *"Right now, there's a flashing red light that used to be green."*

While some contacts mentioned specific information they would like to be able to see, the additional functionality desired by email contacts also revealed that not all participants fully understood the capabilities of their devices. Some contacts mentioned existing device capabilities:

- *"It has no daily history. I cannot tell when I reach the next tier in pricing or if I reduce my electricity say by 10% what I would save. Access to a web page would be much more useful and a way to set emails alerts."*
- *"It doesn't display use history."*

In in-depth interviews, contacts elaborated on what they found most useful about the device. These responses revealed that participants seem to be using their IHDs to monitor both short-term and long-term energy use and costs. Some reported that the rate tier and monthly expected usage estimates were the most useful, while others reported that they valued the instantaneous usage information and daily tracking, because it allowed them to connect their usage to specific appliances and events.

Illustrative Comments of Instantaneous Use

- *"How it monitors power usage, live. If you kick on the AC, you can immediately see the rise in kWh."*
- *"If I see an energy use level that looks off, I'm able to see what's on that shouldn't be."*
- *"It's the fact that you have a constant reminder and you can see when you're using a lot more kilowatts, how much electricity you're using. You can see if something's on or off."*

Illustrative Comments of Monthly Use

- *"I think probably just looking at the estimated cost as we go through the month and estimated cost at the end of the month. That's pretty much what I look at and cost of kWh. Mostly it's been an awareness thing. When we first got it, we were tier 4, and now we're not. We turned off Jacuzzi, and we're now at tier three... last month we were at tier 4 again, and we decided to turn on the Jacuzzi..."*
- *"I always keep the display on the chart that shows what the electric part of the bill will be at the end of the cycle. This way we can see what we can do to bend the line down in order to save money."*

While many found the IHD a useful visual way to monitor energy use and a constant reminder to conserve, at least one contact found the information overwhelming: *"It's overwhelming. It's just*

raw data with no context. I'm not real clear about why it matters to me and how [to] use that info."

In-depth interviewees were asked to elaborate on any difficulties they had experienced with the IHDs. Twenty-one of 30 contacts reported that elements of the IHD did not work, or did not meet their expectations. These comments echoed those mentioned in the email survey. Several contacts specified that the inaccurate cost data was because their rate tier does not change at the beginning of the month, as their actual billing rate tier does.

Message Delivery

During in-depth interviews, a majority of contacts (14 of 15 of TECH group, and 11 of 15 of IHD group) indicated that they were able to tell when SDG&E sent them messages. Most respondents reported noticing the flashing light or the pop-up indicator on the IHD informing them of these messages, although several people also reported that the emails informed them of events, as well. Half of TECH group contacts also mentioned that they received messages on their thermostat. When asked how often they check for messages, about a third of contacts said they do not check, or rarely check; a third said they check regularly; and a third said they check only when it flashes or when they receive other notification. Fewer IHD group participants than TECH group participants reported checking daily (or more often) for messages.

Offline Events

To understand why program records indicated periods where IHDs went offline, we asked in-depth interviewees about their awareness of offline events.[4] A majority of contacts (21 of 30) reported that their IHD had gone offline (indicated by a red blinking light). All but one contact indicated that they were able to get it working again. Most were able to fix the problem by unplugging the device or resetting their routers, and a few (three) called Tendril support. One contact reported that the device fixed itself.

Six contacts, all in the IHD group, also reported periodically disabling the device (for reasons other than to change its location). They offered a variety of reasons for shutting it off, including needing the outlet for other purposes, temporarily moving the device in order to clean, shutting down their wireless network, and because of interference with other devices.

THE ENERGY MANAGEMENT WEBSITE

Program staff provided the evaluation team with website analytics tracking logon statistics for the Tendril website (Table 10). These analytics tracked the dates of logons by unique email addresses associated with each pilot. Although we were unable to match the email addresses in these analytics to the participants we surveyed, these analytics provide a broad overview of

[4] Program records tracked periods when gateway devices went offline. When the gateway devices are offline, the IHDs do not receive updates.

participants' use of the program website. Despite some possible list errors (the number of people logging on exceeds the number of TECH group enrollees, although it is possible that enrollees logged on with more than one email address), almost all RACT group participants logged onto the website at least once. This is not surprising, though, as installers were expected to show participants how to access the website. More significant, a majority of both TECH and IHD group participants logged onto the website at least twice. Overall, TECH group participants appear to have used the website more often than IHD group participants, with an average of 12 logons each (versus four each in the IHD group) through January 31, 2012.

Table 10: Website Logon Statistics

STATISTIC	TECH GROUP	IHD GROUP
Number of Program Enrollees	99	108
Number of unique email address logons	102	99
Percent of emails with multiple logons	76%	55%
Average number of logons	12	4

In email survey responses, over two-thirds of respondents (70%) reported logging into the website at least once, including 85% of TECH participants and 60% of IHD participants. This apparent discrepancy in logons may be due to the fact that, while the system counts each use of the email address as a logon, contacts may not have counted the initial setup as a logon.

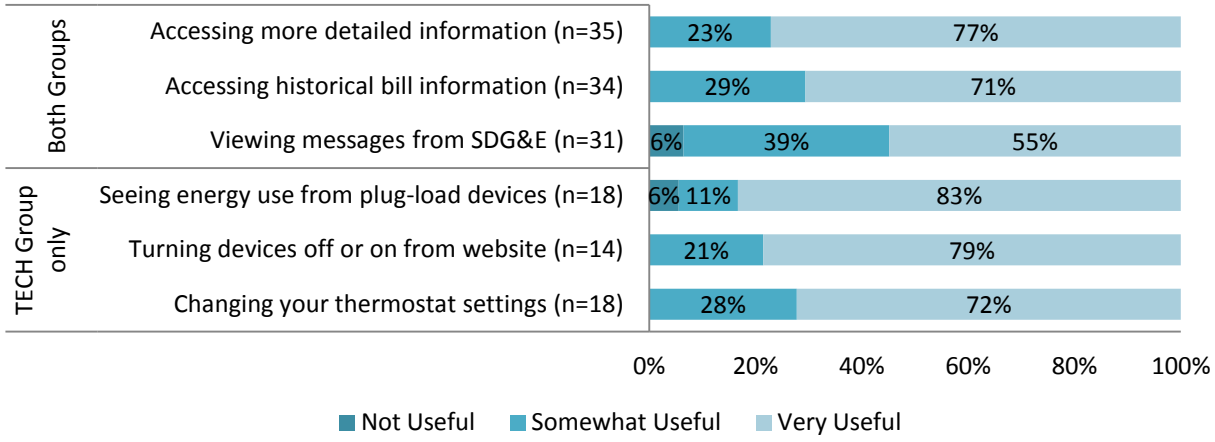
Of those email survey respondents who reported using the website, a majority reported having used the website to access detailed information about household energy use, to access historical bill information, and to view messages from SDG&E (Table 11). A majority of TECH group respondents also reported using the website to see how much energy is used by devices in plug-load controllers, to change the thermostat setting, and to turn devices off or on—all functions not available to IHD group contacts, who did not receive PCTs or PLCs.

Table 11: Percent of Respondents Using Website Features (n=57)

	PERCENT USING FEATURE	
FEATURE	TECH Group	IHD Group
Accessing more detailed information about your household energy use patterns	82%	54%
Accessing historical bill information	66%	57%
Viewing messages from SDG&E	61%	58%
Seeing how much energy is used by devices connected to your plug-load controllers	68%	N/A
Changing your thermostat setting on the website	66%	N/A
Turning devices off or on from the website	55%	N/A

Among those who had used these features, a majority reported that the information displayed on the website was very useful (Figure 5).

Figure 5: Usefulness of Information Displayed on Website (n=57)



When email respondents were asked what they would like changed about the website, eight contacts (9%) suggested more flexibility in showing past usage history, information on plug-load usage, or more information regarding changes in tiers, so that they know how much money they have spent in each tier and are notified when moving from one tier to another. Six contacts (7%) wanted more control over the user interface so they could manipulate the data displayed to best fit their needs, and five contacts (6%) suggested a phone application to remotely access data or to remotely control devices.

In the in-depth interviews, we sought more detail about when and for what purpose participants used the website. Overall, very few IHD group interviewees reported using the website more than a few times over the course of the pilot, and several reported never having used it at all. In contrast, many TECH group interviewees reported using the website regularly, although some mentioned that the frequency of use had decreased over time.

Contacts reported looking for a variety of types of information on the website, including tracking electricity use, seeing historical data, and remote thermostat functions. In general, TECH group participants were more able to find what they were looking for on the website than IHD group participants. A few TECH group participants mentioned a desire for more or better presented data on the website, including more historical data and differently presented plug-load graphs. A few IHD group participants mentioned struggling to find the website at all. Finally, as in the email survey, two contacts expressed a desire for a website that worked on a smart phone, to facilitate remote thermostat changes.

THE PROGRAMMABLE COMMUNICATING THERMOSTAT

To understand TECH group participants' use of, and views on, the PCT, we asked both email survey and in-depth interview respondents about their experiences with the PCT.

Typical Usage

In-depth interview contacts explained how they typically used their PCT over the summer. TECH group contacts set their PCT temperature between 72 and 85 degrees, with the most frequent setting being 78 degrees. Two contacts reported not using the air conditioner at all, and another reported using it very infrequently. Two-thirds of contacts (10 of 15) had their PCTs programmed to reflect their daily schedule. Two contacts also mentioned that they customized the programming to meet their needs, such as dividing the house into zones. One contact used to have the PCT on a schedule, but does not anymore; and one had it programmed, but not on a schedule. Three of the contacts we interviewed reported that their use of the PCT was limited, and it was often off, because although they have working central air, they rarely use it.

While a majority of contacts (11 of 15) had tried adjusting their thermostat via the website, less than a third reported that they regularly adjusted their thermostat remotely. A majority of contacts (10 of 15) reported having successfully adjusted their thermostats from the energy management website. Four contacts indicated that they regularly used this feature, while six reported that they used it only occasionally or just at first. Only one contact reported being unable to find this function on the website.

Opinions of PCT

In email survey responses, TECH group participants appreciated the information displayed on their thermostats and the ability to access their thermostat remotely (19% each; Table 12). However, over half of TECH participants (54%) mentioned not liking an element of the thermostat, including 32% who did not like that there were multiple steps for simple functions (such as turning the thermostat on or down). Participants also mentioned that their thermostat was hard to understand (27%).

Table 12: PCT Feedback (n=37; Multiple Responses Allowed)

FEEDBACK	PERCENT
LIKED	
Good information displayed	19%
Access thermostat externally via computer	19%
Easy to understand	14%
Easy to use	14%
Ability to program	11%
DISLIKED	
Multiple steps for simple function (need on/off switch)	32%
Hard to understand	27%
Auto-programming not easy	8%
Other	11%

To understand more about what RACT participants did and did not like about the PCTs, we asked in-depth interview respondents to expand on their previous responses. In the in-depth interviews, as in the email survey, a majority of contacts reported finding the PCT cumbersome to use or reported specific problems in using it.

Contacts who had owned previous programmable thermostats appeared the most critical of this device. Four explicitly said that it was more difficult to use than their previous programmable thermostats. Among those who did not report having had previous programmable thermostats, the most useful feature cited was the programmability. Two of these contacts also said that it was user-friendly, and two appreciated the remote access feature.

The types of criticisms mentioned varied, with a few responses each. Specific criticisms included the thermostat was hard to operate; it was difficult to turn it off and on, especially via the website; re-setting the clock was difficult, especially after outages; and the fact that a manual adjustment to the program is overridden when the next phase of the program schedule begins.

Illustrative comments include:

- *"The programming wasn't that challenging, but it's my least favorite of the tech. If you have a friend stay over, they wouldn't know how to figure it out. Over riding the system is challenging."*
- *"It was more cumbersome than previous smart thermostat—the button sequences took some getting used to. After we got used to it, it was okay."*
- *"It [the remote feature] worked well, but you can't turn the system on remotely."*
- *"I've always had a programmable thermostat and it is actually the worst one I've had. - I can't turn it off completely. I want to turn it off when I know that the air or heat will only come on for five minutes. Or if I'm travelling I can't just turn it off; I have to put it on vacation mode - hard and I'm a tech savvy guy. Other SDG&E thermostats are better."*
- *"It only worked for 3 weeks. We have certain temp ranges set up, and if it's a little uncomfortable we will override it. Sometimes it stays at this new temp, sometimes it goes back to the previous setting."*
- *"It's complicated when it loses it's time sync. Tendril noticed it had lost its internet connection and they called me and told me how to reset it."*

Event Day Use

In the email survey, less than half of the TECH group[5] noticed their thermostats being changed (15 of 37, or 41%). Of the 15 contacts who noticed their thermostat being changed, six reported experiencing negative effects due to their thermostat being changed by SDG&E. Four of the

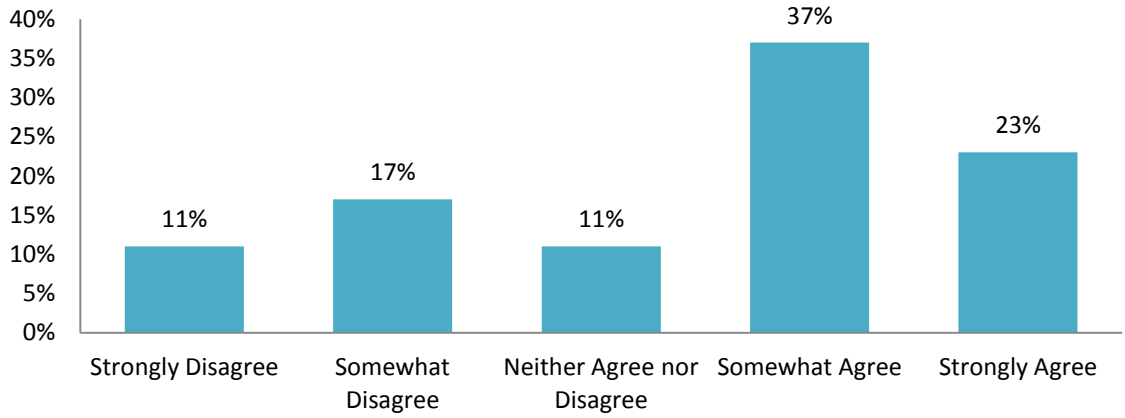
[5] TECH group participants have thermostats that can be adjusted by SDG&E.

contacts who experienced negative effects reported that their house became uncomfortably hot[6]. Contacts who noticed the thermostat change were nearly evenly split between those that did nothing (8 of 15) and those that overrode the temperature change (7 of 15).

In the follow-up interviews, we sought more detail about participants' interaction with their PCT on event days. A majority of contacts (11 of 15) reported that they could tell from the thermostat when an RYU event was occurring (three were unsure or had their thermostats off, and one person was unable to tell).[7] Four of 11 contacts noticed increases in temperature, and all four reported manually over-riding the setting because they were too hot: *"I thought there might be a bit of a flaw. The event moves [my thermostat] to 80 by default. It's already pretty high, so maybe mine does not need to be moved. I am already doing my share by having it at 78 before the alert. I have let it go to 80 a few times, but the third time I was sick."* All four reported initial settings between 78 and 82 degrees, and three reported resetting the temperature back to the original setting (one lowered it by *"a degree or two"*).

In the email survey, participant responses indicated some resistance to the idea of allowing SDG&E to adjust their thermostat. While a majority of contacts (21, or 60%) indicated that they are not bothered by SDG&E adjusting their thermostat, a substantial number (14, or 40%) indicated that they were either neutral or bothered (Figure 6).

Figure 6: Responses to Question: "Letting SDG&E adjust my thermostat doesn't bother me." (n=35)



To understand the source of this resistance, we asked in-depth interviewees to elaborate. Twelve contacts indicated they did not have reservations about letting SDG&E change their settings, but six added caveats, such as: *"no, as long as I can override it"* or *"no, as long as I know."* Two of

6 Specific examples: one mentioned the house getting to 95 degrees indoors, another said they already set their AC at 82 and SDG&E raising it 4 degrees more was too much.

7 Although all PCTs were supposed to receive a signal to increase their current setting by 4 degrees, program staff note that due to network reliability issues, customers may not all have received this signal.

14 contacts reported reservations about letting SDG&E change their thermostat settings, because they already try to do their part to conserve.

- *"For years we have been talking about signing up to have turning off AC for periods during the day. We never opted in because we try to manage it ourselves. We're both older and want to enjoy retirement."*
- *"Yes, because I'm already trying to conserve. They should recognize that I'm already conserving [by setting my thermostat at 82 degrees]."*

While it is not surprising to find resistance to remote thermostat adjustment, the RACT participants opted-in to the pilot and thus into this scenario. Resistance to this capability among the public is likely substantially higher.

THE PLUG-LOAD DEVICES

In the email survey, three-fourths of TECH program participants reported that they use one or more of their plug-load devices. Entertainment equipment was most commonly plugged into the devices (reported by nine contacts, or 31%), but lamps and computer equipment were also commonly reported (28% and 21%, respectively; Table 13). A few contacts reported plugging other equipment into their devices, including refrigerators/freezers (two mentions); wine coolers (one mention); laundry equipment (one mention); and air purifiers (one mention).

Table 13: Types of Equipment Used with Plug-Load Devices (n=29)

TYPE OF EQUIPMENT	EMAIL SURVEY COUNT
Entertainment	9
Lighting	8
Computer	6
Refrigerators/Freezers	2
Laundry	1
Room heaters or AC	0
Miscellaneous small appliances	2

Among in-depth interview contacts, about two-thirds (9 of 15) said they still use one or more of their plug-load devices. Two contacts mentioned that at least one of their devices no longer functioned. Similar to findings in the larger sample, in the in-depth interviews, contacts reported plugging a variety of types of equipment into their plug-load devices, including entertainment equipment, computer equipment, refrigerators or freezers, portable heaters or room air conditioners, laundry equipment, and miscellaneous small appliances, including an espresso maker and a hair dryer.

We found evidence that some TECH group participants used their plug-load devices as tools to help them better understand and monitor their energy use, either in addition to, or instead of, tools to reduce their use on RYU days. The six contacts who reported that their devices were no longer in use offered a variety of explanations. Three contacts indicated that they used their plug-load devices to monitor their appliances' energy use, but then stopped using them once they understood their energy use, or because they found the monitoring on the website to be unhelpful. One contact mentioned that while the PLC was not useful when plugged into their lighting, they would like to continue to experiment: *"we are pretty good about turning things off already, so if you do that with the lamp it didn't help. It would be better to use them on another appliance. I want to experiment by putting them on some other device."*

Two contacts also indicated that they stopped using them because they didn't want to lose power on event days: *"After I figured out how much energy they were using, I stopped using them because I didn't want to lose power all of a sudden if an event day came;" "When we had an event, it turned off, and I lost program settings on my home theater system."* One contact each mentioned that the devices were no longer working or that they were remodeling their home.

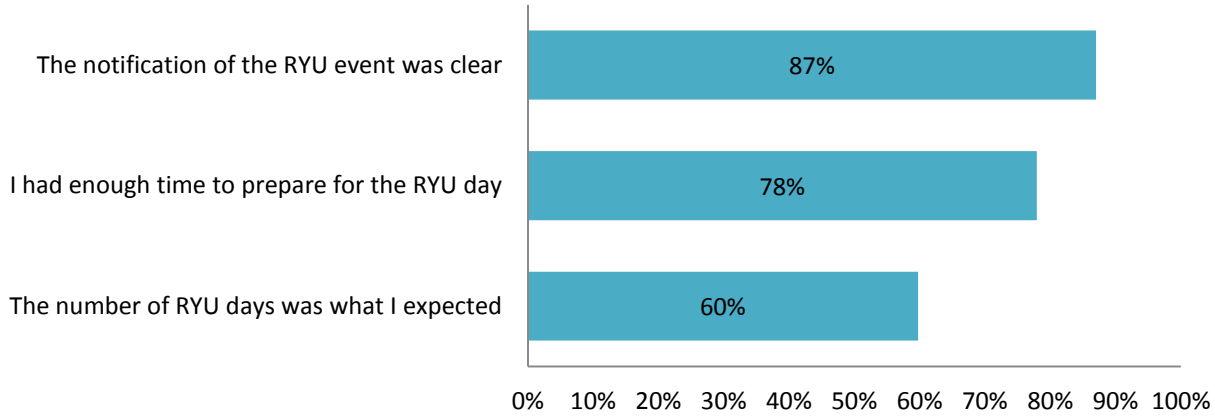
Of the nine contacts who reported that their devices were still in use, four indicated that their equipment had been shut down during an RYU event. Of these four, one reported overriding the shutdown to avoid running down the battery on a laptop computer. The other three reported *"no problems"* with the equipment turning off.

REDUCE YOUR USE EVENT DAYS

Notification

In the email survey, nearly all contacts (94%) recalled receiving RYU messages. On average, contacts reported receiving about three messages. Most contacts agreed (offering a 4 or a 5 on a 5-point scale) that RYU notifications were clear and that they had enough time to prepare for RYU days (87% and 78%, respectively; Figure 7).

Figure 7: Attitudes about RYU Days: Percent "Somewhat" or "Strongly" Agree (n=77)



Because we wanted contacts to be thinking of a specific curtailment event when they described their behavior, we asked email respondents if they recalled receiving an event notice on or around October 13, 2011. A majority of contacts (87%) remembered receiving a RYU message from SDG&E on or around October 13, 2011. Although contacts recalled a variety of sources of curtailment notification, email was the most frequent source (Table 14).

Table 14: Means of Notification on Most Recent Event Day (Multiple Responses Allowed)

Means of Notification	Group	
	TECH Group (n=31)	IHD Group (n=40)
Both TECH and IHD		
By email	**97%**	**93%**
In Home Display	84%	43%
By phone	10%	0%
Don't know	3%	0%
TECH Only		
On PCT	87%	N/A

In follow-up interviews, all but five contacts indicated that their preferred means of event day notification were email and text messages. About half of contacts said that sending event notification to a specific device (IHD or PCT) was a good strategy, either in addition to—or, less often, instead of—email or text. Thirteen of the 30 participants contacted for follow-up interviews reported that they did not receive email or text notifications, but would like to, indicating a lack of awareness about the available notification options. Four IHD group contacts specifically mentioned text message notifications in their final program comments, as well. While contacts mentioned receiving messages via multiple means, no contacts volunteered that they felt they received too many notifications.

Actions Taken

In the email survey, of those that recalled receiving an RYU notification for the October 13th event, 70% reported that they were at home at some point during the event day. Among those who were at home, all but one (98%, 57 of 58) reported taking action to save energy and about 59% (35 of 58) took multiple energy saving actions (ranging from 2 to 6 actions; Table 15).

Table 15: Actions Taken on Most Recent RYU Day (n=81; Multiple Responses Allowed)

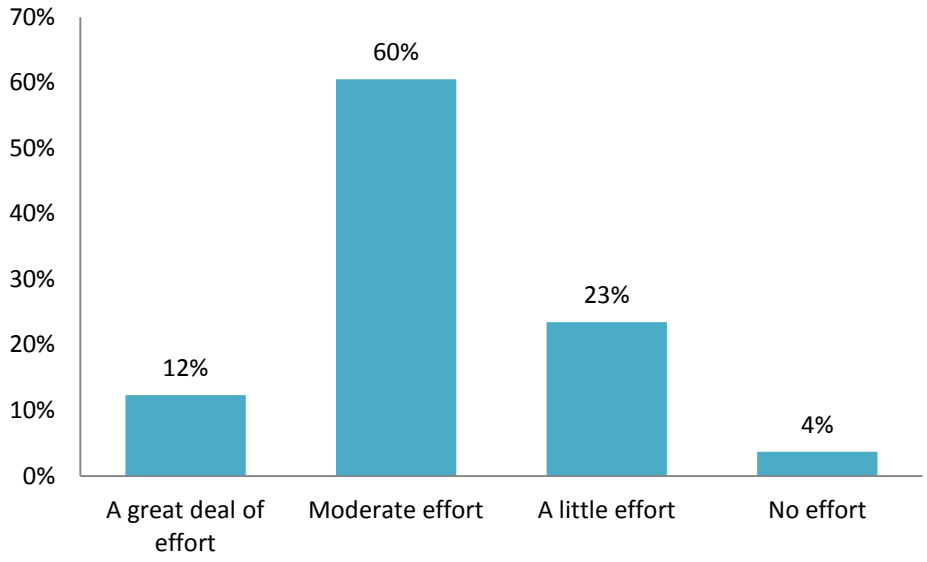
ACTION TAKEN	PERCENT
Not at home	30%
Generally try to use less energy[1]	53%
Turn off lights	30%
Shift laundry	28%
Reduce AC use[2]	25%
Run dishwasher earlier/later	15%
Turn off the pool pump	9%
Shift cooking time	4%

[1] A survey response option

[2] Eleven of the 26 TECH participants answering this question offered this response, even though their PCTs would have set back during the event.

Three-fourths of respondents (76%) reported that household routines were not affected by the RYU event. A majority of email survey respondents (60%) reported that their level of effort in response to RYU requests was *"moderate"* (Figure 8).

Figure 8: Level of Effort to Reduce Energy Use in Response to RYU Requests (n=81)

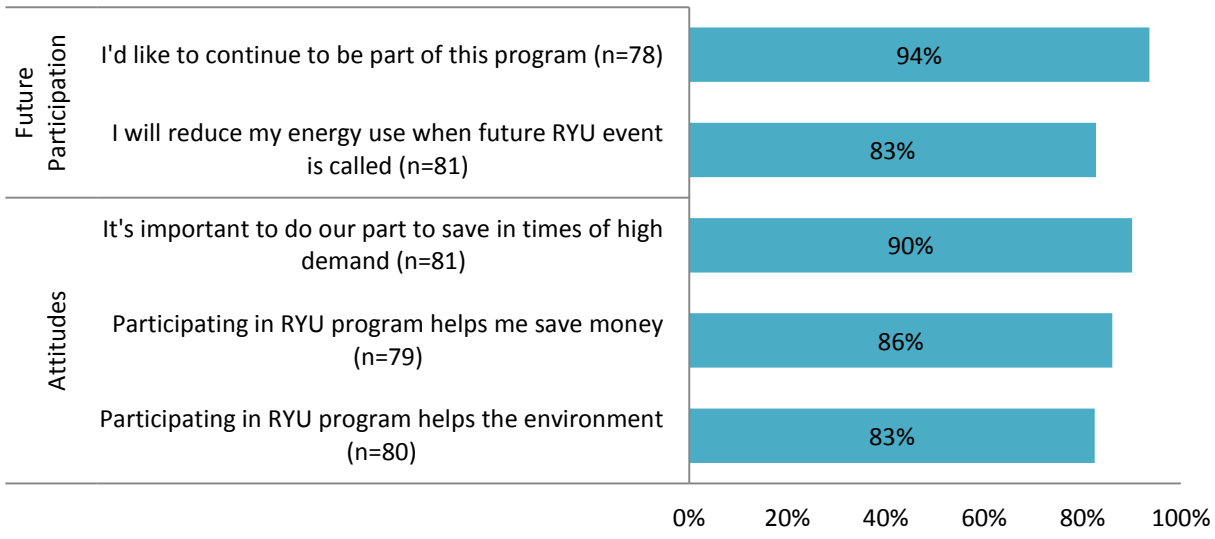


Because of concerns that email survey respondents were not distinguishing between energy saving actions performed every day and energy saving actions taken on RYU days over and above every day behaviors, interviewers focused on this distinction in follow-up interviews. In follow-up interviews, contacts were asked to specify what, if any, additional actions they had performed on RYU days - over and above what they normally tried to do. Seventeen of the 30 in-depth interview respondents reported performing specific additional actions to save energy on RYU days. The type of actions reported were consistent with the email survey responses in Table 15. Although most contacts seemed aware of the RYU event days, a few TECH participants did not participate beyond allowing their thermostats to be reset, and at least one IHD contact said that she did not know that the RYU events existed. A couple of contacts said they did not believe there was anything additional that they could do, beyond what they already do to conserve energy.

Rationale of, and Tolerance for, RYU Days

In the email survey, contacts indicated their likelihood of participating in future events and their attitudes about the impact of RYU event participation (Figure 9).

Figure 9: Likelihood of Future RYU Participation and Attitudes about Impacts: Percent "Somewhat" or "Strongly" Agree



In in-depth interviews, contacts were asked why they thought SDG&E requested that they reduce their use on specific days. Virtually all contacts associated the need for RYU days with increased load or peak demand because of hot weather on specific days. Although just two contacts mentioned the citywide outage in early September, one third of contacts mentioned the general need to prevent brownouts or blackouts. Justifications of RYU days focused on the need to meet power demand on high-demand days; just three contacts mentioned avoiding costs as a reason for RYU days.

In-depth interviewees also explained their rationale for cutting their energy use on RYU days. Most contacts said that they reduced their use on these days because SDG&E asked them to, or for the benefit of their community. Several also mentioned that they reduced their use to prevent outages, and six mentioned that they wanted to avoid paying peak time rates. Representative comments include:

- *"Because it's a high usage day and that's what they ask you to do."*
- *"To help make it so everyone has electricity."*
- *"It's the right thing to do. I'd hate to see a brownout."*
- *"Trying to be responsible customer of the utility."*
- *"I don't want to pay the extra rate."*

In-depth interviewees also estimated the number of events their household could accommodate, which varied widely. Nearly half of respondents said they could accommodate as many as needed (several specified that they would not participate under special circumstances; if someone

was ill, or people were visiting, for example). Among the other half of respondents, frequencies varied from a few times a year, to once a week; just two cited acceptable frequencies of *fewer* than one event per month.

Finally, in-depth interviewees' responded to the question *"is there anything SDG&E could do to make it easier for you to reduce your energy use on 'Reduce Your Use' days?"* These responses also varied: two contacts mentioned an incentive; four mentioned text notifications; one mentioned a remotely controlled pool-pump; and one mentioned an alert for times when power was less expensive.

THE CONTEST

In email survey responses, TECH group participants appeared more engaged with the Biggest Energy Saver contest than IHD group participants - with half of TECH participants who received the email signing up, compared with just a fifth of IHD participants (Table 16). Once signed up for the contest, all but one contact reported tracking their ranking online.

Table 16: Contest Invitation Email Receipt and Sign up Status, by Group

	GROUP	
PARTICIPATION STATUS	TECH (n=35)	IHD (n=48)
Received invitation email, signed up to participate	31%	10%
Received invitation email, did not sign up to participate	31%	42%
Did not receive invitation email	37%	48%

Of the 11 in-depth interviewees who reported having signed up for the contest, seven reported performing actions to save energy that they would not have otherwise done as part of the contest. Only one of the 11 reported tracking their energy use more than they would have otherwise as part of the contest. One contact mentioned winning because they were out of town during the measurement. Another described being confused about the ratings, and wanting more context. In comments about their favorite elements of the program, two TECH group participants called out the contest as particularly helpful in motivating them to reduce their energy use.

OTHER ONGOING CONSERVATION EFFORTS

In the email survey, nearly all participants (91%) indicated they had made changes to try to reduce their energy use, irrespective of RYU events, since their equipment was installed (Table 17). The most common changes mentioned included replacing lights or turning them off more often (44%), and raising the AC temperature (38%, including 49% of IHD group respondents).

Table 17: Changes Made to Conserve Energy since Installation of Equipment (n=86; Multiple Responses Allowed)

CHANGE	PERCENT
Replaced lights or turned off more often	44%
Increased AC temperature	38%
Turned off computers or other electronics	24%
Altered pool pump or spa temps	19%
Increased awareness	12%
Run clothes washer at off hours	8%
Run dishwasher at off hours	7%

In the in-depth interviews, respondents elaborated on how the information provided by their devices had affected their household's ongoing energy use. Twenty-six of the 30 contacts, including 14 of 15 TECH group contacts, said that the information provided by the devices had affected their household's energy use. Although a few contacts made more general claims about trying to reduce household energy use, a large majority of contacts (18 of 26) mentioned specific devices or appliances they had identified as particular energy users or as an area for decreased use, based on monitoring they had done through the pilot. Two contacts also mentioned longer-term intentions to replace equipment they had identified as particularly energy-intensive, and one mentioned receiving an energy audit since starting the program. Five contacts mentioned that they had shifted the time they used some energy-using household appliances (four of five specifically mentioned laundry). For example:

- *"We experiment with our energy usage and see what the impact of different lighting and lower pool pump RPMs is. It's nice to see how much things are using at that exact moment."*
- *"Because I can see exactly how much it's going to cost, it gives me good data. We conserve more because once we see we get over a certain limit it's going to cost us this much, we use our appliances less and keep from washing from peak times."*

In detailing their actions since the installation of equipment, a majority of contacts (15 of 26) mentioned the increased awareness as a key motivating factor. Some contacts (8 of 26) also called out the ability to track energy use and costs over time as a motivating factor, and two TECH group participants mentioned the contest as a motivating tool. Several comments illustrate the ways in which the devices motivated energy conservation activities:

- *"It makes me more aware. I use my pool pump less…"*
- *"Having access to energy use information with comparisons to the past has helped. The contest they were running helped a lot – we won four gift cards."*
- *"We're always trying to beat our previous week's usage."*

➡ *"We're reducing our usage—we're about 30-40% lower than last year."*

DEMOGRAPHICS

Email survey respondents answered several demographic questions. Mean household size was just over three people, with 46%[8] of contacts reporting having a child under 18 and 10% reporting that at least one household member was 70 or older (Table 18). A majority of respondents (59%) reported household incomes greater than $100,000 (Table 19). These demographic characteristics indicate that survey respondents are significantly more affluent than California as a whole, where 26.4% of households have incomes greater than $100,000.[9]

Table 18: Household and Home Characteristics

	AVERAGE	MIN	MAX
Household members (n=78) [1]	3.2	1	7
Home size (sq. ft; n=79)	2,510	860	5,000
Home built (year; n=79)	1977	1911	2006

[1]One outlier, who reported 44 household members and 20 children between 5 and 18, was excluded from this average.

Table 19: Household Income (n=89)

INCOME	PERCENT
< $40,000	2%
$40,000 to $50,000	5%
$50,000 to $75,000	5%
$75,000 to $100,000	15%
More than $100,000	59%
Decline to answer or DK	14%

In addition to answering demographic questions, in the in-depth interviews, several interviewees made spontaneous comments indicating high motivation and awareness about energy conservation, demand response, and facilitating technologies. Although these households were targeted for participation because of their high energy usage, several contacts mentioned that they were current or former engineers, several had participated in previous programs, and many reported having made previous attempts to understand or curtail their energy use.

8 Compared with 37% of all California households, according to 2010 Census data (no significant difference; http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

9 According to the 2010 American Community Survey; a statistically significant difference (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

3 THE LOW-INCOME PILOTS

PILOT INFORMATION

The Low Income In-Home Display (IHD) and Low Income Programmable Communicating Thermostat (PCT) pilots were administered by SDG&E's Customer Programs and Assistance Group in the second half of 2011. The two Low Income Pilots differed in the technology they offered and in their goals:

- The **IHD pilot** provided participants with an IHD capable of displaying near real-time energy use and cost information. By making this information available at a central location within a participant's home, the program sought to raise participant awareness of energy use and motivate energy conservation behaviors.
- The **PCT pilot** provided participants with a thermostat that was both programmable and communicating—allowing SDG&E to increase the set point on central air conditioners by four degrees during a demand response event.

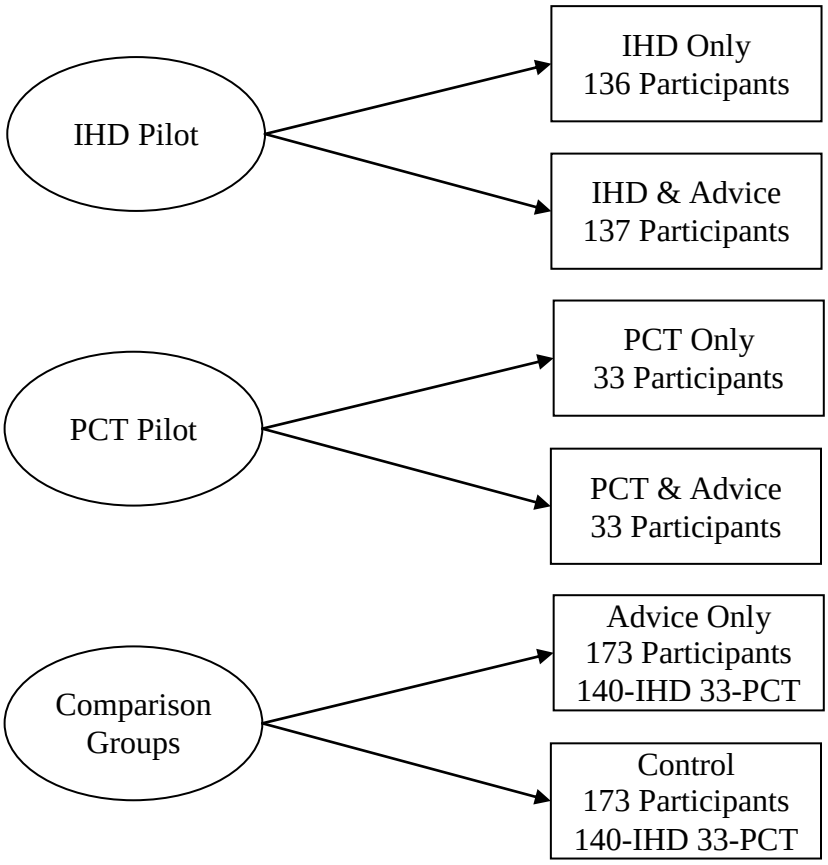
In addition to the devices, participants in both of these pilots received access to an energy management website, which provided information similar to that available from the IHD: near real-time energy use tracking, cost estimates, and comparisons to past usage. In general, the information on the website was more detailed and designed to be more graphically pleasing. The website also allowed participants in the PCT pilot to remotely change the settings on their PCT. Table 20 summarizes the components of the Low-Income IHD and PCT pilots.

Table 20: Low Income Pilot Components

FEATURE PROVIDED	IHD	PCT
In-Home Display	Yes	**No**
Communicating Thermostat	**No**	Yes
Day-ahead event notification	Yes	Yes
Website access	Yes	Yes

To test the role of energy efficiency information and advice in motivating conservation behaviors, the program divided participants into groups that received varying combinations of devices and conservation advice. Some participants received a series of four emails, each containing advice focused on energy savings for different end uses; while others received a device, but did not receive emails. A third group of participants received informational emails, but did not receive a device. The pilots also identified control groups for comparison. Figure 10 summarizes these groups.

Figure 10: Low Income Pilot Sub-Groups



Target Population

The IHD pilot sought to enroll approximately 300 participants, while the PCT pilot sought approximately 250. Both pilots targeted customers living in single-family homes who had participated in the Energy Savings Assistance Program (formerly LIEE) between 2006 and 2010 and had an average monthly energy use of at least 275 kWh. In order to qualify for the pilot, customers within the target population had to:

- Pay a residential domestic service rate: Customers paying residential service rates (DR) and customers taking part in the California Alternate Rates for Energy program (DRLI rate) were eligible to participate. Customers on medical baseline or life support rates were ineligible, as were customers with net metering agreements.
- Plan to stay in their current home for at least six months.

- Have the necessary equipment and internet connection capabilities: participation required a smart meter with, at a minimum, Hardware 2.0, System Release 2.0, Service Pack 5.1, a high-speed internet connection with a modem and a router with an open port, a home computer, and an email account.

Participants in the PCT pilot also had to have a working central air conditioner.

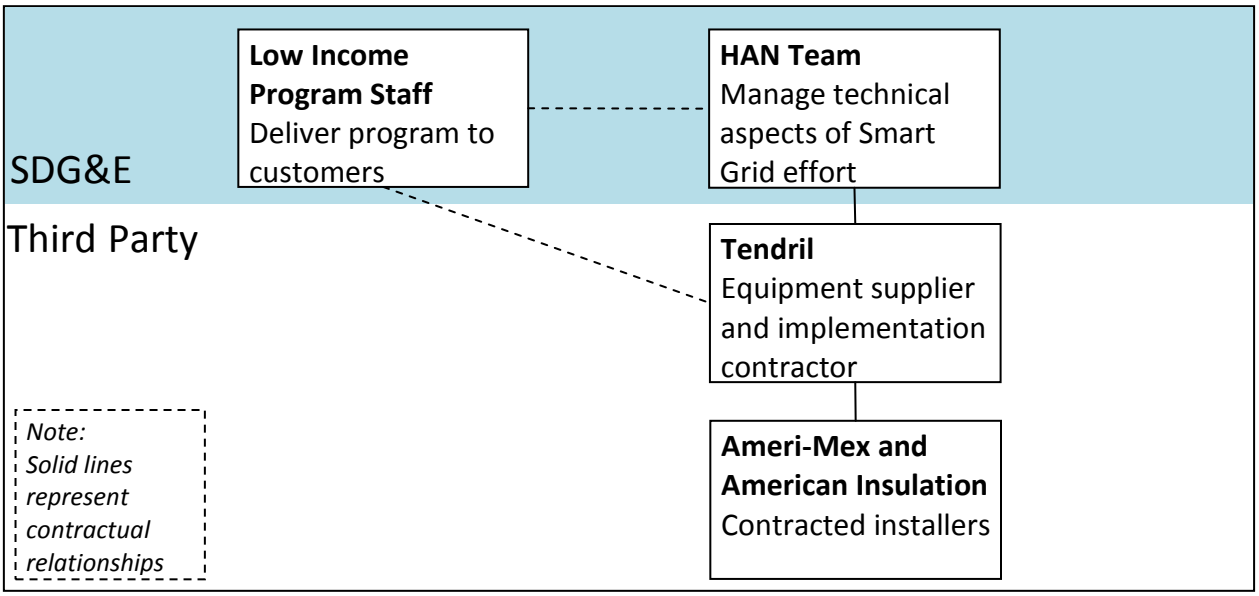
Program Implementation Roles

Within SDG&E, implementing these pilots required the coordination of three groups:

- SDG&E's **Low Income program staff** were responsible for overall program delivery. They coordinated with other groups involved in program design and technology deployment, oversaw program marketing, and were involved in recruitment and eligibility screening of participants.
- SDG&E's **HAN team** manage the technical aspects of SDG&E's Smart Grid efforts. They tested and selected the technologies the pilots offered and supported the integration of the technologies with other SDG&E systems. The HAN team selected Tendril as a technology vendor and managed Tendril's contract. They worked closely with Tendril to coordinate technology installation. The HAN team also sent messages notifying customers of event days. The HAN team coordinated various aspects of the Smart Grid pilots in order to identify emerging issues and standardize processes.
- **Tendril** is a third-party vendor that played a dual role, acting both as an equipment supplier and as an implementation contractor. As an equipment supplier, Tendril provided the PCTs and IHDs that the pilots offered and sub-contracted for equipment installation. As an implementation contractor, Tendril managed the program's contact with participants. In this role, Tendril scheduled equipment installation and managed a customer-facing website, which provided an energy consumption "dashboard." Tendril also responded to customer requests for technical support.

All three groups involved in implementing the IHD and PCT pilots worked closely together. The HAN team and Low-Income program staff worked together to determine whether demand forecasts warranted calling a curtailment event. Tendril staff reported daily contact with installers when equipment was actively being installed, and, as needed, involved SDG&E staff in these calls. Tendril staff also attended weekly meetings with program staff and information technology (IT) staff at SDG&E to address pilot marketing and IT issues, installation scheduling, status updates, and technology performance. Figure 11 illustrates the interaction between the groups responsible for implementing the Low Income IHD and PCT pilots.

Figure 11: Groups Involved in Low Income Implementation



Recruitment and Installation

SDG&E initially identified potentially eligible participants based on the information available in its database. Program staff contacted these potentially eligible households with marketing materials sent by postal mail and email (for customers who had provided their email address to SDG&E). Potential participants that were recruited for the IHD pilot received as many as two emails and three direct mailings, while those that were recruited for the PCT pilot could have received as many as seven emails and eight direct mailings. Recruitment materials directed customers to the program's enrollment website. As part of the enrollment process, potential participants answered a series of questions to ensure that they met eligibility requirements. The first 140 potential IHD participants and 33 potential PCT participants who applied, but did not qualify, for the pilot formed the information only groups. Table 21 details program recruitment results.

Table 21: Pilot Recruitment Results

NUMBER OF POTENTIAL PARTICIPANTS	IHD	PCT
Sent recruitment materials	~12,000	5,125
Completed enrollment questionnaire	591	259
Qualified for pilot	317	150
Received device	279	66

With eligibility confirmed, Tendril contacted qualified participants to arrange for device installation. Program enrollment and installation took place over a period of approximately two months. Tendril sub-contracted with two companies to install program technologies in customers' homes. American Insulation installed the IHDs, and Ameri-Mex installed the PCTs. Program staff reported that installers tried to place the IHD in a central location within the home, while respecting homeowner preferences and ensuring that the device was close enough to the gateway (a device connected to the router) that it would reliably receive a signal. The PCT replaced the existing thermostat and was thus installed where the existing thermostat had been located.

In addition to installing program devices and demonstrating how to use them (including how to override temperature setbacks on the PCT), installation contractors registered the devices on the program website and showed the website to participants. IHD participants also received a brochure explaining their tiered rate structure and demonstrating how they could save money by avoiding the highest tiers of energy use. PCT participants received information about how their thermostat could save them money and increase the reliability of the electrical grid.

Demand Response Events

Participants in both pilots received notification of demand response events through text messages sent to their program-provided devices and notifications on the program's web portal. During demand response events, SDG&E remotely raised the temperature setting on PCTs by four degrees; participants could override this adjustment by pushing a button on their PCT, adjusting the temperature manually, or by changing their temperature settings on the energy management website. SDG&E did not automatically curtail any equipment for IHD pilot participants. Instead, these participants were expected to respond to event notifications by altering their own energy-using behaviors. The program did not offer incentives for measured energy savings use reduction achieved by participants, nor were there penalties for those that did not reduce their energy use.

Program staff and the HAN group worked together to determine whether to call an event based on the load and weather forecasts. The program provided both 24-hour advance notification and notification on the day of the event for each of the events called in 2011. Due to various coordination and technology issues, the IHD pilot launched in March, and the PCT pilot launched in July, later than program staff had hoped. The program notified IHD and PCT pilot participants of four demand response events, on September 6, 7, and 8, and October 13, 2011.

Table 22: LI Events Called in 2011

DATE	START TIME	END TIME
September 6	3:00 PM	5:00 PM
September 7	2:00 PM	6:00 PM
September 8*	1:00 PM	5:00 PM
October 13	2:00 PM	5:00 PM

* SDG&E was affected by a widespread power outage affecting Southern California, Arizona and parts of Mexico on September 8, 2011.

Staff Experience

In interviews, program staff reported encountering several implementation and technical issues.

According to program staff, the PCT pilot failed to meet its target enrollment of 250, because of the requirement of operable central air conditioning and because renters could not always accept PCT installation. Program staff had also anticipated sending participants emails to notify them of event days, in addition to the text messages sent to their devices, but technical and administrative barriers prevented them from doing so.

Program staff reported little contact with participants once the pilots were underway, but the program did follow-up with participants who chose to leave the pilots. According to program contacts, participants who opted out described confusion in operating program technologies or did not like the devices themselves. The IHD pilot experienced a higher than expected rate of IHDs that were off line. Contacts from SDG&E's HAN team reported that between 20% and 30% of the pilot's IHDs had gone offline at some point during the pilot, and their data suggested that many of these IHDs were consistently offline. Tendril reached out to these customers and succeeded in bringing 40 IHDs (approximately 15% of those the program provided) back online.

Program staff also described some technical issues with the devices. As with RACT, the Low-Income IHDs were programmed to display the projected end-of-month rate tier, rather than the current rate tier. Thus, although the rate tier resets to Tier 1 at the beginning of each billing cycle, participants' IHDs continued to show their projected end-of-month tier, based on current electricity use. Finally, the pilot experienced some reliability issues with the network, meaning that not all of the devices (IHDs and PCTs) received demand response messages on event days.

IHD PILOT PARTICIPANT FINDINGS

Methods and Disposition

This process evaluation draws on two types of data collected from pilot participants:

- Email surveys conducted by SDG&E
- In-depth interviews

SDG&E's Low Income program staff conducted the email survey in-house, using a survey instrument that they had drafted and the research team reviewed. Participants completed the survey in Fall 2011. This survey followed an earlier email survey that program staff sent to pilot participants, which focused on participants' experience with IHD installation. The data file SDG&E provided to the research team contained 56 respondents. Because the data file contained

no information about individual respondents or the survey campaign disposition, we were unable to assess the characteristics of the survey respondents relative to the entire pilot population.

To conduct follow-up interviews, we randomly-selected a subset of 40 IHD participants and completed 10 in-depth follow-up interviews. Participants were offered a $40 incentive for completing an interview over the telephone, which occurred between January 31, 2012, and February 3, 2012.

Chapter Structure

Because of the two survey samples, and because not all contacts answered all questions in the email survey, the sample size varies throughout this chapter, and has been noted for each question. Results from the in-depth interviews are used to provide context and additional detail for the responses to the email survey.

PROGRAM EXPECTATIONS AND EXPERIENCE

Nearly all of the in-depth interviewees (9 of 10) reported that the potential to track their energy use convinced them to sign up for the IHD pilot. Contacts also cited the opportunity to save money (four mentions) as a motivator for their participation in the pilot. Interview findings suggest that participants were largely satisfied with their program experience; nine of the ten interviewees described positive experiences with the program.

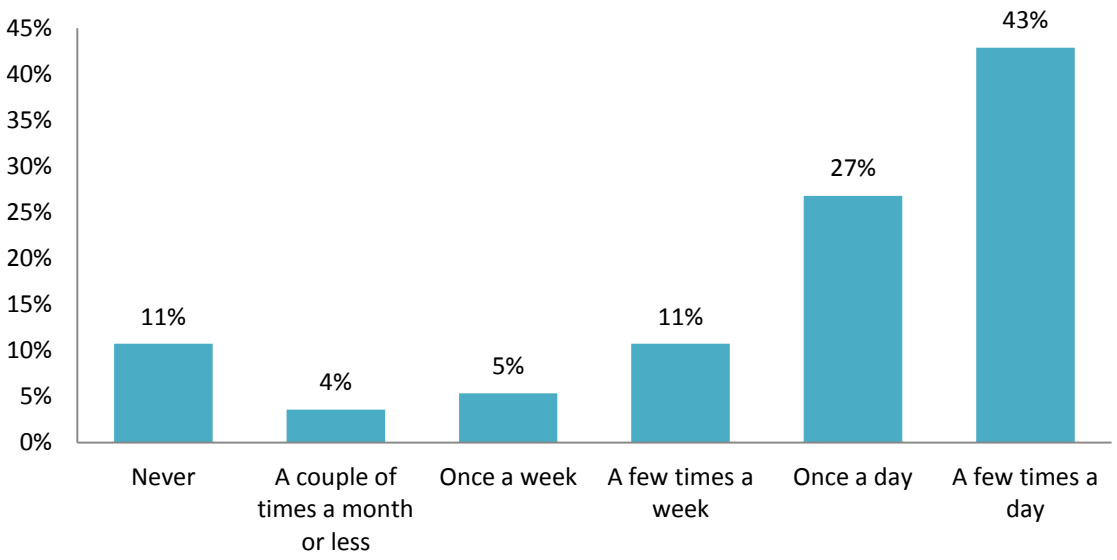
Problems establishing a connection between the IHD and their home network may have detracted from some contacts' program experience. One interviewee who did not have a positive experience reported that, as a result of the IHD installation, his household lost internet service. Another interviewee - who reported an overall positive experience with the program – also reported losing access to her computer because of the IHD installation.

THE IN-HOME DISPLAY

Frequency of Use

Email survey respondents reported using their IHD frequently. More than 80% of survey respondents reported that they checked their IHD more than once a week (Figure 12).

Figure 12: Frequency of IHD Use Reported in Email Survey (n=56)



The in-depth interviews were consistent with this finding: most in-depth interviewees (seven of ten) reported checking their IHD daily or multiple times a day.[10] Two of the three remaining interviewees check their IHD at least once a month, using the device to forecast their upcoming bill. The third interviewee disconnected his IHD, as he felt he had learned all the useful information the device could provide. Several interviewees (three of ten) mentioned checking the IHD more often than they might otherwise have because they placed it in a convenient, visible spot.

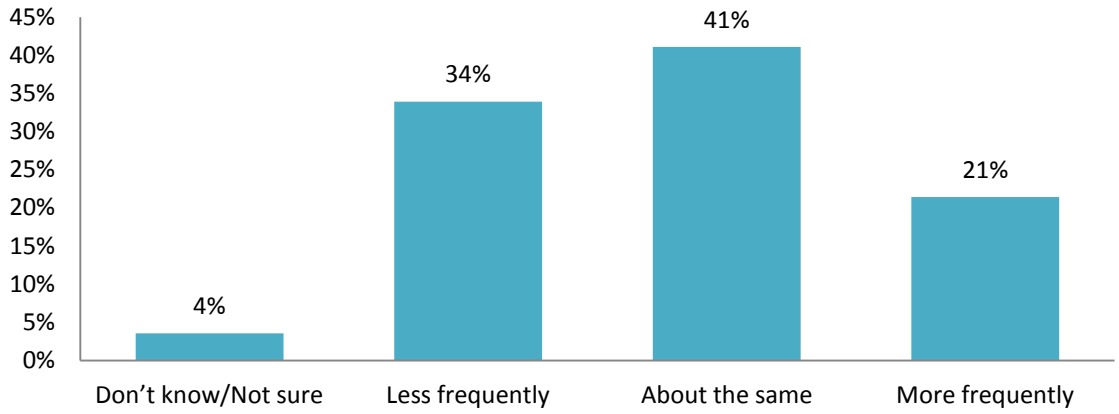
Illustrative comments include:

- *"I look at the unit every day. What's helped a lot is relocating, I have it in my kitchen now, where originally I had it in my office, and when I put it in the kitchen because it's right there all the time, I can't not see it. That's helped as well."*
- *"Oh gosh. I cannot even tell you how many times we look at it during the day. I probably look at it 25 times a day. Because it's in a convenient place and again because we have that option to move it to a convenient place."*

A majority of email respondents (62%) reported using their IHD with the same or greater frequency than when they initially received the unit. Among email survey respondents that reported checking their IHDs more frequently than when they first received it, almost all (11 of 12) reported using the IHD at least once a day. About a third (34%) of email respondents reported using their IHD less now than when they had just received it (Figure 13).

[10] One of these interview contacts, who stated that he would ordinarily check the IHD daily, reported that the device had recently broken.

Figure 13: Reported Change in IHD Use (n=56)



In-depth interviewees showed the same pattern as email respondents, with seven of ten interviewees using their IHD with either the same frequency (five of ten) or more frequently (two of ten). The remaining three interviewees use their IHDs less than when they first got the device, typically noting that as the information on the device became routine, it seemed less important to monitor it frequently.

Perceptions of Device

Most email survey respondents reported positive perceptions about their IHDs (Table 23). The majority of the email respondents (88%) agreed that the unit is easy to use, and 81% agreed that the unit helps them save money.

Table 23: Perceptions (n=52)

ASPECT	DISAGREE	NEUTRAL	AGREE
My In-Home Display is easy to use	8%	4%	88%
The In-Home Display helps me save money	12%	8%	81%

Email survey respondents also provided positive ratings for the information their IHD provides (Table 24). Overall, 88% of email respondents reported the IHD had been generally useful. Email survey respondents provided the highest ratings for the usefulness the daily energy use and cost information the IHD provides, with 94% of those aware of these features rating the elements at least somewhat useful. Fewer contacts were aware of the estimated monthly bill information the IHD provides, although 90% of those who were aware, rated the information helpful. The smallest proportion rated the current outside temperature as useful.

Table 24: Usefulness of IHD (n=56)

	Aware of the Information		"Somewhat" or "Very Useful"	
	Count	Percent	Count	Percent*
Overall usefulness of IHD	--	--	49	88%
"Today Used"	51	91%	48	94%
"Daily Cost"	47	84%	44	94%
"Estimated End of Month Bill"	41	73%	37	90%
"Today Price"	50	89%	44	88%
"Current Outside Temperature"	45	80%	34	76%

* Percent calculated based on the number of contacts who were aware of each feature.

Like survey respondents, those contacted for in-depth interviews also rated the energy use and cost information the IHD provides as most useful. Six contacts found the ability to monitor their energy use most useful, although these contacts were divided regarding the granularity of the information they sought. Three contacts cited access to real-time monitoring of energy use most useful, while three reported that total usage information for a day or month was most useful. Three additional contacts reported that being able to monitor their bill and track energy spending was most useful. One interviewee said the most useful feature was how easy the device was to use.

Best Features

Interview and survey findings suggest that participants generally view their IHDs positively. Email respondents most often cited the rapid feedback about household energy use and the bill projection feature as the best aspects of the device (Table 25). Email respondents reported that their IHDs had helped them to see how specific equipment affects their energy use and described having more awareness and control over their household's energy use.

Table 25: Best Features of IHD (n=56)

Most Liked Features	Count	Percent
Rapid feedback about energy use	14	25%
Bill projection	13	23%
Usage data	7	13%
Identify loads of specific appliances	7	13%
Easy/Convenient	5	9%
Other	5	9%

The question was asked in an open-ended format, and the responses were later coded. The denominator used to calculate the percentages is all the respondents (n=56).

The in-depth interviewees also largely (7 of 10) indicated that the IHD device met or exceeded their expectations. One interviewee noted that the IHD *"was detailed enough for a person like me to let [me] know where [I am] at."*

Complaints

Fewer than half of the email survey respondents (46%) expressed complaints about their IHDs when asked what they liked least about the device. Similarly, in in-depth interviews, four of the ten participants interviewed offered no criticisms when asked what they liked least about their IHDs.

In both the email survey and in-depth interviews, those who suggested opportunities to improve the IHD primarily focused on two aspects of the device:

- It's hardware and design
- The depth of information it provides

Hardware and Design

The in-depth interviews gave the research team a chance to probe a bit deeper into reasons for dissatisfaction and specific opportunities for improvement. In-depth interviewees voiced several complaints about the IHD, including a cord that is not long enough, the small size of the display, and the fact that the backlight lacked an on-switch.

Similarly, among the email survey respondents with complaints about the IHD, the aspects mentioned most frequently related to the fragility of the hardware and issues with user interface. Illustrative comments include:

- "*It keeps falling down. It needs a better stander-upper.*"
- *"The idea is great, execution is horrible. The equipment design [appears] very old and the display was unreadable after a few weeks. The menus are hard to navigate."*
- *"One unit failed due to poor quality LCD screen. I left the backlight on for extended periods, and the panel failed."*

In suggesting ways to improve the hardware and design of the IHD, email survey respondents sought higher-quality screens. One in-depth interviewee suggested that a larger screen would be helpful (Table 26).

Table 26: Email Survey Results: Issues with IHD and Suggestions for Improvement

LEAST LIKED FEATURES	COUNT	PERCENT
ISSUES WITH IHD (n=26)		
Hardware Aspects (breaks, flimsy build quality, too large)	10	38%
Information provided is limited (not detailed enough)	7	27%
Software Limitations (hard to read, software glitches)	6	23%
Other (lack of technical support, not instantaneous)	5	19%
SUGGESTED IMPROVEMENTS (n=56)		
Access to more detailed information about energy use	8	14%
Higher Quality Screens	6	11%
Faster Display Response	4	7%
Sound or alarm when usage reaches a pre-set level	2	4%
Other requests (easier passwords, ability to erase messages, tomorrow's weather)	5	9%

The denominator used to calculate the percentages for the "issues with IHD" section is those who expressed opinions about their least liked features of their IHD (n=26); the denominator used to calculate the percentages for the "Suggested Improvements" section is all email survey respondents (n=56).

Information Provided

Email survey respondents expressed a desire for more detailed or meaningful information than that provided by the IHD. These respondents wanted to see their energy consumption on a more granular level, either at room-level or in sufficient detail to explain to them why their household energy usage regularly puts them in higher rate tiers. Specifically, respondents cited a desire for gas usage information and estimates of their total SDG&E bill, as well as information on energy use by house zone and charts portraying their energy usage over time. According to one email survey respondent, *"The information has not been enough to change my habits with regard to energy use. In fact, it's been more frustrating to see that I go over every time."*

Email respondent suggestions for improvements to their IHDs also reflect this overarching desire for more detailed information about their energy use. Among the 24 email respondents that offered suggestions, eight asked for more detailed usage information, such as the ability to track energy use by time of day, usage by room, more detailed month-over-month comparisons, and visibility into natural gas use (Table 26).

In-depth interviewees also expressed a desire for detailed usage information on their IHDs. Two interviewees wanted information on specific appliance energy usage, and another expressed a desire for a bar graph comparing energy usage for the previous week with the current week.

In-depth interviewees' suggestions on how to improve the IHD also referred to added information or other software feature changes. These suggestions fell into two categories - alerts and additional information. One contact suggested combining the two, stating: *"[I] would like*

more feedback on deviation from typical usage; if it detected high usage during certain times, maybe provide dropdowns giving you ideas of what to look for."

Offline Issues

The majority of IHD users (71%) reported they have experienced connection problems with their IHD (saw a red light on their IHD). Of those, 80% attempted to re-establish the connection, but 30% reported they were not able to do so. In addition, five contacts reiterated that they experienced technical difficulties or provided comments about wanting their devices to work properly in their recommendations for program improvement, describing an assortment of technical issues with flashing lights, firmware upgrades, and computer interference.

In-depth interviewees described their experiences with connection issues; seven of ten reported knowing that their IHD had gone offline. All said they were able to get the device back online by rebooting it. One reported that the device had permanently failed. Four of the ten in-depth interviewees disabled their IHD to move it to another area of the house, but reconnected the device after changing its location.

Use of Alerts

The IHD provides an alert feature that notifies participants when their estimated bill reaches a set amount, but only 39% of the email survey respondents reported they were aware of this feature. Half of those aware of the feature said they had set up this alert.

One in-depth interviewee expressed a desire for the IHD to include an alarm that would go off when her household reached a set level of energy use, lending support to the email survey finding that some participants were unaware of the alarm feature. Another participant had disabled this feature after finding it annoying.

Energy Management Website

Program staff provided the evaluation team with website analytics tracking logon statistics for the Tendril website (Table 27). These analytics tracked the dates of logons by unique email addresses associated with each pilot. Although the evaluation team was unable to match the email addresses in these analytics to the participants we surveyed, these analytics provide a broad overview of participant use of the program website. Despite some possible list errors (the number of people logging on exceeds the number of IHD group enrollees), almost all IHD pilot participants logged onto the website at least once. This was expected, though, as installers showed the participants how to access the website. About one-third (37%) of IHD pilot participants logged onto the website more than once, though. Overall, IHD pilot participants appear to have used the website occasionally, with an average number of logons just under three.

Table 27: Website Logon Analytics

STATISTIC	IHD GROUP
Number of program enrollees	*279*
Number of unique email address logons	303
Percent of emails with multiple logons	37%
Average number of logons	2.7

Consistent with the website analytics, email survey findings suggest that the Low Income IHD participants relied on information displayed on their IHDs to a greater extent than the program website. Less than half of the email respondents (48%) reported they had logged into the website, and respondents reported using the website less frequently than the IHD. Three respondents reported looking at the website a few times a day, but most looked at it rarely, or not at all. Despite this, 70% of website users reported the website was useful, even those who rarely used it.

Those contacted for in-depth interviews reported using the website to a greater extent than email survey respondents. Seven of ten in-depth interviewees said they had logged onto the website. However, while in-depth interviewees largely reported that they currently look at their IHDs as much or more than they did when they first got the device, interview findings suggest that their use of the website has declined. While six of the seven interviewees who had accessed the website reported logging on at least a couple of times a month during the summer months, four of the seven reported they no longer use the website. Interviewees provided several reasons why they no longer used the website. One interviewee indicated he had learned what he needed from the website, one had technical difficulties, one used the website in the summer to see AC and pool pump usage, and another reported just using the IHD instead.

In-depth interviewees reported logging onto the website in order to access more detailed energy use information than is available on their IHD. The information interviewees reported seeking includes hourly, daily, or total usage information (four mentions), usage patterns (one mention), comparisons of expenditures from one day to the next (one mention), and more details of their energy use in general (one mention).

Email respondents offered a wide range of suggestions for website improvement, including:

- Specialized cell-phone or desktop software
- Ability to delete messages
- A more navigable menu system
- More accurate tier calculations
- Ability to track usage with more granularity (by room, appliance, etc.)
- A guide to show what is an expected cost for end uses

Three in-depth interviewees had recommendations for the website. These suggestions included: having access to individual energy use measurements for appliances; having graphs that compare current to previous usage for the month, week, and day; and mapping the pre-set page views to those provided by the IHD.

Information Emails

Prior to the email survey, SDG&E had sent four emails to participants in the advice group (half of all IHD participants, see Figure 10: Low Income Pilot Sub-Groups). The advice emails provided energy conservation tips focused on four major sources of energy use within the home. Thirty-eight percent (21 of 56) of the email respondents recalled receiving at least one of these emails.[11] Among the 21 that recalled receiving these emails, 14 reported that they were helpful, and 11 reported changing their energy using habits based on these tips.

Nine of the ten in-depth interviewees were in the advice group, and five of them recalled receiving emails from SDG&E providing energy saving tips. These five interviewees provided generally positive assessments of the emails they received. Two of the five suggested that the emails complimented their IHDs by increasing their overall awareness of household energy use. According to one of these two interviewees, "*this monitor, honestly, has really raised my awareness… I am much more attuned when an email message comes through, when I read an article, when I go to buy something; I'm so much more aware."* The other noted that estimates of the energy costs associated with different end uses are particularly valuable. Two additional interviewees of the five reported that the emails had motivated them to change energy-using behaviors - for example, turning off lights and changing their thermostat. The fifth interviewee who recalled receiving emails stated that the information provided was valuable, but speculated that conservation advice would mask a rate increase.

Demand Response Events

Only two of the ten in-depth interviewees recalled receiving messages on their IHDs, separate from the conservation emails, informing them of demand response events. Of these, one reported taking action to reduce household energy use in response to the event. The other reported ongoing efforts to reduce energy use, but did not carry out specific conservation activities in response to the notification.

In general, contacts expressed satisfaction with the information on energy savings opportunities they had received from SDG&E.

[11] Because survey data did not include any information that would allow us to identify participants, we are unable to determine if participants who recalled receiving the emails were actually in the advice sub-group.

Attitudes and Behaviors

While survey results indicate that the Low Income IHD participants value energy savings and environmental benefits, findings suggest that participants are primarily motivated by cost savings. Almost all email respondents agreed that it is important to save energy in times of high demand (94%). Similarly, 85% agreed that participation in this program helps the environment (Table 28). When asked to choose between saving money or protecting the environment as their primary motivation to reduce energy use at home, 57% of email respondents said they are more interested in saving money, and 36% said they are interested in both equally. Very few (3%) indicated they are more interested in environmental protection.

Table 28: Attitudes (n=56)

ASPECT	DISAGREE	NEUTRAL	AGREE	TOTAL
It's important to do our part to save energy in times of high electricity demand.(n=54)	4%	2%	94%	100%
Participating in this project helps the environment. (n=53)	8%	8%	85%	100%

Consistent with this interest in saving energy, almost all email respondents (90%) reported attempting to change energy habits to reduce energy use after receiving their IHD (Table 29). The most common activities contacts cited were turning off appliances or turning off lights. A number attempted to reduce plug load use either by unplugging appliances or switching off power strips. Some email respondents also installed more efficient lights. Among email respondents, 64% reported noticing a reduction in their energy use as a result of their actions.

Table 29: Activities Employed to Save Energy (n=56)

ACTIVITY	COUNT	PERCENT
Turn off appliances	20	36%
Turn off lights	18	32%
Reducing plug load	9	16%
Changed lights	8	14%
Targeted higher loads	6	11%
Changed HVAC habits	4	7%
Bought new equipment	3	5%
Changed cooking habits	3	5%
Changed laundry times	3	5%
Other	5	9%

The question was asked in an open-ended format, and the responses were later coded. The denominator used to calculate the percentages is all the respondents (n=56).

Consistent with email survey findings, all ten of the in-depth interviewees reported that the IHD had affected their household energy use in an ongoing way. Elaborating on their responses, four interviewees reported that having the IHD had made them more conscious of their energy use in general, and two additional interviewees specified that they now consider energy use in a way they had not done before when buying appliances or equipment. Four interviewees also reported altering their behavior in order to reduce energy use, primarily by turning off lights and other devices when not in use. Two interviewees reported seeing reductions in their energy bills because of the actions they had taken.

One in-depth interviewee noted that, while the IHD had been useful initially, he had lost interest in it once he gained an understanding of his household's energy use. According to this contact, *"Once you check it out and figure out what to do to reduce [your energy use], you become more aware; that's positive. But after that, it's just a little mundane."* This contact nonetheless expressed a desire to remain in the program so he could use the type of information the IHD provides to understand the energy use impact of any new appliances or equipment that he purchases.

Experimentation

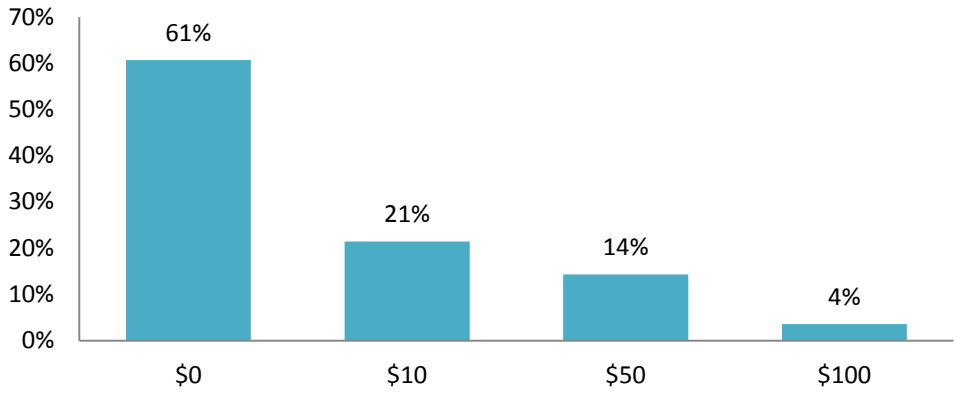
In-depth interview findings suggest that interviewees are open to experimenting with, and learning from, the IHD, website and email notifications, and that they would like more information about energy use and ways to save energy. Describing the type of experimentation he had undertaken using the IHD, one interviewee said, "*The initial focus that I had on it, and the ability for me to see the data and the information, [gives] me an opportunity to react and try to make some changes to reduce energy consumption."*

In addition to describing experimentation with the device, interviewees expressed a desire for more information, tips, or tools to help them learn more about their energy use. One interviewee stated that *"more information, I think, is helpful. Little things like knowing that fluorescent bulbs are more efficient than regular bulbs."* Another noted the value of *"constant reminders or tips."* A third interviewee stated that information on the energy costs associated with operating different appliances is particularly valuable.

Value of the IHD

Both in-depth interviewees and email survey respondents indicated that they value the IHD; however, both groups expressed little willingness to pay for a similar device. While 75% of email respondents agreed that the IHD helps them save money, the majority of respondents would not pay for an IHD. Even among the 34 respondents who "strongly agree" that the IHD helps them save money, the majority (18 of 34) would not pay for the device (Figure 14).

Figure 14: Willingness to Pay for IHD (n=56)



We explored this issue further with in-depth interviewees. While the in-depth interviewees also valued the information provided by the IHD, interview findings suggest they would be willing to pay relatively little for an IHD if the program had not provided one at no charge. Four interviewees stated that they would not pay for the device, while five stated that they would purchase the device if its price were in the range of $20 to $30. Another stated he would potentially be willing to pay, but was unsure of how much.

PCT PILOT PARTICIPANT FINDINGS

Methods and Disposition

This section draws on two types of data collected from participants in the Low Income IHD pilot:

- An email survey conducted by SDG&E
- Follow-up in-depth interviews

SDG&E's Low Income program staff conducted an email survey in-house, using a survey instrument that they had drafted. Participants completed the survey in fall 2011. The data file SDG&E provided to the research team contained 20 respondents. Because the data file contained no information about individual respondents or the survey campaign disposition, we are unable to assess the characteristics of the survey respondents relative to the entire pilot population.

To conduct follow-up interviews, we randomly selected a subset of 40 Low-Income PCT participants and completed 10 in-depth follow-up interviews. Participants were offered a $40 incentive for completing an interview over the telephone, which occurred between January 31, 2012, and February 3, 2012. The interviews included a mixture of open-ended questions and rating scales. Participants were asked about their experience with their PCT, their expectations, and their suggestions for improvement.

Chapter Structure

Because of the two data sources, and because not all contacts answered all questions in the email survey, the sample size varies throughout this chapter, and has been noted for each question. The email survey for the Low-Income PCT pilot was focused primarily on their experience with PCT installation; thus, there was less overlap between the topics discussed in the email survey and the in-depth interviews in this pilot than in the others. Additionally, because the in-depth interview topics were more comprehensive for this Pilot than for the others, only a few of the question frequencies from the email survey are included in this section. The remaining survey results are located in Appendix A.

Program Expectations and Experiences

In-depth PCT pilot interviewees reported enrolling in the program to save energy and money (five interviewees) and because they were attracted by the program's offer of new technology. Three interviewees reported wanting the technology's ability to enable them to assess and monitor their energy usage, while three additional interviewees reported they took advantage of the free programmable thermostat to replace their old, non-programmable thermostats.

Half of those interviewed stated that receiving a new programmable thermostat was the best part of the program. Two interviewees reported that the best part was increased awareness and knowledge of their energy use that program participation provided. In all, interview findings suggest that participants largely had a positive experience with the program. Nearly all contacts (8 out of 10) agreed that they would like to continue to be part of the PCT pilot program (rating their agreement a "4" or "5" using a 5-point scale).

Participation in the PCT pilot appears to have motivated contacts to alter their behaviors related to energy use. Seven interviewees reported their energy use behavior has changed since their enrollment in this program. Four of the seven reported becoming more conscious about their temperature settings, and had raised their thermostat's cooling temperature setting on a regular basis. Contacts reported applying a range of techniques in attempting to use less energy to cool their homes—primarily by using fans and opening windows. Three interviewees reported making an energy efficiency upgrade - such as installing insulation, replacing an old water heater, and installing CFLs instead of incandescent light bulbs - since they enrolled in the program.

Despite the technology that they received and the energy saving actions they undertook, a majority of interviewees (7 of 10) indicated that their experience with the program had been different than what they anticipated when they signed up. Two commonly reported reasons concerned difficulties with the program's website and lower than expected bill savings. Three interviewees mentioned that they had trouble viewing the energy management website: two had been unable to properly navigate to the website and log on using their access information; the third uses an iPad, which is incompatible with the website. Three interviewees also described not seeing the energy bill savings they had expected. In fact, two interviewees reported experiencing higher energy bills after the PCT was installed.

Interviewees' suggestions for program improvement primarily reflect a desire for more information about their home's energy use. Three contacts suggested that the program should provide customized, detailed analysis of their energy use and offer advice for improvements, while two others wanted the thermostat or website to provide information on natural gas usage. Others requested easier login and navigability on the website, provision of a thermostat with more sophisticated functions, ability to remotely turn the thermostat on or off,[12] and earlier demand response event notification.

The PCT

Installation

In the email survey, 15 of 20 respondents rated the overall installation experience as "good" or "excellent" (a "4" or a "5" on a 5-point scale). When asked about the installer's explanation of the PCT and the website, nine of 20 contacts said that the functionality was fully explained and that they fully understood the explanation (Table 30).[13]

Table 30: Participating Ratings of Installer PCT and Website Explanation (n=20)

	FULLY UNDERSTOOD	DID NOT FULLY UNDERSTAND, OR UNSURE IF FULLY UNDERSTOOD
Fully explained	9	3
Unsure if fully explained	0	4
Not fully explained	0	4

All but two of the 20 email survey respondents reported receiving the Getting Started Guide, the Thermostat User Guide, and the Home Cooling Brochure.

In in-depth interviews, eight contacts provided comments about their thermostat installation,[14] and almost all (7 of 8) reported that the process went smoothly. All eight interviewees reported receiving a brochure about demand response events and an instruction booklet. Multiple interviewees reported that the installers thoroughly explained how to use the thermostat, but one interviewee indicated the installer did not program the thermostat. One interviewee described the installation taking two days because the installer had to return with additional parts.

12 The thermostat could be adjusted up or down if it was on, but could not be remotely shut down completely.

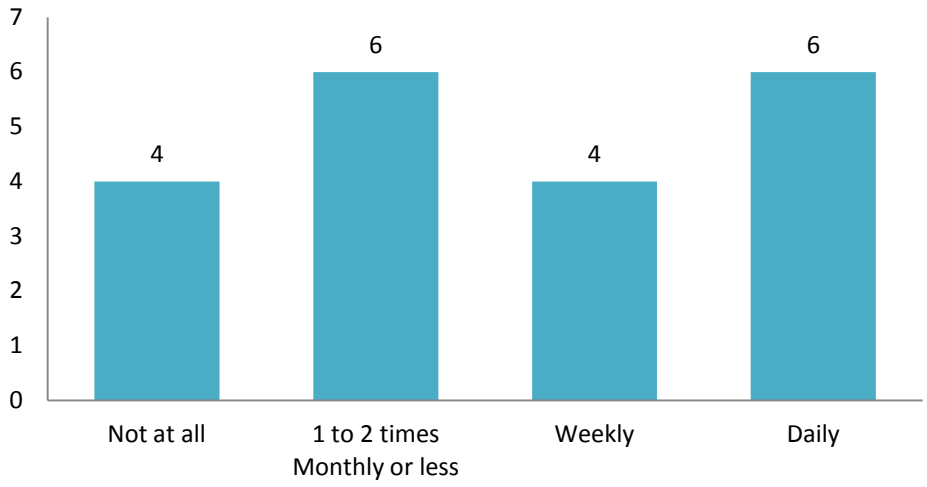
13 These totals include "don't know" responses. For complete frequencies, see Appendix A.

14 A question about installation process was added after completing two surveys.

Typical Usage

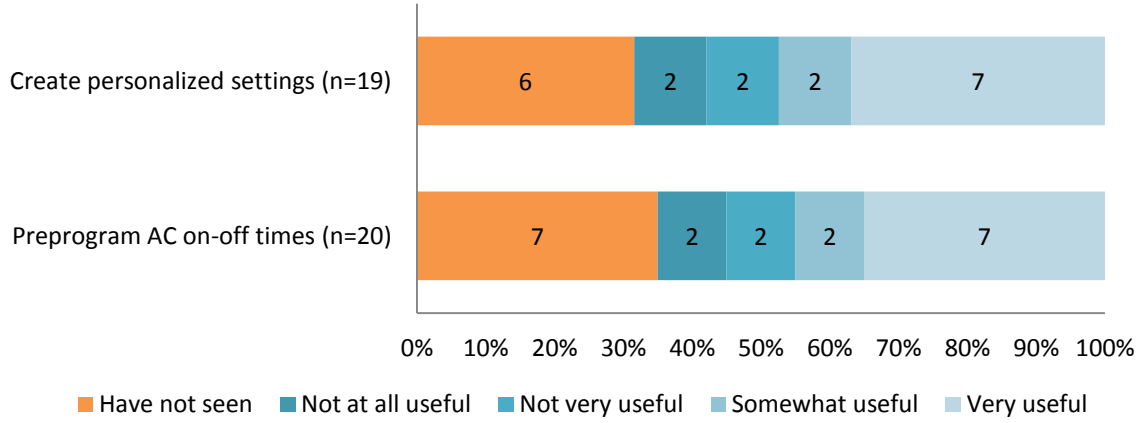
In the PCT email survey, respondents indicated how often they manually adjust the settings on their PCTs (Figure 15). Half of respondents (10 of 20) indicated making manual adjustments at least once a week.

Figure 15: Frequency of Manual PCT Adjustment (n=20)



Email survey respondents also rated the usefulness of PCT settings. Although a majority of those who were aware of the ability to preprogram on-off time and to create personalized settings found these features useful, a third of respondents reported not having seen these features (Figure 16).

Figure 16: Awareness and Usefulness of PCT Settings



Auto-Curtailment

Among email survey respondents, just under half of those aware of the demand response events (6 of 14) recalled noticing a change in temperature in their home. Of the six who noticed the change in temperature, four reported manually adjusting their PCT during at least one demand response event. One additional respondent who did not notice a temperature change also manually adjusted the PCT during an event. Three of these five specified that they overrode due to discomfort.

Similarly, half of the in-depth interviewees (5 of 10) reported noticing that SDG&E had automatically adjusted the temperature setting on their thermostat during a demand response event in the summer of 2011. Two of those interviewees reported that they overrode the utility's automatic temperature adjustment after experiencing discomfort. One interviewee complained that the temperature setting did not reset after these events.

Opinions of PCT

The in-depth interviewees rated their PCTs on a variety of factors (Table 31). The ratings suggest that, while interviewees see a broader environmental benefit to the PCT, they are more ambivalent regarding the extent to which the device has provided them a personal benefit in terms of identifying energy savings opportunities and saving money. Findings also indicate little opposition on interviewees' part toward allowing SDG&E to adjust their temperature settings.

Table 31: Opinions of Smart Thermostat (n=10)

	DISAGREE	NEUTRAL	AGREE
My Smart Thermostat is easy to use	2	2	6
My Smart Thermostat helps me identify how I can save energy	2	4	4
My Smart Thermostat helps me save money	2	4	4
My Smart Thermostat helps the environment	1	1	8
Letting SDG&E adjust my thermostat doesn't bother me	0	4	6

The interviewed participants generally (6 of 10) agreed that their thermostat is easy to use (rating their agreement a "4" or "5" using a 5-point scale). Interviewees primarily cited the programmable features that allow time-of-day temperature setting as their favorite aspect of the device. They also liked the ability to access and control the thermostat online and the ability to specify precise temperature settings using the digital display.

Of the two interviewees who did not agree that their thermostat was easy to use, one expressed a desire for greater energy monitoring functionality on the thermostat itself, rather than on the program website. The other indicated that the temperature settings on her previous programmable thermostat had been different, and the settings on the PCT were less comfortable

for her and had resulted in a higher energy bill. Further, she reported her problem with higher energy bill using the PCT to SDG&E, but she reported SDG&E did not provide satisfactory answer. Four additional interviewees offered criticisms of the PCT, including that the device is difficult to program; the gateway wireless device needs to be rebooted from time to time; the thermostat must be turned on for remote access through the website to work; and the thermostat had failed to reset after demand response events.

In the email survey, two respondents mentioned that, while they had turned their PCTs off before leaving town, a power outage caused their units to reset and turn on while they were away.

The Energy Management Website

Program staff provided the evaluation team with website analytics tracking logon statistics for the Tendril website (Table 32). These analytics tracked the dates of logons by unique email addresses associated with each pilot. Although we were unable to match the email addresses in these analytics to the participants we surveyed, these analytics provide a broad overview of participants' use of the program website. Despite some probable list errors (the number of people logging on exceeds the number of PCT group enrollees), almost all PCT pilot participants (59 of 66, or 89%) logged onto the website at least once. This was expected, though, as installers showed the participants how to access the website. About half (54%) of those who logged onto the website did so more than once. Overall, Low-Income PCT pilot participants appear to have used the website occasionally, with an average number of logons just over three.

Table 32: Website Logon Analytics

STATISTIC	PCT
Number of program enrollees	*66*
Number of unique email address logons	59
Percent of emails with multiple logons	54%
Average number of logons	3.3

In in-depth interviews, seven contacts reported using the website to view detailed information about their energy use. The contacts who had used the website were divided between those who reported using the website regularly during the summer months (one reported *"once a day,"* and two reported *"a few times a week"*), and those who visited the website less frequently. All of the contacts reported that they currently visit the website less frequently than they had over the summer. Most often, (3 of 7) contacts reported that this less frequent use was a result of lost passwords, lost URLs, or difficulty logging on. However, two contacts reported they are less interested in their electricity usage during the winter when they are not using air conditioning.

Finally, two interviewees reported they had visited the website less frequently because it did not provide the type of information they sought. One cited the gateway device going offline as a cause of gaps in the information available on the website. The other expressed general

dissatisfaction with the information available, saying *"I wasn't getting the analysis that I needed. It didn't look like our bill was decreasing, so I felt no need to continue logging on."*

Interviewees most often reported using the website to access historical bill information, view messages from SDG&E, and change their thermostat setting (Table 33). Fewer contacts reported accessing more detailed information on their energy use patterns.

Table 33: Website Users' Ratings of Use and Helpfulness of Website Features (n=7)

	NOT USED	NOT AT ALL HELPFUL	SOMEWHAT HELPFUL	VERY HELPFUL
Accessing historical bill information	1	2	2	2
Viewing messages from SDG&E	2	0	3	2
Changing the thermostat setting	3	0	2	2
Accessing more detailed information about your household energy use pattern	4	1	0	2

A slight majority of the interviewees who had visited the website rated it as easy to navigate (rating their agreement a "4" or "5" using a 5-point scale; Table 34). In in-depth interviews, contacts offered an ambiguous assessment of the extent to which the website helps them save energy, and these assessments do not appear related to the ease of navigating the website. Contacts who disagreed that the website helps them identify ways to save energy nonetheless agreed or were neutral that the site is easy to navigate. All of the interviewees who use a smart phone (n=4) agreed that accessing information similar to that on the website on their smart phones would be helpful.

Table 34: Opinions of Website (n=7)

	DISAGREE	NEUTRAL	AGREE
The website is easy to navigate	2	1	4
The website helps me identify how I can save energy	2	2	3
I'd have liked to access the website on my smart phone (n=4)	0	0	4

The interviewed participants' suggestions for improving the website reflect the technical difficulties that some reported and a desire for additional information, particularly information related to reducing their energy use. Contacts sought a more user-friendly login process and easier navigability of pages (three mentions), inclusion of gas usage information (three mentions), and actionable advice on how to improve their energy use (two mentions). Suggesting a way the program might provide advice on reducing energy use, one interviewee noted, "*After*

two months, it should send an email saying how much money you've saved and offer advice on how to adjust your individual household's settings."

Email survey respondents also answered questions about the energy management website. These responses largely mirror in-depth interviewees' comments, and are provided in Appendix A.

Demand Response Events

Just over half of email survey respondents (11 of 20) were aware of any demand response events.[15] In subsequent in-depth interviews, contacts demonstrated a higher degree of awareness of demand response events. Almost all the interviewed participants (9 of 10) reported that they received at least one request from SDG&E asking them to reduce their energy use on a specific day during the summer and fall of 2011.

As noted in above, the program called four demand response events between August and October 2011. The number of event notifications the interviewed participants could recall ranged from one to seven, but more than half (5 of 9) could recall at least four notifications (Table 35). Two interviewees recalled receiving more than four notifications, suggesting that these contacts may have confused other energy efficiency and demand response information they had received with the program's event notifications.

Table 35: Number of Demand Response Event Notification Received (n=10)

	COUNT
Did not receive messages	1
Received fewer than four notifications	4
Received four notifications1	3
Received more than four notifications	2

[1] Includes participants who recalled receiving "at least four," "four to six," and "four at the most" notifications.

Further suggesting that participants may not distinguish between the program's event notifications and other conservation messages, a slight majority of interviewees who received notifications (5 of 9) reported receiving the notification outside of their PCT. These contacts primarily reported receiving notification by email, although one contact each also cited postal mail and phone notifications. The program sent notifications only to the PCT device and to the website. Four interviewees reported receiving event notifications through their PCT and did not recall receiving them any other way.

Regardless of the source of event notification, the interviewed participants were largely accepting of demand response events and responsive to requests. Most of the contacts who had

[15] Because the data file did not include the PCT install date or the date of survey response we are unable to assess the number of events each participant should have experienced.

received notifications agreed that the number of demand response events met their expectations (Table 36); the one contact who disagreed reported receiving only one event request. A majority also reported the event notification messages were clear and they had enough time to prepare for the events. All of the contacts reported intending to respond when future events are called, and all agreed that saving energy in times of high electricity demand is an important thing to do.

Table 36: Opinions of Demand Response Events (n=9)

	DISAGREE	NEUTRAL	AGREE
The number of Demand Response events was what I expected	1	2	6
The notification of the Demand Response event was clear	1	1	7
I had enough time to prepare for the Demand Response event day notification	1	0	8
I will reduce my energy use when future Demand Response event is called	0	0	8
It is important to do our part to save energy in times of high electricity demand	0	0	9

Seven interviewees reported that they had been home during a demand response event, and a slight majority (four) reported taking action to reduce their energy use during the event, beyond their normal conservation efforts. In response to the event, these contacts most often (3 of 4 cases) reported adjusting the temperature setting on their air conditioner. While responses do not specify whether they did so manually or through automatic curtailment, one contact mentioned that she used a fan to pre-cool the house prior to the event. Contacts also reported turning off lights in unoccupied areas of home, and generally trying to use less energy.

Interview findings suggest that responding to demand response requests did not significantly inconvenience customers. A slight majority of interviewees who received requests (5 of 9) reported that their household made a moderate effort to reduce their energy use in response to program requests, although some (3 of 9) reported making no effort. Only one interviewee reported making a great deal of effort. No one reported negative effects on their household routines as a result of their efforts to address demand response requests.

Ongoing Conservation Efforts

In the email survey, contacts indicated whether they had made any changes to try to reduce their energy use since enrolment. Nine of 20 contacts indicated they had made changes (Table 37). Of these, three specifically mentioned reduced AC use. Two respondents mentioned non-HVAC behaviors (including changing TV settings and “lifestyle energy usage” changes).

Table 37: New Energy Use Conservation Behaviors

ENERGY REDUCTION BEHAVIOR	COUNT (N=20)
HVAC changes	7
Programmed PCT	4
Use AC less overall; monitor more closely	3
Other changes	2
Have not made changes	9
Unsure if have made any changes	2

RESPONDENT DEMOGRAPHICS

In-depth interviewee respondents in both Low Income Pilots (n=20, 10 IHD and 10 PCT interviewees) answered several demographic questions. Mean household size was just over 3 people, with 50%[16] of contacts reporting having a child under 18, and 20% reporting that at least one household member was 70 or older (Table 38).

Table 38: Household and Home Characteristics

	MEAN	MIN	MAX
HOUSEHOLD CHARACTERISTICS (N=20)			
Household members	3.75	1	7
Children 0-5	0.25	0	3
Children 5-18	1.15	0	5
Adults >70	0.25	0	2
HOME CHARACTERISTICS (N=20)			
Home size (sq. ft)	1793	1000	3000
Home built (Year)	1967	1918	1997

LI interviewees are more educated than the general California population as a whole, 95% have some college, a bachelor's or master's degree[17] (Table 39). A majority of interviewees were Caucasian (65%)[18].

16 Compared with 37% of all California households, according to 2010 Census data (no significant difference; http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

17 Compared with 59% of all adults in California who have some higher education (significant difference; http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

18 Compared with 57% of all California households, according to 2010 Census data (no significant difference; http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

Table 39: Respondent Characteristics

	Count	%
Level of Education (n=20)		
High School or less	1	5%
Some College or Vocational School	7	35%
Bachelor's	9	45%
Master's	3	15%
Race and Ethnicity (n=20)		
Caucasian or White	13	65%
Hispanic or Latino	3	15%
Black or African American	2	10%
Asian	1	5%
Other	1	5%

In addition to answering demographic questions, in the in-depth interviews, several interviewees made spontaneous comments indicating high motivation and awareness about energy conservation, demand response, and facilitating technologies. Although these households were targeted for participation because of their low income, all had participated in the LIEE program within the last year, and many reported having made previous attempts to understand or curtail their energy use.

4 CONCLUSIONS AND RECOMMENDATIONS

The RACT Pilot, the Low-Income IHD Pilot, and the Low-Income PCT Pilot were among several Demand Response pilot programs launched by SDG&E in the summer of 2011 to test different mixes of enabling technologies, rewards, notification and conservation messages. All relied on SDG&E's HAN technologies and the services of a third-party vendor, Tendril, to test and evaluate customer response to several energy management devices. Through these pilots and other Smart Grid Initiatives, pilot staff, Low-Income program staff, the HAN team, and Tendril worked together on efforts designed to leverage the benefits of near real-time energy use and price information. The pilots made this price and usage data accessible through customer-facing communication devices. Pilot participants received program technologies at no charge. The programs did not offer incentives for energy or demand savings that the participants achieved.

This report presents the results of a process evaluation conducted to inform the RACT and Low-Income program staff. In September 2011, SDG&E contracted with Research Into Action to conduct research to: 1) document and assess the implementation process and identify opportunities to improve effectiveness of each, and 2) assess customer perceptions and response to installed technologies, event and conservation messages, and recommend opportunities for improvement.

RACT

The RACT pilot sought to raise participant awareness of energy use and motivate energy conservation and demand response behaviors through access to enabling technologies, which provided a combination of energy use information and automatic load curtailment. RACT divided participants into two sub-groups, a TECH group and an IHD group, which received different mixtures of devices. All RACT participants received an IHD capable of displaying near real-time energy use and cost information. Those assigned to the TECH group also received additional enabling technology, including PCTs that allowed SDG&E to remotely set back the thermostat temperature during a RYU event, and plug load controllers that SDG&E could trigger remotely—turning off whatever equipment was plugged into them at the time. Participants in the IHD group received only the IHD. Both groups had access to a special energy management website and were invited to participate in the BES contest.

LOW INCOME

The two Low-Income Pilots differed in the technology they offered and in their goals. The IHD pilot provided participants with an IHD capable of displaying near real-time energy use and cost information. By making this information available at a central location within a participant's home, the program sought to raise participant awareness of energy use and motivate energy conservation behaviors.

The PCT pilot provided participants with a thermostat that was both programmable and communicating. The PCT allowed SDG&E to increase the set point on central air conditioners by four degrees during a demand response event.

SUMMARY OF FINDINGS

As part of this evaluation, we assessed participants' perceptions of the enabling technologies, RYU events, and the pilot as a whole. We also assessed SDG&E's experience with pilot management and the lessons learned in the process of integrating two-way communication devices and automatic curtailment with the utility's HAN and Smart Grid capacity.

Overall, we found that the pilots were effectively launched and that SDG&E staff were able to navigate HAN pilot roll out activities that included identification and recruitment of eligible households, installation of a variety of technology devices in participant homes, and establishment of communication processes whereby participants would be informed of RYU days and have automatic curtailment devices triggered. In order to coordinate the diverse activities associated with these pilot programs, the HAN team established regular communication with Tendril, SDG&E information technology teams, and the program staff.

Customers appreciated the program opportunity, and a majority of customers in each of the sub-pilots reported wanting to continue their involvement. Customers appreciated having an increased ability to monitor energy use and commonly reported an increased understanding of how their household uses energy.

RACT participants reported taking action during event days, but without access to load impact or performance data we cannot link specific patterns of responses with measured performance. Survey responses indicate widespread awareness among pilot participants of issues around peak load and the need to reduce one's energy use on specific days, but contacts also noted a lack of information about how to effectively use PLC devices.

Low Income pilot participants reported a relatively high level of engagement with their IHDs, but program data and survey responses indicate this population had more difficulty keeping their IHD communicating and their gateway portal online.

Because both the RACT and Low-Income pilots operated with screening criteria and an opt-in model that recruited only a fraction of the potentially qualified homes, it is reasonable to assume that participants in both pilots possess higher than average motivation to use enabling devices and perhaps a higher than average desire to reduce their energy use. Because of this, any issues encountered or dissatisfaction with specific program elements among this cohort of participants would likely be magnified if identical services were provided to the general population.

CONCLUSIONS

Information is valuable.

The information provided by the IHDs was valued by participants for facilitating increased awareness and providing new visibility into how participant households used energy. Participants reported taking action to reduce their energy use since receiving their IHD.

Related survey findings:

- In in-depth interviews, a majority of RACT participants (18 of 30) cited the increased awareness and understanding of their energy use as the best part of the program. Similarly, all Low-Income IHD pilot interviewees mentioned either actionable information or increased awareness of their energy use as the best part of the program.
- Three-fourths of both RACT and Low-Income IHD participants (80% and 75%, respectively) agreed that the IHD helped them save money.
- Over half of Low Income IHD participants (62%) reported that the frequency with which they use their IHD has stayed constant or increased over time.
- In in-depth interviews, a majority of participants in both pilots (26 of 30 in RACT, 10 of 10 in Low-Income IHD) said that the devices had affected their energy use.
- Nearly all participants (91% of RACT, 90% of Low-Income IHD) reported conservation efforts since receiving the technologies.

We found evidence that participants use information in different ways and seek different levels of detail:

- The most common program suggestion from RACT participants was for more communication and/or supporting information to help them understand what to do (13 of the 30 email survey respondents who offered comments) .
- When giving feedback about the IHD, several email survey respondents mentioned desiring additional functionality (9 of 49 in RACT, 7 of 26 Low-Income IHD offered these comments).
- Participants used the devices to monitor their energy use in different ways: real time experimentation (16 of 30 RACT; 4 of 10 Low-Income IHD) and tracking energy costs and use over time (11 of 30 RACT; 5 of 10 Low-Income IHD).

Participants are using the information and requests from SDG&E to support or trigger both conservation and demand response activities.

The feedback devices and access to information provided by the HAN team could be a potentially valuable mechanism for engaging customers with energy efficiency programs and increasing overall awareness about household energy use. Participants reported using the information from their HAN program experience to take action on RYU days, as well as to support ongoing conservation behaviors. Explanations of both appeared informed and legitimate.

Related survey findings:

- Ninety-four percent of RACT participants reported receiving RYU day messages; 68% of participants reported taking additional actions on event days.
- Most (83% of RACT; 10 of 10 LI-PCT interviewees) intend to participate in future event days.
- Most common event day actions include turning off lights, postponing laundry, and adjusting air conditioning temperature.
- In in-depth interviews, two thirds of the RACT-Tech group participants (9 of 15) reported that they continue to use their plug-load controllers.
- Nearly all (90% of LI-IHD, 91% of RACT) participants reported undertaking conservation efforts since receiving the technologies.
- When asked about general conservation actions, participants reported turning off the lights, increasing the air conditioning temperature, and turning off unused electronics.

Participants may have had unrealistic expectations for their PCT.

While participants found value in having access to more detailed information about their household's energy use, it will be important to manage participant expectations about automatic energy use or bill reductions from device installation. The presence of an IHD, or even a PCT, does not automatically lower household energy use unless the household changes energy use patterns because of the devices. Expectation management is particularly important for participants receiving a PCT without an IHD, where the risk of optimistic expectations of savings from programming alone is greatest. A programmable thermostat will not save energy unless it is programmed more conservatively than its predecessor, and the small number and short duration of demand response events mean that auto-curtailment events are unlikely to have discernible effects on participant energy bills.

Related survey findings:

- In in-depth interviews, just two of the ten Low-Income PCT participants interviewed said the program met their expectations.

- Among those participants who did not previously have a programmable thermostat, the most frequently mentioned best part of the Low-Income PCT program (4 of 10) was the PCT's programmability.
- Four of ten Low-Income PCT participants agreed that the PCT helped them save money.
- In the email survey, half of Low-Income PCT participants responding (10 of 20) reported manually adjusting their thermostat at least once a week, indicating that the PCT was either not programmed, or was not programmed sufficiently to meet household expectations.

Technology improvements could facilitate a higher level of engagement with feedback devices.

Participant complaints and suggestions for improvements centered on addressing problems with the devices themselves. Some of these complaints were about the functionality and attractiveness of the hardware itself, while others focused on perceived inaccuracies of the devices. The complexities of displaying tiered pricing meant that IHDs were programmed to display projected end-of-the month tiers rather than the actual current pricing tier causing participants to think that their IHD was inaccurate. Similarly, PCTs were only remotely adjustable when the thermostat was in the cooling mode—limiting participant ability to change their settings from "off" to "cool" or vice versa.

Related survey findings:

- Across both the RACT and Low Income pilots, 20 participants mentioned that the IHD did not work as it was supposed to, including several people who specifically mentioned inaccurate tier information that did not re-set at the beginning of the month.
- Eight participants commented that the IHD was hard to use.
- Twenty-three participants mentioned disliking the device aesthetics and/or design.
- Over half of participants had complaints about the PCT (6 of 10 Low-Income PCT interviewees; 51% of RACT-TECH). These complaints included comments that the PCT was hard to understand, that there were multiple steps for simple functions, that it was hard to program, and that they had technical issues.

RECOMMENDATIONS

SDG&E should continue efforts to expand customer access to detailed information about household energy use.

Increasing access to IHDs for households that desire more information would enable additional households to experience better visibility into how they use energy. It could also help SDG&E

continue to test and refine communication messages about reducing energy and demand—messages tailored to the energy use patterns of a given household. IHDs might be made available for check out at local libraries or provided on a limited-time basis to households requesting help lowering their energy bills.

The HAN team will likely have opportunities to support or leverage other initiatives, such as Green Button, the Google power meter, and more detailed website features to expand access to this information.

Look for opportunities to provide more detailed or customized information to households that seek it.

Responses indicate that participants sought different levels of information, and program data indicate that some contest participants were particularly attuned to their household energy use. Surveys, contests, and web analytics could help identify these households, as could tracking those that request or purchase an IHD, or check one out if that option is made available. Continue efforts to provide information at the level of detail desired by customers, and be prepared to ratchet up visibility and granularity when customers seek it.

Continue to monitor those with IHDs to understand the extent to which these households reduce their energy use and respond to requests for curtailment.

More research may be needed to determine whether it is more beneficial to use these devices to promote energy efficiency, demand response, or both. While the feedback devices appear to increase household awareness around everyday energy use, the communication and alert features are also valuable for communicating extra-ordinary curtailment events. SDG&E should continue to monitor the conservation effect with billing analysis focused on houses with feedback devices. If the overall energy reduction is more prominent than load impacts from demand response requests, the utility may want to re-consider the overall objective of providing near real-time feedback devices.

Manage participant expectations with regards to the PCT.

Programmable thermostats are valuable to households that do not already have them; however, the communicating component is of particular value to SDG&E, not necessarily to participant households. In promoting the installation of PCTs, SDG&E will need to avoid communicating that the thermostat will somehow automatically lead to lower energy bills without more conservative temperature setting behavior.

Review procurement guidelines to ensure that they explicitly include acceptable failure rates and measures of user interface usability.

The development of specific curtailment devices and device features and interface is outside of SDG&E's control. However, as SDG&E continues to procure devices or recommend devices available at retail, it will be important to have procurement guidelines that clearly prioritizes usability, durability, and design.

Ensure that the information displayed is understandable and accurate.

Communicating the tiered pricing structure for SDG&E customers is complicated; however, for those that are pursuing information and attempting to adjust behaviors to lower their electricity bills, the simpler "projected" tier caused confusion. If the device displays "current tier," it should be the current tier, while "projected bill" should show projected tier.

APPENDICES

APPENDIX A: RACT INTERVIEW GUIDES

APPENDIX B: LOW-INCOME IHD INTERVIEW GUIDE

APPENDIX C: LOW-INCOME PCT INTERVIEW GUIDE

A RACT INTERVIEW GUIDES

EMAIL SURVEY INSTRUMENT

Q1. Thank you for taking the time to complete this questionnaire. Please answer each question.

Q2. Do you have an In-Home Display, similar to this one?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q3. [Answer If *Q2 Yes* Is Selected] Has your In-Home display been plugged in...

- ☐ All the time since it was installed
- ☐ Sometimes since it was installed
- ☐ Not at all since it was installed
- ☐ I'm not sure

Q4. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] Where is it plugged in?

- ☐ Kitchen
- ☐ Living Room
- ☐ Dining Room
- ☐ Office
- ☐ Bedroom
- ☐ Other _____

Q5. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] Is it working?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q6. Do you have a Smart Thermostat, similar to this one?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q7. Do you have any Volt Plug-Load Controllers, similar to this one?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q8. [Answer If *Q7 Yes* Is Selected] How many do you have?

Q9. [Answer If *Q7 Yes* Is Selected] How many of them are plugged in?

Q10. [Answer If *Q7 Yes* Is Selected] What type of equipment is plugged into them?

- ☐ Lamps
- ☐ Computer equipment
- ☐ Entertainment equipment
- ☐ Space heaters
- ☐ Room air conditioners
- ☐ Other _____

Q11. As part of this pilot program, you may have received a request from SDG&E asking you to reduce your energy use. Do you remember receiving a message from SDG&E asking you to reduce your energy use on a specific day?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q12. [Answer If *Q11 Yes* Is Selected] About how many messages have you received?

Q13. [Answer If *Q11 Yes* Is Selected] Do you remember receiving a message from SDG&E asking you to reduce your energy use on or around October 13th?

- ☐ Yes
- ☐ No

Q14. [Answer If *Q11 Yes* Is Selected] Thinking about the most recent request to reduce your energy use...Did you receive a message...(check all that apply)

- ☐ [Display if *Q2 Yes* Is Selected] On your In-Home Display
- ☐ [Display if *Q6 Yes* Is Selected] On your Smart Thermostat
- ☐ By email
- ☐ By phone
- ☐ All of the above
- ☐ I'm not sure

Q15. [Answer If *Q11 Yes* Is Selected] Again thinking about the most recent request, were you ...

- ☐ At home during the entire "Reduce Your Use" event
- ☐ At home part of the time
- ☐ Not at home during the event
- ☐ I'm not sure

Q16 . [Answer If *Q11 Yes* Is Selected And *Q15 Not at home during the event* Is Not Selected] During this Reduce Your Use event, did you...

- ☐ Adjust the temperature setting on your air conditioner
- ☐ Shift doing laundry to before or after the "Reduce Your Use" time
- ☐ Turn off lights
- ☐ Turn off the pool pump
- ☐ Shift cooking to a different time
- ☐ Run the dishwasher earlier or later
- ☐ Just tried to use less energy
- ☐ Something else _____

Q17. [Answer If *Q11 Yes* Is Selected] Were any household routines affected by this request to reduce your energy use?

- ☐ Yes
- ☐ No

Q18. [Answer If *Q17 Yes* Is Selected] What routines were disrupted?

Q19. [Answer If *Q11 Yes* Is Selected] Did you experience any negative effects as a result of having your thermostat's setting changed or having plugged-in devices shut down?

- ☐ Yes
- ☐ No

Q20. [Answer If *Q19 Yes* Is Selected] Please describe any negative effects you experienced.

Q21. [Answer If *Q2 Yes* Is Selected Or *Q6 Yes* Is Selected Or *Q7 Yes* Is Selected] Have you made any changes to try to reduce your energy use since your devices were installed?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q22. [Answer If *Q21 Yes* Is Selected] What changes have you made?

Q23. [Answer If *Q6 Yes* Is Selected] Have you ever noticed your Smart Thermostat being adjusted automatically by SDG&E?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q24. [Answer If *Q23 Yes* Is Selected] What did you do when the Smart Thermostat was adjusted?

- ☐ Nothing
- ☐ Manually changed the temperature setting
- ☐ Hit the "reject" button to reject the adjustment
- ☐ Changed the temperature setting through the Energy Management website
- ☐ Something else _____

Q25. [Answer If *Q2 Yes* Is Selected Or *Q6 Yes* Is Selected Or *Q7 Yes* Is Selected] We have a few questions about the equipment the program provided you.

Q26. [Answer If *Q6 Yes* Is Selected] Smart Thermostat (similar to the picture below)

Q27. [Answer If *Q6 Yes* Is Selected] To what extent do you agree with the following statements about your Smart Thermostat? Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree ,or strongly disagree that...

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Don't Know
My Smart Thermostat is easy to use.						
My Smart Thermostat helps me identify how I can save energy.						
Letting SDG&E adjust my thermostat doesn't bother me.						

Q28. [Answer If *Q6 Yes* Is Selected] What features of your Smart Thermostat do you like the most and why?

Q29. [Answer If *Q6 Yes* Is Selected] Is there anything about your Smart Thermostat you don't like?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q30. [Answer If *Q29 Yes* Is Selected] What don't you like about your Smart Thermostat?

Q31. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] Your In-Home Display

Q32. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] Which of the following best describes how often you look at the information on the In-Home Display?

- ☐ A few times a day
- ☐ Once a day
- ☐ Every couple of weeks
- ☐ A couple times a month
- ☐ Never

Q33. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] What do you like the most about the In-Home Display?

Q34. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] What do you like the least about your In-Home-Display?

Q35. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] For each item below, please indicate if you've seen that information on your In-Home Display.

	I'VE SEEN THIS	I HAVE NOT SEEN THIS	I'M NOT SURE
"Today Used" - showing the energy your household has used (in kWh) today			
"Today's Price" - showing cents per kWh you currently pay			
"Daily Cost" - showing total cost for yesterday and today			
Current outside temperature			
Estimated end-of-month bill (electric portion only)			

Q36. [Answer If *Q35 I've seen this* Is Selected] For each item below, please indicate how useful this information is.

	NOT USEFUL	SOMEWHAT USEFUL	VERY USEFUL
"Today Used" - showing the energy your household has used (in kWh) today			
"Today's Price" - showing cents per kWh you currently pay			
"Daily Cost" - showing total cost for yesterday and today			
Current outside temperature			
Estimated end-of-month bill (electric portion only)			

Q37. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] Have you turned things off and on to see if the information displayed in the In-Home Display changed?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q38. [Answer If *Q3 All the time since it was installed* Is Selected Or *Sometimes since it was installed* Is Selected] How would you rate the following statements about your In-Home Display?

	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	DON'T KNOW
The In-Home Display is easy to use						
The In-Home Display helps me identify how I can save energy						

Q39. [Answer If *Q9* Is Greater Than *0*] Volt Plug-Load Controllers

Q40. [Answer If *Q9* Is Greater Than *0*] Did you notice anything plugged into your Volt Plug-Load Controller get shut off during the Reduce Your Use period?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q41. [Answer If *Q40 Yes* Is Selected] What did you do when the Volt Plug-Load Controller was shut off?

- ☐ Nothing
- ☐ Hit "override" button
- ☐ Unplugged your Volt Plug-Load Controller
- ☐ Plugged items into another outlet
- ☐ I didn't notice
- ☐ Other _____

Q42. [Answer If *Q9* Is Greater Than *0*] How would you rate the following statements about your Volt Plug-Load controller?

	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	DON'T KNOW
My Volt Plug-Load Controller is easy to use.						
My Volt Plug-Load Controller helps me save energy.						
I have control over what is turned off when using the devices provided by the utility.						
It is ok for SDG&E to turn off equipment in my home on Reduce Your Use days.						

Q43. The Energy Management Website

Q44. Have you logged into the energy management website included with this project?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

[If No Is Selected, Then Skip To *Q51*]

Q45. Which of the following best describes how often you look at information on the energy management website?

- ☐ A few times a day
- ☐ Once a day
- ☐ A few times a week
- ☐ Once a week
- ☐ Every couple of weeks
- ☐ A couple of times a month or less
- ☐ Never

Q46. [Answer If *Q45 Never* Is Not Selected] What features of the Energy Management website do you like the most and why?

Q47. [Answer If *Q44 Yes* Is Selected] Below are several features of the Energy Management website. For each one, please indicate if you've used it.

	I'VE USED IT	I HAVE NOT USED IT	I'M NOT SURE
Accessing historical bill information			
Changing your thermostat setting on the website			
Seeing how much energy is being used by devices connected to your plug-load controllers			
Viewing messages from SDG&E			
Accessing more detailed information about your household energy use patterns			
Turning devices off or on from the website			

Q48. [Answer If *Q47 I've used it* Is Selected] How helpful were these features for you?

	NOT AT ALL HELPFUL	SOMEWHAT HELPFUL	VERY HELPFUL	I'M NOT SURE
Accessing historical bill information				
Changing your thermostat setting on the website				
Seeing how much energy is being used by devices connected to your plug-load controllers				
Turning devices off or on from the website				
Viewing messages from SDG&E				
Accessing more detailed information about your household energy use patterns				

Q49. [Answer If *Q44 Yes* Is Selected] To what extent do you agree with the following statements about the Energy Management website?

	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	DON'T KNOW
The Energy Management website is easy to navigate.						
The Energy Management website helps me identify how I can save energy.						

Q50. [Answer If *Q44 Yes* Is Selected] What would you change about the Energy Management website to make it more useful?

Q51. Did you receive an email inviting you to enter a contest that awards prizes to households with the biggest energy savings over last year for the months of September, October, and November?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q52. [Answer If *Q51 Yes* Is Selected] Did you sign up to participate in the contest?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q53. [Answer If *Q52 Yes* Is Selected] Since signing up for the contest, have you tracked your ranking online?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

Q54. Below are several statements about your experience with this pilot program. Please indicate the extent to which you agree with each statement.

	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	DON'T KNOW
The number of Reduce Your Use days was what I expected.						
The notification of the Reduce Your Use event was clear.						
I had enough time to prepare for the Reduce Your Use day notification.						
I'd like to continue to be part of this program.						
I will reduce my energy use when future Reduce Your Use day event is called.						
Participating in Reduce Your Use program helps me save money.						
Participating in Reduce Your Use program helps the environment.						
It is important to do our part to save energy in times of high electricity demand.						

Q55. When requested to reduce your energy use, what level of effort would you say that your household made to lower your energy use?

- ☐ A great deal of effort
- ☐ Moderate effort
- ☐ A little effort
- ☐ No effort
- ☐ Don't know

Q56. In the box below, please provide any suggestions for how we might improve this program.

Q57. Over the next four weeks we will be contacting a subset of people from the Reduce Your Use pilot program. This follow up will involve focus groups or longer interviews with people like you. We will provide payment to compensate people for the added time. Would you consider being part of this opportunity?

- ☐ Yes
- ☐ No
- ☐ Don't know

Q58. We just have a few final questions to help us group your answers with those of other households.

Q59. Including yourself, how many children and adults normally live in your household on a full-time basis?

	PLEASE ENTER A NUMBER
Total number of people in the household	
How many of those are children are under 5 years of age?	
How many of those are children between 5 and 18?	
How many of those are adults 70 or older?	

Q60. Approximately how large is your home, in square feet? (Please enter a number)

Q61. Approximately when was your home built? (Please enter a number)

Q62. Which of the following categories includes the total combined income of all members of your household from all sources?

- ☐ Less than $10,000
- ☐ $10,000 to $15,000
- ☐ $15,000 to $20,000
- ☐ $20,000 to $30,000
- ☐ $30,000 to $40,000
- ☐ $40,000 to $50,000
- ☐ $50,000 to $75,000
- ☐ $75,000 to $100,000

- ☐ More than $100,000
- ☐ Decline to answer
- ☐ Don't know

Q63. Thanks, someone may be calling you about a focus group or to schedule a more in-depth interview sometime in the next 3-4 weeks.

Q64. Those are all of our questions. Thank you very much for your time today! Please click ">>" to finish.

IN-DEPTH INTERVIEW GUIDE

Hi, this is _____ from Research Into Action calling on behalf of SDG&E. SDG&E would like to thank you for participating in the (In Home Display or Smart Thermostat pilot) this year and would like to learn more about your experiences with those devices. We are an independent research firm calling on their behalf to see how the In Home Display, the Smart Thermostat, and the devices that enable remote shut down of plug-load devices are working for you. [If needed – someone from Tendril installed these devices around [Date]]. Because you've been contacted several times about this program we will provide a $40 gift card to you if you'd be willing to talk with me in a little more detail about your experience with the devices provided by this program and whether or not they met your expectations. [Obtain agreement] Great, thank you.. Your thoughts will help us to make good suggestions for improving the program. All responses will be kept anonymous. Is this a good time or is there a better time to call you back?

Q2. Thinking about when you first heard about the opportunity to get an in-home display, and other tech devices to help you understand and manage your home's energy use...

Q3. What was attractive to you about this offer? What convinced you to sign up?

Q4. Looking back over the past six months or so that you've participated, was the program what you expected it to be? If not, how was it different?[if mention not working - Probe: "Is your TECH working?]

Q5. As part of this program, you were given access to a special website designed to help households like yours manage your energy use and view equipment settings...

Q6. Have you used the Energy Management website to view detailed information about your energy use or to adjust the settings on your equipment?[Note to interviewer: This website is managed by Tendril and is different from the SDG&E website. It is not the site they would go to in order to pay their bill.]

- ☐ Yes _____
- ☐ No _____

Q7. How often do you look at the website?

Q8. Do you log on regularly?

Q9. What information were you looking for?

Q10. Have you been able to find what you were looking for?

Q11. Thinking about the in-home display... this is the device in your home that shows current temperature, the amount of energy being used, and how much electricity costs...

Q12. What have you found most useful about this device?

Q13. Is there anything about the device that doesn't seem to work, or that hasn't met your expectations?

Q14. How often would you say you look at it now?

Q15. How does this compare to when you first got the device?

Q16. Of the information provided by the device, what information is most interesting or valuable to you now?

Q17. How does this compare to when you first got the device?

Q18. Can you tell from looking at your in-home display, when you have messages from SDG&E, or if there is a "Reduce Your Use" event?

Q19. How do you check for messages?

Q20. How often do you check?

Q21. Has it ever gone "off line" (they would have seen a red blinking light)?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q22. Were you able to get it working again?

Q23. What did you have to do?

Q24. Have you ever disabled the device on purpose?

TECH Group Only

Q25. You also received two other types of equipment: a Smart Thermostat, and at least one Volt plug-load controller. Thinking about the Smart Thermostat… in addition to adjustments made from home, this thermostat enables you to adjust settings through a website and SDG&E to adjust settings on "Reduce Your Use" days after alerting you.

Q26. How did you use your Smart Thermostat this summer? Did you have it programmed to go on and off on a schedule?

Q27. What have you found most useful about the Smart Thermostat?

Q28. Have you ever adjusted your thermostat from the energy management website?

Q29. How many times?

Q30. How did it go? Did it work?

Q31. Did you adjust it remotely during a "Reduce Your Use" event?

Q32. Is there anything about this thermostat that didn't work the way you expected it to?

Q33. Have you had trouble with the thermostat? How did you resolve the issue?

Q34. On a hot day, what temperature do you usually set the AC to?

Q35. Can you tell from the thermostat, when a "Reduce Your Use" event is occurring?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q36. What happened? What was the new setting? [Probe to understand if they noticed specific temperature changes - "Did you notice a difference in temperature?"]

Q37. Did you override the change? [Clarification if needed: did they adjust the temperature after noticing it had changed?]

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q38. Did you know you could override it?

Q39. Why did you override it?

Q40. What did you change it to? [Probe: Did you change it back to your original setting or just a degree or two?]

Q41. Do you have any reservations about letting SDG&E change your thermostat settings on certain days when a "Reduce Your Use" message was sent?

Q42. Regarding the plug-load devices… these are the things that you can plug equipment directly into like a normal plug, but they also enable remote/web shut down—either by SDG&E with notice or by you directly. [if more description is needed: They are white plastic devices that plug directly into a wall outlet].

Q43. Do you have any of these devices?

- ☐ Yes _____
- ☐ No _____

Q44. How many?

Q45. Are they still plugged in?

- ☐ Yes _____
- ☐ No _____

Q46. Did you ever have anything plugged into them?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q47. Any reason you didn't plug anything into them?

Q48. What did you have plugged into them?

Q49. Why did you stop using them?

Answer If Are they still plugged in? Yes Is Selected

Q50. What is plugged into them?

Answer If Are they still plugged in? Yes Is Selected

Q51. Has (the equipment mentioned) ever shut down during a Reduce Your Use event?

- ☐ Yes
- ☐ No

Q52. What happened? Did it cause any problems for you or your household?

Q53. Did you turn the (equipment mentioned) back on during the event?

- ☐ Yes - Why? _____
- ☐ No _____

TECH and IHD Groups

Q54. I have a few questions for you about the messages to "Reduce Your Use"… these messages would have come on only a few days this summer and fall and could have resulted in your thermostat being set back and/or equipment connected to the plug load controller being turned off.

Q55. Do you recall how many messages you got?

Q56. How did you get the "Reduce Your Use" message? [IHD, email, text, PCT...]

Q57. Is this the best way for you to get this information?

Q58. Thinking about the days you were asked to "Reduce Your Use," why did you think your electric utility asked you to reduce your use?

Q59. What, if anything, did your household do during these events to use less energy, specifically we are wondering about activities that are different from your day-to-day efforts to conserve?

Q60. Why do you cut your energy use on "Reduce Your Use" days?

Q61. How many of these events could your household comfortably accommodate?[Probe for frequency - a couple a year, once a month, once a week, however many is needed...]

Q62. Has the information provided by these devices, the IHD, Smart Thermostat and Plug-Load devices, affected your household's energy use in an on-going way?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q63. In what way?

Q64. How, if at all, do you think this type of information could affect your energy use... can you think of any way it might?

Q65. Is your household enrolled in the biggest energy saver contest?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q66. What, if anything, has your household done as part of participating in the contest that you would not normally do?

Q67. Have you tracked your energy use or estimated your savings as part of the contest?

Q68. I just have a couple final questions for you.

Q69. What has been the best part of this program, from your perspective?

Q70. What do you like least about it?

Q71. Why? Anything else? Did anyone else in your household have another experience?

Q72. Would you like to stay enrolled in the program? [Why/Why not?]

Q73. As part of this program, you had access to the IHD, smart thermostat, plug-load devices, and tracking website... thinking about your experience with this equipment, would you be willing to pay for similar equipment if it wasn't provided free to you by your utility?

- ☐ Yes _____
- ☐ No _____
- ☐ Don't know _____

Q74. How much would you pay for a similar package?(if can't answer use range: 1-25, 26-50, 51-75, 76-100, over 100)

Q75. Is there anything SDG&E could do to make it easier for you to reduce your energy use on "Reduce Your Use" days?

- ☐ Yes _____
- ☐ No _____

Q76. What?

Q77. Those are the questions I have for you. Thank you very much for your time! I'd like to confirm your address with you so we can send you the gift card.

Q78. Do you live at [Address]?

- ☐ Yes
- ☐ No - Correct Address: _____

Q84. Interviewer Name

Q83. Review previous pages before submitting survey.

B LOW-INCOME IHD INTERVIEW GUIDE

INTRODUCTION Hi, this is _____ from Research Into Action calling on behalf of SDG&E. SDG&E would like to thank you for participating in the In-Home Display pilot this year and would like to learn more about your experiences with those devices. We are an independent research firm calling on their behalf to see how the In-Home Display is working for you. Because you've been contacted several times about this program we will provide a $40 gift card to you if you'd be willing to talk with me in a little more detail about your experience with the devices provided by this program and whether or not they met your expectations. [Obtain agreement] Great, thank you. Your thoughts will help us to make good suggestions for improving the program. All responses will be kept anonymous. Is this a good time or is there a better time to call you back?

GENERAL PROGRAM QUESTIONS

Thinking about when you first heard about the opportunity to get an in-home display to help you understand and manage your home's energy use . . .

Q1. What did you like about this offer? What convinced you to sign up?

Q2. Looking back over the past six months or so that you received your IHD and access to the website, was the experience what you expected it would be? If not, how was it different?

WEBSITE

As part of this program you were given access to a special website designed to help households like yours manage your energy use.

Q3. Have you used the Energy Management website to view detailed information about your energy use? [Note to interviewer: This website is managed by Tendril and is different from the SDG&E website. It is not the site they would go to pay their bill.]

- ☐ Yes (1)
- ☐ No (2)
- ☐ DON'T KNOW (3)

Q3a. How often did you log onto the website during the last summer months?

- ☐ A few times a day (1)
- ☐ Once a day (2)

- ☐ A few times a week (3)
- ☐ Once a week (4)
- ☐ Every couple of weeks (5)
- ☐ A couple of times a month or less (6)
- ☐ Don't know (7)

Q3b. Compared to the summer months, do you log in more or less now? [IF MORE OR LESS] Why did that change?

Q3c. What information were you looking for? Have you been able to find what you were looking for? What would you change about the website to make it more useful?

IN-HOME DISPLAY

Thinking about the in-home display… this is the device in your home that shows current temperature, the amount of energy being used, and how much electricity costs . . .

Q4. Please describe how you use the IHD. What features do you use, and what do you use it for?

Q5. What have you found most useful about this device?

Q6. What instructions, materials, or education did you get to help you use the device?

Q7. Has it ever gone "off line" (they would have seen a red blinking light)? [IF YES] a. Were you able to get it working again? b. What did you have to do?

Q8. Have you ever disabled or unplugged the device on purpose?

Q9. Is there anything about the device that doesn't seem to work, or that hasn't met your expectations?

Q10. Is there anything else it could do that would help you save energy? (if they suggest features that the IHD has, try to find out why they aren't using it as designed. Was the interface hard to read so they didn't go through all the options? Does it just not work so they haven't played with it? Did someone else set it up for them? Are there any other functions that would make the device more useful for managing your energy use?)

Q11. How often would you say you use it now?

Q12. How does that compare to when you first got the device? [IF CHANGED] why did it change?

Q13. Of the information provided by the device, what information is most interesting or valuable to you now?

Q14. How does that compare to when you first got the device?

CHANGES IN ENERGY USE

Q15. Has the information provided by the in-home display affected your household's energy use in an on-going way?

[IF YES] In what way?

[IF NO] How, if at all, do you think this type of information could affect your energy use… can you think of any way it might?

CONSERVATION MESSAGES TO IHD ON EVENT DAYS

As part of this program, SDG&E's sent several messages to your IHD asking you to conserve energy on a specific day for 2-4 hours.

Q16. Do you remember receiving such messages? Did you try anything to conserve energy on the day you receive this message? What did you do differently that day that was different from what you normally do to conserve energy?

INFORMATION EMAILS

To some customers, SDG&E's also sent you four emails providing a variety of energy saving tips that could help lower your SDG&E bills.

Q17. Do you recall any emails from SDG&E with energy saving tips since receiving your in-home display?

- ☐ Yes (1)
- ☐ No (2)

Answer If Do you recall any emails from SDG&E with energy savings... Yes Is Selected

Q18. Have you taken any actions as a result of seeing these energy saving tips?

Q19. What did you do differently that day that was different from what you normally do to conserve energy?

CONCLUDING QUESTIONS

I just have a couple of final questions for you.

Q20. What has been the best part of your experience with this device, from your perspective?

Q21. What do you like least about it?

Q22. Why? Anything else? Did anyone else in your household have another experience?

Q23. Would you like to stay enrolled in this program? [Why/Why not]

Q24. As part of this program you had access to the IHD and tracking website . . . , thinking about your experience with this equipment, would you be willing to pay for similar equipment if it was not provided free to you by your utility? [IF YES] how much would you pay for a similar package? (If can't answer use range: $0-$25, $26-$50, $51-$75, $76-$100, over $100)

Q25. Is there anything SDG&E could do to make it easier for you to reduce your energy use? [IF YES] What?

DEMOGRAPHICS

Q25. Including yourself, how many children and adults normally live in your household on a full-time basis?

Total number of people in the household (1)

How many of those are children under 5 years of age? (2)

How many of those are children between 5 and 18? (3)

How many of those are adults 70 or older? (4)

Q26. Do you rent or own?

- ☐ Rent (1)
- ☐ Own (2)

Q27. Approximately how large is your home, in square feet?

Q28. Approximately when was your home built?

Q29. What is your highest level of education?

- ☐ High school (1)
- ☐ Some college (2)
- ☐ Bachelor's (3)
- ☐ Master's (4)
- ☐ Doctorate or professional (5)

Q30. How would you describe your race?

- ☐ Caucasian or White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaskan Native (3)
- ☐ Asian (4)
- ☐ Pacific Islander (5)
- ☐ Hispanic or Latino (6)
- ☐ Other (specify): (7) _____

Q31. What's your birth year?

Q32. Those are the questions I have for you. Thank you very much for your time! Our database shows your address is ${e://Field/Fulladdress}, and you name is ${e://Field/Fullname}. Are these correct?[IF INCORRECT, UPDATE INFO HERE]

Full address (1)

Full name (2)

You'll receive $40 check within two week from today from Research Into Action. Thanks again for your time.

C LOW-INCOME PCT INTERVIEW GUIDE

INTRODUCTION

[VM] Hi, this is _____ from Research Into Action calling on behalf of SDG&E. We're conducting an interview about the Smart Thermostat Pilot program in which you participated in. This interview will take about 20 minutes, but when you complete we'll provide a check of $40 cash. If you'd like to participate in this study, please give me a call back at _____, and try to talk to me. My name is _____. Thank you.

[PERSON] Hi, this is _____ from Research Into Action calling on behalf of SDG&E. SDG&E would like to thank you for participating in the Smart Thermostat pilot and would like to learn more about your experiences with those devices. We are an independent research firm calling on their behalf to see how the Smart Thermostat is working for you.

This interview will take up to 20 minutes, but upon completing this interview, we'll provide a check of $40 cash to you. Would you be able to participate in this interview now, or would you like to schedule a callback from us at more convenient time for you? (must be scheduled before Friday Feb 3 to conduct an interview)

[SCHEDULE CALLBACK] SCHEDULE A DATE/TIME, AND HUNG UP.

[INTERVIEW NOW] Great, thank you. Your thoughts will help us to make good suggestions for improving the program. All responses will be kept anonymous.

S1 Are you using your cell phone to talk to me now?

[IF YES] This interview will take about 20 minutes or more. Are you at a safe place, or not driving?

[IF NO] I'd like to schedule a callback so that you can talk to me when it's safe. SCHEDULE CALLBACK.

S2 Let me first see if you qualify for this interview. Did you move from the original address where the thermostat was installed to a different address before December 1, 2011?

- ☐ Yes (1)
- ☐ No (2)

In order to participate in this interview, you needed to live in the original house after December 1, 2011. Thank you very much for your time.

GENERAL PROGRAM QUESTIONS

Thinking about when you first heard about the opportunity to get a Smart Thermostat and access to an energy management website to help you understand and manage your home's energy use…

G1. What did you like about this offer? What convinced you to sign up?

G2. Looking back over the past six months or so since you received the Smart Thermostat and access to the website, was the experience what you expected it would be? [IF NOT] How was it different?

DEMAND RESPONSE EVENT

Q1. As part of this pilot program, you may have received a request from SDG&E asking you to reduce your energy use on a specific day during the summer and fall of 2011. Do you remember receiving such a message from SDG&E?

- ☐ Yes (1)
- ☐ No (2)
- ☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To ABOUT THE SMART THERMOSTAT

Q2. About how many messages have you received during the last summer?

Q3. How did you receive information about the Demand Response event? (How did you become aware that an event had happened or was about to happen?)

Q3a. Would it be more helpful to receive this message from SDG&E on your mobile phone, email, or some other ways?

Q4. Have you ever been home during a Demand Response event?

- ☐ Yes (1)
- ☐ No, I've never been home during a Reduce Your Use event (2)
- ☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To ABOUT THE SMART THERMOSTAT

Q5. During Reduce Your Use events, did you do anything to reduce your energy use OVER AND ABOVE what you usually do?

☐ Yes (1)

☐ No (2)

☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To Were any household routines affected ...

Q5a. What did you do? (check all that apply)

☐ Adjust the temperature setting on your air conditioner (1)

☐ Shift doing laundry to before or after the "Reduce Your Use" time (2)

☐ Turn off lights (3)

☐ Turn off the pool pump (4)

☐ Shift cooking to a different time (5)

☐ Run the dishwasher earlier or later (6)

☐ Just tried to use less energy (7)

☐ Something else (specify): (8) _____

Q6. Were any household routines affected by this request to reduce your energy use?

☐ Yes (1)

☐ No (2)

If No Is Selected, Then Skip To ABOUT THE SMART THERMOSTAT

Q7. What routines were disrupted?

ABOUT THE SMART THERMOSTAT

Q8. Did you receive a new Smart Thermostat after signing up for this pilot program?

(TO INTERVIEWER: It's a new thermostat that SDG&E installed in all of the homes that are participating in this program at the outset of the program last year. It has a large screen at the center and three menu buttons right below the screen, has temperature control button on the right side, and a round button at the bottom that allows you to switch system and fan mode. The thermostat can communicate to the customer's smart meter, allowing them to control their thermostat over the internet, and allowing SDG&E to remotely control their thermostats. Customers can also pre-program the thermostats to turn on and off at their preferred times each day of the week.)

☐ Yes (1)

☐ No (2)

☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To ENERGY MANAGEMENT WEBSITE ...

Q8a. How did the application process and installation of the thermostat go? Were there any issues? Do you recall receiving a brochure about Demand Response events from SDG&E when your Smart Thermostat was installed?

Q9. Have you ever noticed your Smart Thermostat being adjusted automatically by SDG&E?

☐ Yes (1)

☐ No (2)

☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To.. To what extent do you agree with the ...

Q10. Thinking about the most recent Demand Response event, when your Smart Thermostat was automatically adjusted, what did you do? (PROBE TO CODE)

☐ Nothing (1)

☐ Manually changed the temperature setting (2)

☐ Hit the "reject" button to reject the adjustment (3)

☐ Changed the temperature setting through the Energy Management website (4)

☐ Something else (specify): (5) _____

Q11. Did you experience any negative effects as a result of having your thermostat's setting changed?

☐ Yes (1)

☐ No (2)

If No Is Selected, Then Skip To what extent do you agree with the ...

Q12. Please describe any negative effects you experienced.

Q13. To what extent do you agree with the following statements about your Smart Thermostat, using the 5-point scale where 1="strongly disagree" to 5="strongly agree"?

	1=STRONGLY DISAGREE (1)	2 (2)	3 (3)	4 (4)	5=STRONGLY AGREE (5)	DON'T KNOW (6)
My Smart Thermostat is easy to use (1)						
My Smart Thermostat helps me identify how I can save energy (2)						
Letting SDG&E adjust my thermostat doesn't bother me (3)						

Q14. What features of your Smart Thermostat do you like the most and why?

Q15. Is there anything about your Smart Thermostat you don't like?

- ☐ Yes (1)
- ☐ No (2)
- ☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To ENERGY MANAGEMENT WEBSITE ...

Q16. What don't you like about your Smart Thermostat?

ENERGY MANAGEMENT WEBSITE

As part of this program you were given access to a special website designed to help households like yours manage your energy use and view equipment settings…

Q17. Have you used the Energy Management website to view detailed information about your energy use? [Note to interviewer: This website is managed by Tendril and is different from the SDG&E website. It is not the site they would go to pay their bill. The site allows customers to view their energy consumption and remotely adjust their thermostat.]

- ☐ Yes (1)
- ☐ No (2)
- ☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To YOUR EXPERIENCE WITH THE PILOT

Q17a. How often did you log onto the website during the last summer months?

- ☐ A few times a day (1)
- ☐ Once a day (2)
- ☐ A few times a week (3)
- ☐ Once a week (4)
- ☐ Every couple of weeks (5)
- ☐ A couple of times a month or less (6)
- ☐ DON'T KNOW (7)

Q17b. Compared to the summer months, do you log in more or less now? [IF MORE OR LESS] Why did that change?

Q18. What information were you looking for? Have you been able to find what you were looking for? What would you change about the website to make it more useful?

Q19/Q20: I will read several features of the Energy Management website. For each one, please indicate if you've used it. Q20: Please tell me if each of the following feature was "not at all helpful," "somewhat helpful," or "very helpful?"

	Q19	Q20: IF Q19 = CHECKED			
	CHECK ALL THAT APPLY	NOT AT ALL HELPFUL (1)	SOMEWHAT HELPFUL (2)	VERY HELPFUL (3)	I'M NOT SURE (4)
Accessing historical bill information (1)					
Changing your thermostat setting on the website (2)					
Viewing messages from SDG&E (3)					
Accessing more detailed information about your household energy use patterns (4)	4	1	0	2	2

Q21. To what extent do you agree with the following statements about the Energy Management website, using a 5-point scale where 1="strongly disagree" and 5="strongly agree"?

	1=STRONGLY DISAGREE (1)	2 (2)	3 (3)	4 (4)	5=STRONGLY AGREE (5)	DON'T KNOW (6)
The Energy Management website is easy to navigate (1)						
The Energy Management website helps me identify how I can save energy (2)						
I'd have liked to access the energy management website on my smart phone (3)						

YOUR EXPERIENCE WITH THE PILOT

Q24. I'll read several statements about your experience with this pilot program. Please indicate the extent to which you agree with each statement, again using a 5-point scale where 1="strongly disagree" and 5="strongly agree,"

	1=STRONGLY DISAGREE (1)	2 (2)	3 (3)	4 (4)	5=STRONGLY AGREE (5)	DON'T KNOW (6)
The number of Demand Response events was what I expected. (1)						
The notification of the Demand Response event was clear. (2)						
I had enough time to prepare for the Demand Response event day notification. (3)						
I'd like to continue to be part of this program. (4)						
I will reduce my energy use when future Demand Response event is called. (5)						
My Smart Thermostat helps me save money. (6)						

	1=STRONGLY DISAGREE (1)	2 (2)	3 (3)	4 (4)	5=STRONGLY AGREE (5)	DON'T KNOW (6)
My Smart Thermostat helps the environment. (7)						
It is important to do our part to save energy in times of high electricity demand. (8)						

Q25. When requested to reduce your energy use, what level of effort would you say that your household made to lower your energy use? Would you say . . .

- ☐ A great deal of effort (1)
- ☐ Moderate effort (2)
- ☐ A little effort (3)
- ☐ No effort (4)
- ☐ DON'T KNOW (5)

Q26. Have you made any changes to try to reduce your energy use since your Smart Thermostat was installed?

- ☐ Yes (1)
- ☐ No (2)
- ☐ I'M NOT SURE (3)

If Yes Is Not Selected, Then Skip To What has been the best part of this p...

Q27. What changes have you made?

Q28. What has been the best part of this program, from your perspective?

Q29. Please provide any suggestions for how we might improve this program.

DEMOGRAPHICS

Q30. We just have a few final questions to help us group your answers with those of other households. Including yourself, how many children and adults normally live in your household on a full-time basis?

Total number of people in the household (1)

How many of those are children under 5 years of age? (2)

How many of those are children between 5 and 18? (3)

How many of those are adults 70 or older? (4)

Q31. Do you rent or own your house?

- ☐ Rent (1)
- ☐ Own (2)

Q32. Approximately how large is your home, in square feet?

Q33. Approximately when was your home built?

Q34. What is your highest level of education?

- ☐ High school (1)
- ☐ Some college (2)
- ☐ Bachelor's (3)
- ☐ Master's (4)
- ☐ Doctorate or professional (5)

Q35. How would you describe your race?

- ☐ Caucasian or White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaskan Native (3)
- ☐ Asian (4)
- ☐ Pacific Islander (5)
- ☐ Hispanic or Latino (6)
- ☐ Other (specify): (7) _____

Q36. In what year were you born?

Q37. Those are all of our questions. Thank you very much for your time. Our database shows your address is ${e://Field/Fulladdress}, and you name is ${e://Field/Fullname}. Are these correct? [IF INCORRECT, UPDATE INFO HERE]

Full address (1)

Full name (2)

You'll receive $40 check within two weeks from today from Research Into Action. Thanks again for your time.