
2010-2012 PG&E AND SCE WHOLE HOUSE RETROFIT PROGRAM PROCESS EVALUATION STUDY – PGE0302.01

Prepared for **PACIFIC GAS AND ELECTRIC COMPANY
SOUTHERN CALIFORNIA EDISON**

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1. EXECUTIVE SUMMARY

This report documents the findings and recommendations from a process evaluation of the Whole-House Program operated by Pacific Gas and Electric (PG&E) and a partnership of Southern California Edison (SCE) and Southern California Gas (SoCalGas) as part of the statewide Energy Upgrade California (EUC) initiative. The goal of this study was to conduct a broad-based evaluation of the Whole-House Program leading to recommendations for improving the program’s marketing, implementation, and design.

1.1. Program Overview

The Whole-House Program is complex and has many “moving parts”: utilities, their contractors (marketing, management, and others), independent contractors that provide Basic or Advanced Upgrade services, and collaborations between the utilities and local entities¹ to induce greater participation in the program.

This evaluation covers July 2011 through February 2012. For PG&E, this period immediately followed a pilot phase of the program. As this period began, PG&E had hired a new team of contractors to operate the program. Although SCE did not have a formal pilot phase, it did substantially change its contractor team and the program procedures in the summer of 2011. For both utilities, this was a transitional time for the program, given that the contractor team changed and the utilities were still defining and refining program procedures, application processing, and marketing strategy.

The pilot period lasted about ten months, starting in the summer of 2010. During that period, 1,179 jobs were initiated. By the end of the pilot phase, 868 were complete. During the period of this evaluation, about the next seven months, the pace of job initiation increased, and 1,445 new jobs were initiated. However, the number of jobs in the pipeline increased dramatically, from 26% at the end of the pilot period to 71% at the end of the evaluation period.

The program delivers two levels of energy-efficiency services to homeowners—the Basic Upgrade and the Advanced Upgrade. These services apply packaged energy-efficiency upgrades to the homes, including but not limited to infiltration control, efficient heating and cooling equipment, and upgrades to the thermal integrity of building envelope. The Basic Upgrade delivers a fixed package of improvements and pays a fixed incentive. The Advanced Upgrade delivers a customized package of improvements and pays an incentive based on estimated savings. Advanced Upgrade jobs dominate, accounting for 97% of all jobs

The program recruited, trained, and supported a workforce of independent contractors who marketed the program (primarily in person), identified packages of efficiency measures,

¹ Local entities are cities, counties, and special-purpose local governments or quasi-governmental agencies that worked with the utilities to implement the Energy Upgrade California initiative.

performed pre- and post-upgrade testing and EnergyPro modeling (Advanced Upgrades only), and provided the IOUs with required documentation².

A large percentage of jobs are associated with a small percentage of the contractors. Of PG&E's enrolled contractors, 23% account for 93% of the jobs. For SCE only 13% of the enrolled contractors account for 93% of the jobs. The utilities have enrolled a large portion of the accredited firms (or firms that could be accredited, based on the certifications of their workforce).

Utilities, local entities, and statewide entities conducted marketing campaigns to promote awareness of and participation in the program. ARRA funding flooded the market and provided additional funds to help with marketing and increased incentives during the period covered by this program evaluation. ARRA funding greatly helped program participation in 2011. However, this additional funding, funneled through numerous entities throughout the State, created a complex management environment that required extensive coordination in a short amount of time.

Utilities conducted QA/QC reviews, approved jobs, and paid incentives. In some cases, local entities paid additional incentives to the contractors or homeowners using ARRA funding. Both the mean and median cost of Advanced Upgrade jobs is more than \$10,000 for both utilities. The SCE/SoCalGas Basic Upgrade jobs are much less expensive; both the mean and median are less than \$4,000. On average, incentives paid by the utilities cover about a quarter of the measure costs.

1.2. Evaluation Objectives and Data Collection

The objectives of this evaluation were to:

- Review prior studies and similar programs.
- Develop an inventory of certified contractors.
- Determine the effectiveness of program technical procedures.
- Determine the effectiveness of program management.
- Assess customer attitudes, motivation, and experience with the program.
- Assess participation barriers.
- Assess contractor attitudes, motivation, and experience with the program.
- Assess the effectiveness of contractor training.
- Assess marketing effectiveness.
- Assess program evaluability.

² The evaluation only examined documentation prepared directly for this program. We did not examine documentation that may have been prepared by other PG&E or SCE/SoCalGas programs for the same homes.

We obtained data from the following sources to achieve these objectives.

- 25 interviews with program staff
- 12 interviews with local entities
- 39 interviews with contractors
- 78 participant surveys
- 316 marketing-effectiveness surveys
- Program-tracking data
- 77 job-file reviews
- 4 On-Site tests of PG&E Advanced Upgrade jobs
- 2 EnergyPro / eQUEST comparisons of PG&E Advanced Upgrade jobs
- 4 Los Angeles County Focus Groups (conducted by LA County)
- Lists of accredited contractor provided by BPI
- SCE contractor-training assessment

1.3. Recommendations

We have identified high-priority recommendations that we believe will improve the program’s marketing, implementation, and design. We have also identified one high-priority research study that should be conducted to better understand homeowner response to this program.

1.3.1. Marketing

The full list of detailed marketing recommendations (including those with low priority) can be found in **6.1 Marketing**. High-priority recommendations related to marketing are:

- *Sustain and enhance IOU marketing strategies*, including:
 - *Foster peer-to-peer marketing*: Participants are very satisfied with their program experience, including the participating contractors, the home-energy assessments, and the energy upgrades. The program should leverage these experiences with customer testimonials to enhance marketing. The program may incorporate the excellent participant feedback it has received into marketing efforts in a way that fosters peer-to-peer marketing. Tactics may include customer testimonials, social media channels, and email.
 - *Promote main program benefits*: Current marketing efforts emphasize multiple marketing messages and this should continue. Our evaluation indicates that different messages will resonate with different customers and there is no “one size fits all.” While participants, non-participants, and contractors disagree on what the main motivating message is for customers, they all agree that at least four main program benefits are

important to convey: (1) home comfort, (2) lowering energy bills, (3) the financial incentives available, and (4) conserving energy for the environment.

- *Continue offering events and workshops:* Several marketing efforts have been effective in driving awareness of the program. In PG&E territory, awareness of the Energy Upgrade California brand is high at 29% of the target population. Media channels such as radio, internet, newspaper, and targeted emails and mailings have all helped build program awareness. While continuing to build general program awareness is important and should continue through mass-media channels, this program is difficult to explain in short-media channels and requires educational channels where interested residents can spend more time understanding the program options and steps involved. In-person workshops supported by the utilities, local contractors, and local government officials have proven to be the most effective educational channel that motivates participation in PG&E territory.
- *Build the future target market based on characteristics of past participants:* When considering the program target for marketing and the appropriate channels to reach that target, the program should consider trying to target residents similar to those who have already participated. For example, many participants did a whole-house retrofit when they first purchased a new home or when they needed to replace an HVAC system. The program may consider some ways to best identify and market to new homebuyers. Because this program is not appropriate for the general residential market, efforts to build program awareness should be targeted.
- *Move control of the EUC website to the IOUs:* Program staff has found CEC ownership of the EUC website to be challenging from a marketing perspective, and hopes that control of the website will eventually transfer to the IOUs. Because confidentiality clauses prevent the CEC from giving the IOUs access to customers who visit the site, the IOUs cannot do follow-up marketing with customers who express interest in the program at the website. The lack of access to this information also affects the evaluability of the program because evaluators cannot access these non-participants to fully explore program-participation barriers. Control of the EUC website, including full rights to use its data for marketing purposes, should be transferred to the IOUs.
- *Support contractor marketing efforts:* There have been many marketing and outreach efforts throughout California to build awareness of the Energy Upgrade California brand and educate residents about the whole-house concept. Utilities, local governments, building contractors, and the California Energy Commission have all helped market the program and educate residents. While these efforts are important and should continue, the participating contractors will likely continue to be the main marketing champions for the program as they interact with and serve the residential market as part of their existing business operations. The program should continue to support contractor marketing by providing them with easily distributable marketing materials such as door hangers, brochures, and fact sheets, which enable them to co-market the program. For example, door hangers could be designed to include slots where contractors can insert their business cards. The program should also continue to support any presentations that contractors want to give to

homeowners by providing marketing materials (e.g., PowerPoint slides that help explain the program) and attending presentations where possible.

1.3.2. Implementation

The full list of detailed implementation recommendations (including those with low priority) can be found in **6.2 Implementation**. High-priority recommendations related to implementation are:

- *Reduce application-processing times and QA/QC requirements:* The program is experiencing many challenges in its implementation process, protocols, and requirements that contribute to long application processing times and contractor dissatisfaction. Reducing application-processing time will require multiple efforts including better educating contractors on how to meet program requirements, rewarding contractors that meet requirements, revisiting QA/QC protocols, and looking at how the program might loosen the program requirements that contractors have difficulty fulfilling. Contractors mentioned that if the program can reduce and streamline its paperwork, the contractors would likely promote it more often. Some contractors also recognized that this issue is likely inherent to a new and complicated program and will likely improve over time. Application processing delays for SCE is partly due to its protocol of performing a pre- and post-upgrade inspection in every job for new contractors. SCE is reducing the percentage of jobs that receive the inspections, which should help reduce application and rebate-processing time. Program changes currently being considered call for inspecting only a sample of jobs. For high-volume contractors, the number of inspections may drop to 10% or less if they have proven their ability to abide by program guidelines in previous jobs.
- *Focus training and mentoring on the top performing contractors:* Because the program is struggling with streamlining its application process, protocols, and procedures, it will be difficult to get more contractors on board, and the program may turn many contractors away from the program in the process. The paperwork, going back and forth to correct applications, and slow rebate-processing times are barriers to contractor participation. So much so that some contractors are “selling against the program” (i.e., telling the customer they can do the job for less if they bypass the program). So far, a few contractors are completing (or selling) the vast majority of jobs. The highest-volume contractors so far are those that began their businesses as a home-performance company. They are more likely to stick with the program because it already aligns with their business model. This program requires a lot of contractor training, mentoring, and practical experience before contractors know what they need to do to meet program guidelines. Therefore, program efforts to support contractors should focus on helping the top contractors grow their customer base and less on trying to get more contractors into the program. Once these contractors are successful and the program has streamlined some of its participation processes, the program can work on broadening the pool of high-performing contractors.
- *Adopt common statewide job reporting:* The PG&E and SCE programs have developed along separate tracks, even though they are part of the overall statewide EUC initiative. They take significantly different approaches to reviewing QC and documenting jobs. Even though each

has used a Job Reporting Template (JRT), they have very different content. Now that both have completed a significant number of jobs, they could benefit by working together and adopting a common JRT. This would present contractors with a consistent expectation for QC review and job documentation. Creating a standardized JRT could provide an opportunity to identify strategies for reducing delays in job processing.

- *Identify financing options for customers:* The program faces the implementation challenge of marketing a program that requires a substantial investment from customers. The average cost to the homeowner of a whole-house Advanced Upgrade job is more than \$7,500, even with the utility incentive. For many customers, this cash is not readily available and they may need or prefer to take out a loan for the job. Among program participants surveyed, 45% used financing to pay for their EUC upgrades. Contractors mentioned that financing plays a key role in their ability to sell whole-house jobs. However, participants rated contractors low on their knowledge of available financing options. Currently, there is no central financing resource. Previous financing programs geared toward home improvements have diminished or may soon end. However, LA County plans to continue offering a strong financing option. One way to ensure this program's success is to make financing easier for customers to obtain and help build awareness of these options. The program should identify and leverage other financing options that complement the program. The financing options available to customers should be listed on the EUC website and in contractors' marketing materials so they can easily communicate these options to customers.

1.3.3. Program Design

The full list of detailed program-design recommendations (including those with low priority) can be found in **6.3 Program Design**. High-priority recommendations related to program design are:

- *Improve customer service to contractors and customers:* Contractors and customers mentioned some dissatisfaction with how the program handles customer service. They currently must call the program or the IOU customer-service line, and often deal with multiple people who are not knowledgeable about the program or their specific job. The program should reconsider its approach to customer service and find ways that it can have fewer points of contact to allow for better program communication, better educate customer-service personnel on the program, and create more centralized, proactive and accessible job status information. Suggestions for accomplishing this include:
 - *Establish a single point of contact:* Each IOU should establish a single point of contact for customer and contractor inquiries. This contact needs to be well versed in all program requirements and guidelines and needs access to the program database to be able to communicate application and rebate status. This customer-service resource should be responsive, answer promptly, and be well informed.
 - *Automate some program-status and customer communication:* Implement an automated process (by email, phone, or a website) that notifies contractors and

customers of status updates for major job milestones (e.g., application received, job approved for rebate, inspection pending, etc.). The IOUs should consult SMUD while creating this tool since they have already developed a website that provides customers with rebate-process updates. Implementing this recommendation may require that the IOUs use the same program-tracking database or that each of their databases communicate the same data to a third system. This would require that the IOUs use the same job-reporting system and the same QC/QC checkpoints, so that the same information could be reported to all customers.

- *Modify or drop the Basic Upgrade package:* The program offers Basic and Advanced Upgrade services. Basic Upgrade jobs are simpler, save less energy, cost less, and are eligible for a smaller utility incentive. Substantial effort has been devoted to developing the Basic Upgrade service and in training contractors to provide this service. Out of nearly 3,000 jobs completed by March of 2012, only 3% were Basic Upgrade jobs. The Basic Upgrade service should be either modified, so that it can play a larger role in the program, or dropped. The program staff understands the issues with the Basic Upgrade Package and has some interesting ideas for modifying it that should be considered. For example, one SCE staff member suggested that, instead of offering customers the option of doing 5 measures, the program could give customers the choice of up to 15 measures and allow them to pick a minimum of 2 core measures and 3 others. This would allow the Basic Upgrade path to progress as a fixed-measure path, giving more flexibility to the contractor and homeowner, and possibly streamlining the internal application processing for Basic Upgrades.

1.3.4. Additional Research

Several additional research efforts would be useful to help understand how to increase participation in the program and make program services better and more efficient.

One particular study should be conducted as soon as possible. That study should investigate the customer-referral process and determine why some customers, who initially contact the program, fail to complete a job. The EUC website records contact information for customers who express interest in the program. The sample for this study should be drawn from these customers. This may become possible if the recommendation to move control of this website to the IOUs is implemented.

2. INTRODUCTION

The Whole-House Program is operated by Pacific Gas and Electric Company (PG&E), a partnership of Southern California Edison (SCE) and Southern California Gas (SoCalGas), and San Diego Gas & Electric (SDG&E) as part of the statewide Energy Upgrade California (EUC) initiative. The program delivers two levels of energy-efficiency services to homeowners—the Basic Upgrade and the Advanced Upgrade. These services apply packaged energy-efficiency upgrades to the homes, including but not limited to infiltration control, efficient heating and cooling equipment, and upgrades to the thermal integrity of building envelope. The Basic Upgrade delivers a fixed package of improvements and pays a fixed incentive. The Advanced Upgrade delivers a customized package of improvements and pays an incentive based on modeled savings.

The goal of this study is to conduct a broad-based evaluation of processes, procedures, and strategies for the Whole-House Program as it is operated by PG&E and SCE. Through its partnership agreement with SoCalGas, the SCE program provides upgrades for saving both gas and electricity. This study does not cover the SDG&E program.

The Whole-House Program is complex and has many “moving parts”: utilities, their contractors (marketing, management, and others), independent contractors that provide Basic or Advanced Upgrade services, and collaborations between the utilities and local entities³ for the purpose of inducing greater participation in the program. This evaluation is designed to obtain primary data from all parts of the program and, from these data, recommend strategies for improving the effectiveness of the program.

2.1. Research Objectives

This study’s research objectives and the evaluation work that supports each are described below.

- **Review prior studies and similar programs.** We reviewed several whole-house programs operated elsewhere across the country. We also reviewed prior studies that characterized the whole-house market.
- **Develop an inventory of certified contractors.** We developed this list based on data provided by the Building Performance Institute (BPI) on accredited firms and individuals certified to provide Advanced Upgrade services under this program.
- **Determine the effectiveness of program technical procedures.** We examined effectiveness from the perspective of the program’s documentation, e.g., job applications, energy assessments, test-in/test-out results, incentive payment, program tracking data, and QA/QC

³ Local entities are cities, counties and special purpose local governments or quasi-governmental agencies that worked together with the utilities to implement the Energy Upgrade California initiative.

reporting. We also obtained relevant data from on-site inspections and by testing a sample of Advanced Upgrade jobs completed by PG&E.

- **Determine the effectiveness of program management.** We examined program management effectiveness by interviewing program managers and local-entity staff. Interview topics included marketing and outreach, deployment and utilization of utility contractor and independent certified contractor workforce, quality-assurance (QA) and quality-control (QC) strategies, and collaboration between utilities and local entities.
- **Assess customer attitudes, motivation, and experience with the program.** We met this objective by surveying participating homeowners by phone.
- **Assess participation barriers.** The data gathered from telephone surveys with participating homeowners also provided the data needed to assess participation barriers. We also used survey data gathered from contractors, program managers, and local entities.
- **Assess contractor attitudes, motivation, and experience with the program.** We met this objective by surveying contractors by phone. We surveyed contractors who are participating in the program (at both high and low volumes), as well as contractors who have BPI-certified staff but were not participating in the program at the time of our survey.
- **Assess the effectiveness of contractor training.** We assessed the appropriateness and effectiveness of contractor training by examining the design, training methods, and materials used by SCE. This included in-depth surveys with SCE program staff and contractors.
- **Assess marketing effectiveness.** We conducted two marketing-focused internet surveys with PG&E customers. One survey collected data from customers considered part of the Whole-House target market. The other survey collected data from customers who participated in one of the community-based Whole-House workshops.
- **Assess program evaluability.** We met this research objective by reviewing program theory and logic documentation and analyzing data gathered from program managers and the program-tracking systems.

2.2. Summary of Data Collected

Table 1 lists each type of data collected for this evaluation, and shows the sample sizes, source, and timing of the data collection.

Table 1: Summary of Process Evaluation Data Collected

Data-Collection Task	Sample Size / Source	Timing
Program Staff Interviews	n=25 (9 SCE, 16 PG&E)	Nov-Dec 2011
Contractor Interviews	n=39 (8 not enrolled), (8 inactive), (8 low-volume), (8 high-volume), (7 Davis Energy Group)	Feb-12
Participant Survey	n=78 (62 PG&E, 16 SCE/SoCalGas)	Feb-12

Data-Collection Task	Sample Size / Source	Timing
Local Entities	n=12 (8 PG&E, 4 SCE)	Dec-Feb 2012
Marketing Effectiveness Survey	PG&E Only, n=81 workshop attendees, n=235 target population in 5 counties	Feb-12
Program Tracking Data	All records	Various times through 2-17-2012
Job File Reviews	52 (advanced) PG&E, 22 (16 advanced) SCE/SoCalGas	Feb-12
On-Site Testing	4 (advanced) PG&E	Dec 2011 – Feb 2012
eQUEST Comparison	2 (advanced) PG&E	Feb-12
LA County Focus Group (conducted by LA County)	4 groups (LA County)	Nov-11
Contractor Inventory	Certifications data provided by BPI	January 1, 2010 and November 1, 2011
Training Assessment	Various SCE and contractor staff and training materials	Dec 2011 – Feb 2012

2.3. Organization of Report

This report is organized in two volumes. The balance of this volume is organized into these four sections:

3. Program Overview and Environment

4. Methodology

5. Findings

6. Recommendations and Supporting Findings

The second volume contains supporting documentation that includes the survey guides, the instruments used to collect data, and frequency tabulations for each of the questions asked in these guides and instruments.

3. PROGRAM OVERVIEW AND ENVIRONMENT

This evaluation covers July 2011 through February 2012. For PG&E, this period immediately followed a pilot phase of the program. As this period began, PG&E had hired a new team of implementers to operate the program. Although SCE/SoCalGas did not have a formal pilot phase, it did substantially change its contractor team and the program procedures in the summer of 2011. For both utilities, this was a transitional time for the program given that the contractor team changed and the utilities were still defining and refining program procedures, application processing, and marketing strategy. During the evaluation period, the program was still operating in a start-up phase and should be treated as such when examining its accomplishments. In many ways, the program is still learning what contractors can do (marketing and many technical tasks) and how much training they need to execute the whole-house approach.

3.1. Key Features of the Program

The key features of the Whole-House Program, as operated by the utilities during the evaluation period are:

- The program offered incentives and other support for two types of upgrade packages (Basic and Advanced) to homeowners.
- Upgrades included air sealing, attic insulation, duct sealing, hot-water-pipe insulation, thermostatic control valve, low-flow showerhead, and combustion-safety testing, OR, high-efficiency furnace, energy-efficient cooling, water heater system, energy-efficient windows, duct replacement, wall insulation, and other custom energy-saving measures.
- The program recruited, trained, and supported a workforce of independent contractors who marketed the program (primarily in person), identified packages of efficiency measures, performed pre- and post-upgrade testing and EnergyPro modeling (Advanced Upgrade only), and provided the IOUs with required documentation.
- Utilities, local entities, and statewide entities conducted marketing campaigns to promote awareness of and participation in the program.
- Utilities conducted QA/QC reviews, approved jobs, and paid incentives. In some cases, local entities paid additional incentives to the contractors or homeowners using ARRA funding.

3.2. Overall Program Environment

ARRA funding flooded the market and provided additional funds to help with marketing and increased incentives during the period covered by this program evaluation. ARRA funding greatly helped program participation in 2011. However, this additional funding, funneled through numerous entities throughout the State, created a complex management environment that required extensive coordination in a short amount of time. In some respects, the ARRA

funding forced utilities to implement the program before it was ready because ARRA funds would likely expire in early 2012.

Furthermore, the program operated under strained economic conditions in 2011, with high unemployment and decreasing home prices and sales. These economic conditions were especially important for a program in which the homeowner may be expected to pay \$12,000 or more to participate.

The interviews with program managers provided more detail about the program’s overall environment and challenges in 2011 (see 4.5. Local Entity Interviews).

3.3. Program Accomplishments

We obtained program tracking data from the utilities (or their contractors) covering all Whole-House jobs initiated before or during the evaluation period (July 1, 2011 through February 17, 2012). For a sample of these jobs, we received and reviewed the project files, including all documentation prepared by the contractor that performed the work or by the utility staff and contractors who reviewed and approved the work. The utilities also provided data on contractors that they had enrolled in the program. We also obtained a list of contractors who had the accreditation necessary for enrollment. We used these data to understand the program’s accomplishments.

Table 2 shows the number of jobs by utility (82% PG&E⁴ and 18% SCE/SoCalGas) initiated active during the evaluation period. Advanced jobs dominate, accounting for 97% of all jobs.

Table 2: Advanced and Basic Upgrade Package Participation (8/27/2010 - 2/17/2012)

Package	Total Jobs (N=2,856)	PG&E (N=2,335)	SCE/SoCalGas (N=521)
Advanced	97%	98%	93%
Basic	3%	2%	7%

A job is complete when the utility sends an incentive check⁵ to the homeowner. Table 3 shows the number of complete jobs and those in the pipeline at the end of two periods. The pilot period lasted about ten months, starting in the summer of 2010. During that period, 1,179 jobs were initiated. By the end of the pilot phase, 868 were complete. During the period of this evaluation, about the next seven months, the pace of job initiation increased, and 1,445 new jobs were initiated. However, the number of jobs in the pipeline increased dramatically, from 26% at the end of the pilot period to 71% at the end of the evaluation period.

⁴ All tables in this section are based on program tracking data obtained from the utilities on 2/17/2012. In the PG&E records, 795 jobs were coded as being neither Advanced nor Basic. These jobs were left out of this analysis.

⁵ For the evaluation period, SCE/SoCalGas jobs were treated as complete if they had achieved the status of “check ready to send,” even if the check had not yet been sent.

Table 3: Jobs Completed and In Pipeline

	Pilot Period (8/27/10 – 7/1/11)				Evaluation Period (7/1/11 – 2/17/12)			
	PG&E / Unknown	PG&E / SMUD	SCE / SoCalGas	Total	PG&E / Other / Unknown	PG&E / SMUD	SCE / SoCalGas	Total
Completed	660	138	70	868	582	124	51	757
In Pipeline	227	67	17	311	885	599	383	1,867
Total	887	205	87	1,179	1,467	723	434	2,624

We placed all contractors that were on either the utility enrollment list or the BPI accredited list into four groups⁶.

- “High-volume,” defined as having initiated ten or more jobs in PG&E territory or five or more jobs in SCE/SoCalGas territory. We counted jobs from the pilot and evaluation periods, including jobs that had been cancelled.
- “Low-volume,” defined as having initiated at least one, but fewer than ten jobs.
- Zero jobs.
- BPI-certified but not enrolled.

We assigned contractors to either PG&E or SCE/SoCalGas based on where (that is, in which service territory) each contractor had completed the most jobs.

Table 4 shows the number of contractors and jobs associated with each of these four groups, by utility. A large percentage of jobs are associated with a small percentage of the contractors. Of PG&E’s enrolled contractors, 23% account for 93% of the jobs. For SCE/SoCalGas, only 13% of the enrolled contractors account for 93% of the jobs. The table also shows that utilities have enrolled a large portion of the accredited firms (or firms that could be accredited, based on the certifications of their workforce).

⁶ Based on BPI data as of 11/15/2011 and utility program tracking data extracted on 1/17/2012.

Table 4: Contractors and Jobs by Volume Group

Type	Volume Group	PG&E				SCE/SoCalGas			
		Contractors		Jobs		Contractors		Jobs	
		Count	%	Count	%	Count	%	Count	%
Enrolled	High	32	23%	2,171	93%	13	13%	495	93%
	Low	35	25%	153	7%	18	18%	39	7%
	Zero	73	52%	-		67	68%	-	
	Total	140	100%	2,324	100%	98	100%	534	100%
BPI Accredited not Enrolled		183		-		58		-	

We found ten separate measures in our review of project files for a sample of completed Advanced Upgrade jobs. Table 5 shows how many of the jobs installed each measure and the mean savings (as a percentage of total savings) that was estimated for each measure. House sealing, attic insulation, and duct sealing were installed in more than 75% of jobs done by both utilities. The lighting measure occurs least frequently; it was installed in only 1 of 16 jobs for SCE/SoCalGas and in none for PG&E.

Table 5: Installation Frequency and Savings by Measure in Advanced Jobs

Measure	SCE/SoCalGas (n=16)			PG&E (n=51)		
	Percent Installing Measure	Number Installing Measure	Average Savings (% of Job Total)	Percent Installing Measure	Number Installing Measure	Average Savings (% of Job Total)
House sealing	81%	13	3.2%	86%	44	2.8%
Attic insulation	75%	12	5.9%	78%	40	4.0%
Duct sealing	75%	12	5.0%	80%	41	7.6%
Duct insulation	56%	9	2.7%	53%	27	7.6%
HVAC System	38%	6	5.2%	61%	31	7.1%
Wall insulation	31%	5	13.5%	29%	15	16.8%
Floor insulation	31%	5	3.4%	25%	13	7.7%
Windows	19%	3	11.7%	18%	9	7.8%
Hot water heater	19%	3	1.0%	29%	15	7.2%
Lighting	6%	1	1.0%	0%	0	

Utilities record the claimed savings for each complete job. Table 6 is based on completed jobs from both the pilot and evaluation periods. Percent savings is reported in the table by utility, and in the case of SCE/SoCalGas, for both Advanced and Basic Upgrade jobs. Savings percent for

Advanced Upgrade jobs is similar across the utilities and savings for Basic Upgrade jobs are lower, as expected, given the scope of services provided through Basic Upgrade jobs.

Table 6: Savings Claimed for Completed Jobs

Utility	Upgrade Type	Completed Jobs	Percent Savings
PG&E	Advanced	936	31%
SCE/SoCalGas	Advanced	106	27%
SCE/SoCalGas	Basic	15	10%

Figure 1⁷ shows the distribution of job costs for completed jobs. A separate plot is presented for PG&E Advanced Upgrade jobs and SCE/ SoCalGas Advanced and Basic Upgrade jobs. Both the mean and median Advanced Upgrade job cost is above \$10,000 for both utilities. The SCE/ SoCalGas Basic jobs are much less expensive; both the mean and median are under \$4,000.

⁷ This figure is a box-and-whisker plot, which graphically characterizes the distribution of values in a data series. The empty circle (o) within each box is the mean value for the series. Looking across the plots you can easily compare the mean for the different data series shown on the chart. The plot also shows the median (–), maximum (upper dot), and minimum (lower dot). The top and bottom edges of the box, along with the median (–) define the quartiles of the distribution. An equal number of values in the data series fall into each of the four quartiles (above the box, below the box, between the bottom of the box and the median, and between the top of the box and the median).

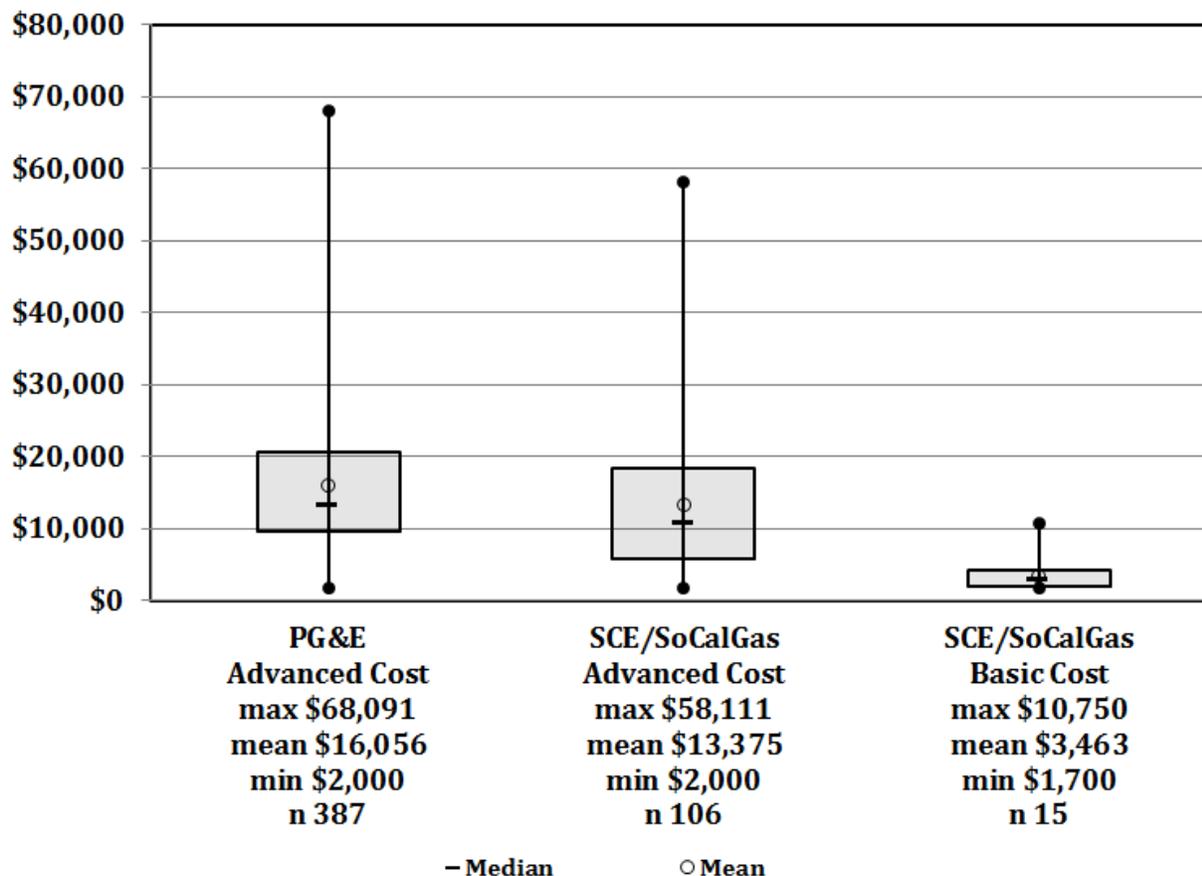


Figure 1: Distribution of Job Costs for Advanced and Basic Jobs

The utilities pay incentives to homeowners who complete jobs. In some cases, a local entity paid additional incentives. The utility program-tracking data only included the incentive paid by the utility and cost of the efficiency measures. Figure 2 plots the distribution of incentives, as a percentage of the measure costs, for each of the utilities. The mean and median values are similar for the two utilities. On average, they both cover approximately a quarter of the measure costs.

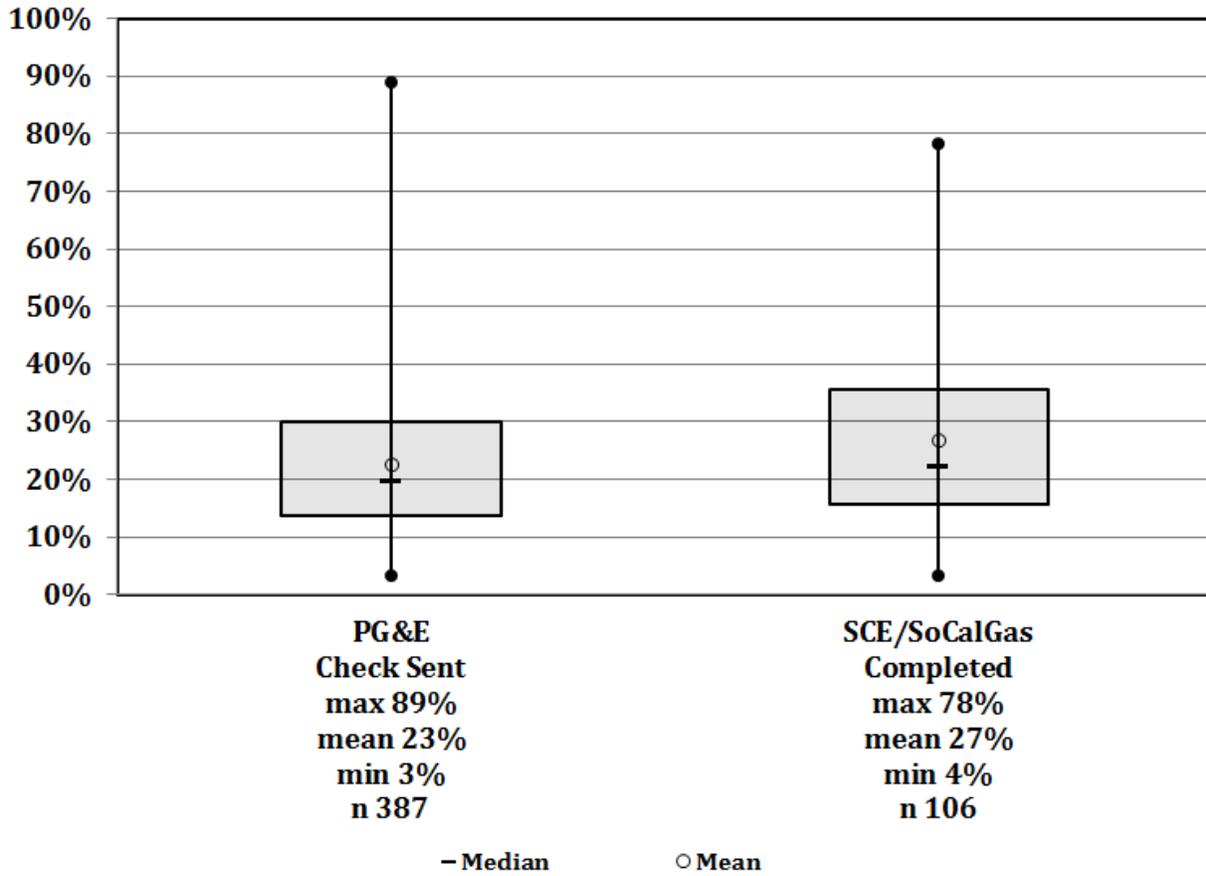


Figure 2: Distribution of Incentives as a Percentage of Measure Costs for Advanced Jobs

4. METHODOLOGY

4.1. Prior Studies and Similar Programs

The evaluation team reviewed several whole-house programs operated elsewhere across the country. This included a review of websites and available materials. In some cases, we also conducted informal discussions with the program sponsor. We also reviewed and summarized the findings from prior studies that characterized the Whole-House market, the contractor workforce serving that market, and the effectiveness of various program strategies that are relevant to the Whole-House Program. Specifically, the evaluation team reviewed key findings from LBNL study entitled *Driving Demand for Home Energy Improvements*,⁸ EPA fact sheets,⁹ and the *Statewide Whole House Program Survey Report*.¹⁰

We conducted this review early in our evaluation, with the objective of both informing the design of primary data collection for our study, and providing feedback to help improve program operations. The following table summarizes the programs included in our review.

Table 7: Summary of Whole-House Programs Reviewed

Program Name	Program Sponsor	Year of Program Launch
Home Performance with ENERGY STAR	Arizona Public Service	2009
Home Performance with ENERGY STAR	National Grid	1998
Home Performance with ENERGY STAR	NYSERDA	2001
Home Performance with ENERGY STAR	Focus on Energy	2001
Home Performance with ENERGY STAR	MassSAVE	2003
Power Saver Program (includes HPwES rebate and loan)	Austin Energy	2004 as branded HPwES; ran an identical program since 1982.
Home Performance with ENERGY STAR	Energy Trust of Oregon	2006
Home Performance with ENERGY STAR	New Jersey Clean Energy Program	2006
Home Performance with ENERGY STAR	LIPA	2006
Home Performance with ENERGY STAR	Xcel Energy Minnesota	2006

⁸ Merrian C. Fuller et al., *Driving Demand for Home Energy Improvements*, (September 2010).

⁹ http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf

¹⁰ HINER and Partners. June 2010.

Program Name	Program Sponsor	Year of Program Launch
Home Performance with ENERGY STAR	Kansas City Power and Light	2008
Home Performance with ENERGY STAR	Gainesville Regional Utilities	2008
Utah Home Performance with ENERGY STAR	Utah State Energy Program	2010
Nicor Gas Home Energy Efficiency Rebate Program (may launch Home Performance with ENERGY STAR to be part of Illinois HPwES)	Nicor	2011
Home Performance with ENERGY STAR	EmPower Maryland Utilities	2009
Home Performance with ENERGY STAR	Efficiency Vermont	n/a
Home Performance with ENERGY STAR	Xcel Energy Colorado	n/a

4.2. Contractor Inventory

To provide services for Advanced Upgrades, contractors must employ people who are certified by the Building Performance Institute (BPI). We obtained, from BPI, lists of firms that are accredited and therefore have employees with that certification. One list was current as of January 1, 2010 (before the initiation of the program) and we got an updated list in November 2011. We also obtained BPI lists of individuals holding the relevant BPI certifications at those two points in time.

Contractors must also meet certain criteria set by the utilities in order to be listed as qualified to provide the two levels of program services (Basic and Advanced). The utilities provide Energy Upgrade California (EUC) with information about each contractor that meets these qualifications and has been enrolled in the program so that they can be listed as such on the EUC website. We also requested and received from the utilities lists of these enrolled contractors.

We analyzed these data to understand the trend in BPI certifications. We matched lists of BPI-accredited firms and the utility-enrolled contractors and added program-tracking data (number of jobs initiated) to create the list we used to select subjects for the contractor telephone survey.

4.3. Program Tracking and Project File Review

We obtained program tracking data from the utilities (or their contractors) covering all Whole-House jobs initiated before or during the evaluation period (July 1, 2011 through February 17 2012). For a sample of these jobs, we received and reviewed the project files, including all

documentation prepared by the contractor performing the work or by the utility staff and contractors charged with reviewing and approving the work.

We developed a database of important information extracted from the program-tracking records and from our review of the project files. We used this database to analyze:

- data quality,
- house and duct air leakage,
- HVAC/water heater replacement,
- safety issues,
- baseline energy use,
- effects of QA/QC review, and
- job-processing time.

4.4. Program Manager Interviews

The evaluation team interviewed program managers, including utility staff and implementation contractors in November and December 2011. We interviewed 25 SCE and PG&E program managers by phone. The interviews covered the program staff’s perspective on topics such as program delivery; homeowner participation; contractor participation; contractor recruitment; contractor training; customer-facing marketing; collaboration with local government entities; quality control; successes and challenges across the topic areas; and opportunities for program improvement.

Table 8: Organizations that Participated in Program Manager Interviews

IOU	Organization	Program Role	Total Number of Interviewees
SCE	SCE utility staff	Program Marketing	2
	SCE utility staff	Program Management	2
	SoCalGas utility staff	Program Management	1
	SCE utility staff	Program Inspection QA/QC	2
	ICFI	Program Implementation Staff	1
	RHA	Program Inspection QA/QC	1
PG&E	BIG	Program Implementation Staff	4
	PG&E utility staff	Program Marketing	1
	PG&E utility staff	Program Management	5
	PG&E utility staff	Program Engineering	1
	EGIA	Program Implementation Subcontractor Staff	5
Total			25

Each interview lasted a little over an hour, depending on the number of interviewees, which ranged from one to five per call. Table 8 summarizes the organizations that were included in the program manager interviews.

4.5. Local Entity Interviews

The evaluation team conducted in-depth interviews with local entities that worked with the IOUs to deliver the Whole-House Program throughout 2011, including staff associated with cities, counties, and special-purpose local governments or quasi-governmental agencies. We conducted interviews with twelve local entities from December 2011 through February 2012. Each 30–60-minute interview covered the local entities' experiences delivering the program, and their experiences collaborating with the IOUs.

The local entities interviewed are:

- **Pacific Gas and Electric**
 - ▣ City of Berkeley
 - ▣ Association of Bay Area Government
 - ▣ San Francisco Department of Energy
 - ▣ Contra Costa
 - ▣ San Mateo
 - ▣ Placer County
 - ▣ Fresno City
 - ▣ Ecology Action
- **Southern California Edison**
 - ▣ City of San Bernardino
 - ▣ LA County
 - ▣ Santa Barbara County
- **Both**
 - ▣ CPUC-ED

4.6. Marketing Effectiveness Survey

The evaluation team conducted two marketing-focused surveys with PG&E customers in February 2012—the Targeted Population survey and the Workshop Participant survey. In each survey, we displayed marketing materials online and solicited the respondents' reactions to those materials.

The Targeted Population survey collected data from 235 customers across 5 counties (Figure 3) served by PG&E. The utility selected the counties in which the survey was fielded by considering

the potential opportunity these counties offered the program relative to energy use, number of homes, types of homes, income level, and high ARRA investment levels. The survey screened respondents for program fit considering county of residence, single-family-home ownership, age of the home, existence of central air conditioning, and household income. The survey covered several topics including exposure to EUC and contractor messaging, job status, barriers to participation, and testing of specific messaging. Table 9 shows that the data come primarily from Santa Clara, San Mateo, and Contra Costa counties.

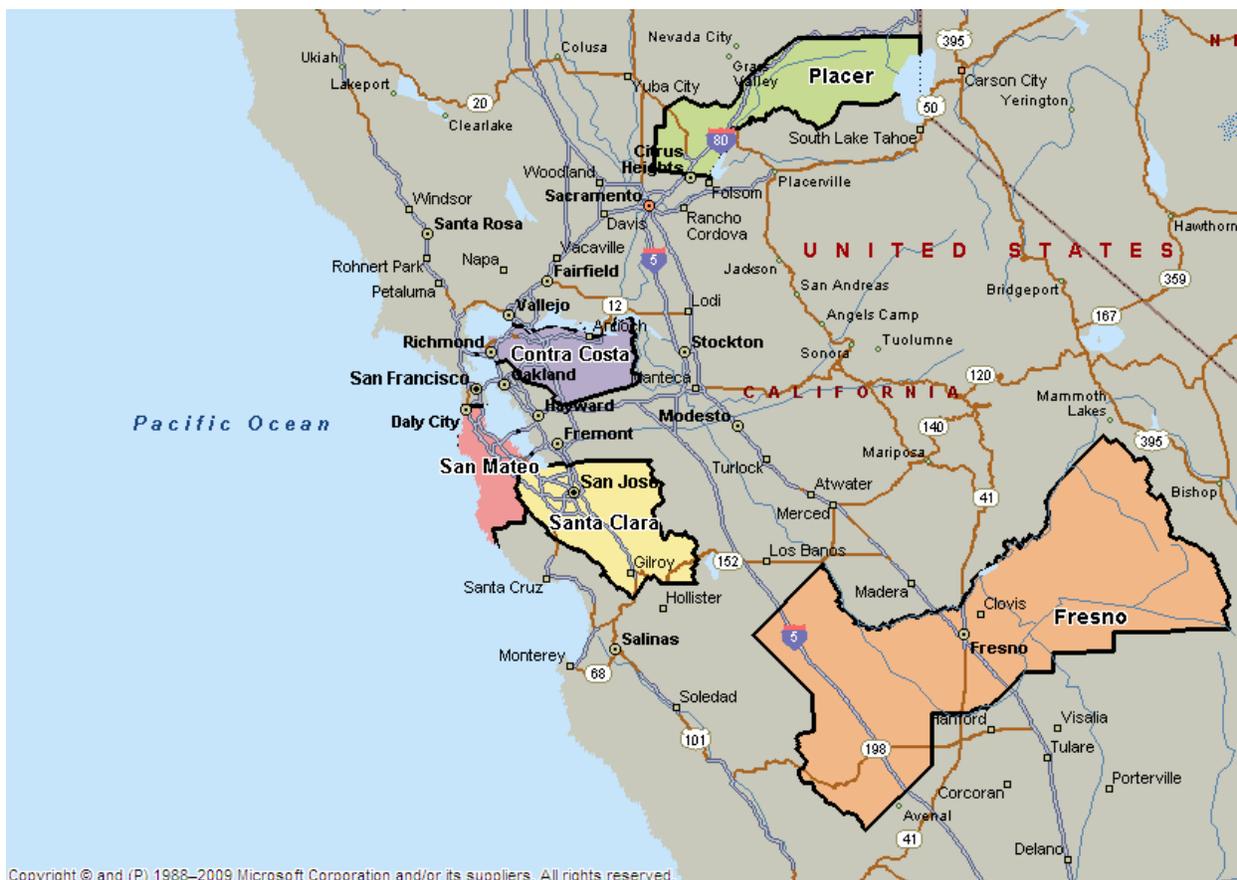


Figure 3: Map of PG&E targeted population survey sample

Table 9: PG&E targeted population survey sample

County	Sample Size
Santa Clara	104
San Mateo	64
Contra Costa	58
Fresno	6
Placer	3
Total	235

The Workshop Participant survey collected data from 81 workshop attendees from a sample frame of 705 potential respondents. These customers had attended a PG&E-sponsored program workshop in one of the five targeted counties but had not yet participated in the program. The survey covered several topics including exposure to EUC and contractor messaging, job status, barriers to participation, and effectiveness of specific messaging.

4.7. Participant Survey

The evaluation team conducted quantitative telephone surveys of program participants. Our survey instrument was designed to:

- determine how participants learned of the program;
- determine motivation for participation;
- help profile the program participants;
- assess satisfaction with services received from the program and its contractors;
- determine the hassle factor (or lack thereof) by the participant when working with the contractor and program;
- assess current levels of awareness, knowledge, and attitudes (AKA) of the participants, in part, by incorporating the most important portions of the statewide AKA-B measurement protocol currently under development; and
- address the impact on customer actions and attitudes from specific marketing and promotional strategies.

4.7.1. Sample Design

We selected the sample using program records received in February 2012, which included participants in various stages of job completion. For PG&E, we selected participants whose rebate check had been sent. Because there were fewer SCE/SoCalGas participants, we selected participants whose rebate had been approved, even if a check had not yet been sent. The sample frame was limited to participants in the program from July 1, 2011 to January 31, 2012. In PG&E territory, SMUD customers and Davis Energy Group customers were removed from the sample. Our sample frame consisted of 352 participants—301 in PG&E territory and 51 in SCE/SoCalGas territory.

4.7.2. Final Sample and Response Rates

Each utility offered their participants an incentive to complete the survey. PG&E offered \$100 and SCE offered \$50. We tried to interview every participant in the sample frame and we called each multiple times. Ultimately, we completed 78 interviews (62 from PG&E and 16 from SCE)

from February 22 through March 1, 2012. Using AAPOR¹¹ standards and formulas, we calculated a 26% response rate and a 81% cooperation rate.

4.8. Contractor Survey

We conducted 39 qualitative, in-depth interviews with contractors in February 2012. Five groups of contractors were interviewed:

- **Group A:** qualified, according to the certification agencies, but not on the Energy Upgrade California (EUC) list for the IOU.
- **Group B:** on the EUC list but have not completed any jobs.
- **Group C:** on the EUC list and have completed a few jobs.
- **Group D:** on the EUC list and have completed many jobs.
- **Group E:** participants in the Davis energy pilot study.

We interviewed eight contractors in Groups A–D and seven in Group E.

Table 10: Contractor Survey Sample

Utility	Sample vs. Completed	Group A	Group B	Group C	Group D	Group E	Total
		Non-Participants	Inactive Participants	Low-Volume Participants	High-Volume Participants	Davis Energy Group	
PG&E	Sample	183	73	34	31	6	327
	Completed	4	4	4	4	2	18
SCE	Sample	58	67	17	8	6	156
	Completed	4	4	4	4	5	21
Total	Sample	241	140	51	39	12	483
	Completed	8	8	8	8	7	39

All interviews addressed the contractors' experiences with the program and solicited input on the strengths and weaknesses of the program training, marketing, service delivery, customer relations, and quality-control strategies. Responses addressed their attitudes about the two levels of services offered by the program, along with information about their service area, work force, and likely growth in two service levels.

¹¹ *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*, AAPOR, 2011.

http://www.aapor.org/AM/Template.cfm?Section=Standard_Definitions2&Template=/CM/ContentDisplay.cfm&ContentID=3156

In addition to the questions asked of all contractors, we explored special topics with each of the four groups:

- **Group A:** Why they have not participated in the program so far.
- **Group B:** Why they have not completed any jobs through the program.
- **Group C:** Barriers to increasing the number of jobs completed.
- **Groups D and E:** Factors that have led to success in the program.

We recruited participants by phone and offered an incentive of \$100–\$150 to be interviewed.

4.9. Contractor Training Assessment

To be eligible for the Whole-House Program incentives, homeowners must employ utility-qualified contractors to perform the upgrades. Contractors who want to participate must meet capability requirements, and must attend program-sponsored training and mentoring sessions.

The purpose of this assessment was to closely examine the training of contractors in SCE’s Whole-House Program. We examined the design, training methods, and materials used to determine the appropriateness and effectiveness of the training offered to contractors. Specifically, we wanted to determine whether the training objectives address the tasks the contractors must perform as part of Whole-House Program, and whether the training prepares the contractors to succeed.

This assessment was limited to the Southern California Edison’s training and implementation of the Whole-House Program, though the findings have statewide implications.

The assessment of the training included reviewing the training materials provided by ICF International (ICF) and those developed and delivered by California Building Performance Contractors Association (CBPCA), plus others. This review also included recommendations to SCE for improving the training procedures. We also looked at other aspects of the program; not all of the uncovered issues can be addressed through training. We found that some of the problems and performance gaps are attributable to the design of the program.

During this assessment, the training was undergoing changes, so the materials we were assessing and the program design and implementation were a “moving target.” We understand that the recommendations made here must make sense in the context of the overall process evaluation, which needs to be considered before the training is modified.

Throughout the program’s operation, gaps in certain aspects of contractor performance have become apparent. Specifically, contractors were not meeting the Quality Assurance (QA) and Quality Control (QC) requirements of the program. One purpose of this evaluation is to determine if these performance gaps can be addressed by training, and if so, whether they are being addressed by training.

Early in the assessment, we outlined what we believed to be the “researchable questions” that might be answered by our investigation, and guide and drive our assessment and research. The researchable questions also defined, for the most part, the scope of our assessment.

While trying to gather this information, other issues and concerns became apparent and we discovered that some of our initial questions were not essential for obtaining information about our primary goals. Also, many of our researchable questions were included as part of the contractor surveys (see **4.8 Contractor Survey**).

4.9.1. Assessment Activities

In the Whole-House Program, homeowners can choose between two levels of service—Basic Upgrades and Advanced Upgrades. The required contractor training relates directly to the measures available in each of these two service levels:

- The Basic Upgrade measures are: air sealing, attic insulation, duct sealing, hot-water-pipe insulation, thermostatic shut-off valve, combustion-appliance-safety testing, and installation of a carbon monoxide (CO) monitor.
- An Advanced Upgrade is customized for a particular house, and the incentives are based on the expected energy savings. This involves assessing the house to identify possible energy-saving measures. Advanced Upgrade measures include Basic Upgrade measures plus others such as replacing heating and/or cooling systems with high-efficiency units, wall insulation, duct replacement, and water-heating systems.

All contractors must attend a two-hour Participation Workshop that orients them to some of the requirements and features of the Whole-House Program.

One way contractors can qualify for completing Basic Upgrade jobs is to participate in the Basic Upgrade training and contract with a Building Analyst (BA) certified in combustion testing by the Building Performance Institute (BPI). Alternatively, they must have at least one BPI BA–certified person on staff, which qualifies them for completing both Basic and Advanced Upgrade jobs. Contractors may attend the Advanced Upgrade training, which is designed to prepare them for taking the BPI BA–certification exam. In addition, after contractors qualify for the Whole-House Program, they must also attend required mentoring sessions and online training.

The primary objective of this assessment was to compare the contents of the training to the requirements of the tasks that contractors must perform for the program. The standards that contractors are expected to meet are defined by the quality-installation requirements of SCE’s program.

The training-assessment activities included:

- Summarizing contractor-performance requirements for Basic and Advanced Upgrades.
- Mapping training objectives to the specific program requirements and tasks. Because the program did not document formal performance objectives for the training, we derived objectives from the training materials. For example, the training objectives for the Basic and Advanced Upgrade training need to reflect contractor tasks and performance requirements of the program. (Are they addressing what contractors really need to do?)
- Conducting interviews with key program personnel to understand how the training was delivered and what the program requirements were.

- Assessing discrepancies between desired and actual performance.
- Summarizing findings.

4.9.2. Interviews

We interviewed key program contributors who were involved in developing the training materials and delivering workshops and webinars. These interviews were critical to understanding the workings of the program and the training itself. We interviewed program/project managers from ICF International (ICF) and quality-control managers and inspectors from Richard Heath and Associates, Inc. (RHA). RHA developed the QA and QC standards for the program, and our interviews with them provided useful insight into many aspects of the standards.

We also included questions in the contractor survey that helped us understand contractor attitudes about the training they receive from the program. We reviewed these survey data as part of the training assessment.

4.9.3. Materials Reviewed

The primary training and associated materials that we reviewed include:

- Whole-House Program materials—online marketing, program description, how to get involved, the benefits of becoming a participating contractor
- Whole-House policy and procedures manuals—the specifics of program requirements for completing upgrade measures, including reporting documents
- Participation Workshop—classroom and webinar materials
- *Basic Training Energy Upgrade California* workbook designed by California Building Performance Contractor’s Association (CBPCA)
- *Home Performance with ENERGY STAR®* Advanced Upgrade training workbooks, also by CBPCA
- Required On-the-Job Mentoring materials. (After contractors qualify for the program they must complete mandatory mentoring sessions.)
 - ▣ Combination session—Job-processing mentoring, Job Reporting Template (JRT) mentoring, and Energy Modeling (EnergyPro) mentoring
 - ▣ Field-data-collection mentoring
 - ▣ “Embedded” Mentoring (part of the BPI Advanced Upgrade training)
- SCE/SoCalGas QA/QC Inspection Guidelines
- *Energy Upgrade California Contractor Handbook*
- *Residential HVAC Quality Installation Program Policy & Procedure Manual*
- Contractor Learning Center online training and related documents

- ❑ JRT (Job Reporting Template) Course outline, content, exam
- ❑ Energy Modeling Course outline, content, exam (also the *EnergyPro Handbook* developed by Bevilacqua-Knight, Inc.)
- ❑ Job Processing Course, outline, content, exam
- ❑ Combustion Safety Course, outline, content, exam
- ❑ Contractor Resource web site printouts
- ❑ *Contractor Update* monthly newsletters (training related)
- ❑ *Online Learning Center Student User's Manual*
- Online web pages
 - ❑ Energy Upgrade CA OC web page
 - ❑ Contractor web pages and others

4.9.4. Training Evaluation Considerations

As part of the training evaluation, we asked the following questions:

- Does the training provide an agenda or a statement of the topics and training objectives?
- Are the training objectives precise and measurable?
- Is the training delivered from the point of view of the instructor or the students?
- Are there opportunities for students to practice the skills described in the training objectives?
- Did the training apply adult-learning principles and practices?

In reviewing the training materials, we considered the following:

- How well did the materials support behavioral change? For example, were there specific job aids or worksheets to help assess or analyze options and to help take action? Did the training include information on where or how to get help taking action?
- Did the materials include motivation for action? For example, were there examples of “typical” benefits realized through actions or measures addressed by the course? Was there a case study of actual implementations and benefits derived?

We also reviewed the course materials to assess whether they applied adult-learning principles and practices. Following is high-level summary of adult-learning principles that we considered during this assessment.

- Learner orientation, buy-in, and engagement

The focus of the training is on the learner rather than the presenter. Buy-in is supported with content or an activity that helps participants see the value of the training; the usefulness of the learning is demonstrated. There are activities that enable the learners to discover important information on their own, and activities that enable the participants to

contribute ideas. The class builds on the students' prior learning or experience and the class meets needs of different learning styles.

■ **Learner success engineering**

The class includes activities that enable the participants to indicate and/or demonstrate their level of experience and expertise, examples and stories that connect new learning to the participants' prior learning and experience. A variety of instructional methods is used to ensure that visual, aural, and kinesthetic learners' needs are addressed.

■ **Practice, application, interactivity**

The class activities reflect the learning objectives, including an appropriate mix of terminal performance and enabling objectives. There are problem-solving activities that actively engage the learners, and opportunities for participants to apply immediately their new learning in the classroom. Class materials include a participant workbook for hands-on activities to check learning and comprehension. Learners are actively engaged in discovering answers, and the design includes checks for comprehension before leaving a key topic area. The class includes opportunities for learners to practice what they have learned as they learn it.

■ **Practice and application are crucial to training effectiveness**

Numerous studies indicate that adults learn best — and are more likely to retain and apply their learning — when the learning experience includes a variety of teaching styles and methods and delivery modes. Research clearly shows the positive affect that actively involving participants has on the long-term effect of the training.

■ **Lesson plan and content decisions**

There are learning objectives that are specific, observable, and measurable. There is a clear focus on key content and there is an organizing principle. There is an appropriate amount of content given the length of the training.

■ **Learning objectives include Terminal Performance Objectives (TPOs) and Enabling Objectives (EOs):**

- ❑ TPOs are the “main things” you want participants to do as a result of the training. The TPOs of a course should directly reflect the desired outcomes. They describe what the training activities should address, and they define the parameters of what would be a final exam.
- ❑ Enabling Objectives (EOs) are the subsidiary things that participants must know or do to accomplish the TPOs. They are the building blocks of the TPOs. The EOs set the parameters for teaching points and practice opportunities.

Both TPOs and EOs should be written as measurable, observable behaviors.

- ❑ Learning objectives describe what the student will be able to do after attending the training, and do not describe what the instructor is going to present in the training.

4.10. On-Site Inspection and Testing

In this task, we collected data from detailed on-site investigations of four PG&E Advanced Upgrade jobs. Our field staff accompanied program QC staff on the upgrade QC site visit. Our work at each site included either collecting the required data or observing the PG&E QC staff collect the data. We compared data collected at the site to the results documented by the contractor who completed the job. The site visit included:

- verifying the installation of measures,
- collecting sufficient data to run the EnergyPro software, and compare the input parameters and model results,
- conducting a blower-door test, and comparing the results,
- conducting a duct-leakage test, and comparing the results, and
- conducting appropriate Combustion Appliance Zone (CAZ) safety tests.

Following the post-upgrade site visit, we re-ran the EnergyPro simulation model. Changes to the model were limited to model inputs either observed or measured to be different from those used by the contractor.

4.11. Comparison of eQUEST and EnergyPro

We completed additional analyses for two of the PG&E Advanced Upgrade jobs whose inspection was described in **4.10 On-Site Inspection and Testing**. The purpose of this analysis was to compare savings estimated with EnergyPro to savings estimated with eQUEST. eQUEST is an energy-modeling program that is not currently approved for use in the Whole-House Program. Work under this task included:

- obtaining utility billing records for the three years before the retrofit and selecting a representative one-year pre-retrofit period to compare to modeled pre-retrofit energy use;
- developing EnergyPro and eQUEST models of pre- and post-upgrade energy use (kWh and therms) for each home, comparing the model results, and identifying reasons for differences; and
- comparing the procedures used to develop these alternative models and developing conclusions concerning the advantages and disadvantages of each software program.

4.12. Evaluability Assessment

The evaluability assessment (EA) addresses three major questions:

- Is there a program theory (and is it adequate)?
- Is there enough data on which to base an evaluation?
- Has there been a change since the last evaluation?

4.12.1. Program Theory

To accomplish this task, we reviewed the program theory, logic model, and process diagrams, and interviewed the program managers. The review focused on several factors:

- Do the documents allow the reader to understand what the program does and why?
- Are the connections between activities, outputs, and outcomes logical?
- Are program goals well defined and measurable?
- Does the program theory describe clear strategies to achieve goals?
- Does the program theory and logic model reflect what the managers report is their program logic and strategies?

4.12.2. Data Adequacy

We addressed several data issues to determine whether the available information would support an impact and a process evaluation of the program.

- Is there a tracking system?
- Does the tracking system contain adequate information?
 - ▣ Are all jobs listed, including those that subsequently decide not to continue with the program?
 - ▣ Are application forms present in all cases?
 - ▣ Is it clear what was installed, when, and in what household?
 - ▣ Is there contact information for all participants?
 - ▣ Is the contractor associated with each job listed?
 - ▣ Is there contact information for the contractors?
 - ▣ Are there records of contractor report cards?
 - ▣ For the Advanced Upgrade Jobs:
 - Are the test-in, test-out, and combustion-test results recorded?
 - Is there documentation of the test process and results?
 - Is there documentation of quality-control inspections and testing?
 - Are there records of contractor qualifications, including classes attended and mentoring processes completed?
- Is there information about contact with other federal, state, or local programs?
 - ▣ Are there contact names, agencies, titles, and roles?
 - ▣ Is there contact information on each?

- ▣ Is there a record of conversations with each?

4.12.3. Change Since Last Evaluation

This program is new, so there are no past evaluations. Thus, the outcome of this aspect of the assessment will be positive.

5. FINDINGS

5.1. Prior Studies and Similar Programs

This section describes our findings from a review of past studies and whole-house programs operated elsewhere in the country. Notably, the most useful prior study to the California Whole-House Program is the LBNL study¹² that describes best practices in “driving demand for home energy improvements”. This study summarizes key lessons for designers of whole-house programs, :

- Retrofits are a tough sell in the marketplace.
- Success requires a holistic approach.
- Identify the target audience.
- Sell something that people want.
- Language matters in marketing communication.
- Engage trusted messengers.
- Work closely with contractors.
- One touch is not enough in outreach campaigns.

We expand upon some of these key lessons and add a few of our own from our review of other whole-house programs across country.

5.1.1. Slow Start Up Is Common

The start-up of the Whole-House Program was slow. This is common throughout the country. Our review of other whole-house programs showed that, in many cases:

- Participation was low during the startup period.
- Savings goals were not met in the early years.
- The program concept was difficult to communicate (i.e., complex) and thus marketing allocations and messaging needed to be adjusted.
- Incentives needed to be adjusted during the initial periods to help encourage participation.
- Extensive time and money were needed to build the contractor network, so costs are high relative to savings in the early years.

We researched mature programs (i.e., programs that have been in operation for eight or more years), and spoke with several of their managers. Many of them indicated that their program

¹² Merrian C. Fuller et al., *op. cit.*

was not cost-effective early on (without combining their effect with other programs in their portfolio). The program administrators also advise that getting past the first two or three years is important. In the first few years of the program, benefits tend to be low and overall program costs tend to be high (two to three times higher than in later years) because of start-up costs, contractor training, and increased marketing. To address this phenomenon, the EPA recommends that these programs be evaluated on a five-year cycle so that the start-up challenges and long-term program benefits are recognized¹³.

Here are four examples of the slow start-up process that has been observed in other areas of the country.

Energy Trust of Oregon

The Energy Trust of Oregon (ETO) spent two years developing their whole-house program, including developing specifications for BPI training and recruiting contractors, before they even began marketing it to customers. The program manager indicated that the two-year mark in a whole-house program is often the point where program managers question if they made the right decision, and in some cases choose to end the program. Notably, ETO took a significant amount of time to build their program before marketing it. In contrast, the California program was somewhat rushed to market so that it could leverage the ARRA funds.

Wisconsin Focus on Energy

The cost effectiveness of the Focus on Energy whole-house program in Wisconsin has increased over time. According to the program manager, this is due to increasing customer awareness, intensive efforts to move more people from the audit stage to installing measures, and a maturing market of trade allies. The program is also adding a direct-install component (for compact fluorescent lamps, faucet aerators, and low-flow showerheads) in 2012 to help increase savings. This will help deliver some immediate savings, which, according to the program administrator, will likely increase cost-effectiveness. The direct installation of measures has been used in several whole-house programs to engage customers, and increase overall savings from these types of programs.

NYSERDA

NYSERDA has a very mature program, yet the NYSERDA program manager reflected that it takes a long time for these types of programs to ramp up. NYSERDA indicated that the whole-house program did not pass the cost-effectiveness test when first implemented, and was still slightly short of meeting this standard after ten years. The program currently is cost-effective, but many measures (and savings) are being left out of the program due to a new requirement that each measure in the program be cost-effective. Including only the most cost-effective measures is often necessary to make the program cost effective.

¹³ http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf

Nicor Gas

Nicor Gas noted that their whole-house program *was* cost effective during the first years. That said, the Nicor program currently only includes shell measures, and is being run jointly with ComEd, who is paying the costs associated with the electric benefits. Nicor also includes the direct installation of gas-saving measures during the assessment, which helps increase savings and cost-effectiveness. Directly installing measures, incentive-based support for measures with high savings, and joint sponsorship all help to increase the cost-effectiveness of this program.

5.1.2. Suggestions for Recruiting Contractors

There are two primary “implementer models” for running whole-house programs:

- In a “rater model” (or “consultant-first model”), the initial interaction is through an auditor who assesses the house and provides recommendations. The homeowners then find a contractor to perform work (or they can do it themselves). These auditors (or consultants) and the contractors form a network of companies that complement each other’s work.
- In a “contractor model” approach, contractors in the market help sell the program, assess the homes, and provide services to help save energy.

The California Whole-House Program uses the contractor model, though we recognize that some cities and counties use ARRA funding to implement a rater model in their jurisdictions (see the findings in **5.5 Local Entity Interviews**). For programs based on the contractor model, building up the contractor base that can provide “whole-house” services is necessary. Outside California, we found that three types of contractors are attracted to this kind of work:

- Insulation or HVAC contractors who have experience in one area, but must broaden their practice to offer whole-house services
- Weatherization contractors who have experience with many efficiency measures
- Other “implementer” contractors who serve other utility programs and therefore often have experience with many measures

California has these three types of contractors, but also has a fourth type that was offering whole-house services before the Whole-House Program started. These contractors are commissioning contractors who specialize in energy-efficiency and self-generation services, and offer assessments, a full suite of whole-house services, and solar-energy systems. These contractors already operated under a business model closely aligned with the Whole-House Program, and simply added incentives to their current services, which enabled them to expand their customer base. Most of the participation in the Whole-House Program has come from these contractors.

Without these whole-house contractors, programs outside California must try to engage contractors to expand services or build networks, or they may indirectly encourage companies that have a more holistic approach (such as a weatherization contractor) to switch their offering to focus on the whole-house market.

While the type of delivery model and the build-up of the supporting trade-ally network differs across programs—each with its own benefits and drawbacks—in all cases, the backbone of the utilities’ energy-conservation programs is partnering with local contractors. Generally, weatherization or implementation contractors find it easier to adapt to a whole-house approach. In many cases, program administrators who were working with contractors who started as insulation or HVAC contractors noted that the whole-house approach was a significant change in the contractor’s business strategy. Instead of responding to a customer’s initial request to replace an HVAC unit, the program is now asking the contractor to determine a comprehensive solution for the customer. In addition to adopting a new way of thinking, contractors must learn the skills required to conduct assessments and properly install the components to meet Whole-House standards.

Because of the amount of training and assistance involved in growing a whole-house program, some utilities, such as Gainesville Regional Utilities (GRU), are limiting contractor enrollment to ensure that training and QA/QC is done well. GRU is starting its fourth year of offering a whole-house program called Home Performance with ENERGY STAR®. New contractors are vying to come on board GRU’s program, but the utility is limiting application periods for new contractors to once every six months, to maintain training control. Other utilities have considered limiting the number of contractors, but generally do so after the initial period, when the program administrators realize that not all trained contractors participate as actively as expected.

5.1.3. Engaging Contractors

Among the programs we reviewed, there appeared to be an initial need to engage (and train) contractors, since contractors are the primary agents for selling the programs. In several cases, there was also an apparent need to keep contractors engaged after their initial enrollment.

Following training, some programs have found that many contractors are not actively participating in the program. In one program that offers free assessments, the contractors are required to do ten free energy surveys for customers every year. In another, a minimum number of jobs are required to maintain their status as a whole-house contractor on the utility website. Requirements like these compel the contractors to try, use, and understand the new processes.

Whole-house processes can be very complex, which can discourage contractors. In addition to a minimum number of assessments or jobs per year, the program administrator’s ability to guide and assist, through in-field training, allows contractors to overcome these hurdles. Many program administrators provide hands-on training for contractors, instead of classroom-style workshops, to help contractors feel more comfortable with the program requirements.

One utility also provides contractor incentives for the first job and first year of production. It offers contractors \$500 for their first job completed within three months of participation, and offers \$1,500 for the completion of 24 jobs, or for work totaling at least \$180,000 within the first 12 months of participation.

In general, the whole-house program increases labor hours, testing, and paperwork. Utilities face the challenge of keeping contractors in the program, especially with the slow economy.

The additional overhead presents a difficult financial challenge to a contractor's business strategy.

Some other strategies that have been used to reduce barriers for contractors include improving marketing materials, adding a help line, and offering more assistance in the rebate submission process. All of these are intended to help increase customer interest and participation.

In addition, one utility added \$150 incentive for auditors per house to help them sell the program. These improvements increased the participation by 35% over the prior year's results. Notably, this program was an rater model, so may not be as relevant to the California market.

Finally, because the cost of diagnostic equipment also poses a barrier to contractor participation, a couple of utilities offer subsidies to offset the initial cost of that equipment. In these cases, the program offers an incentive for each test done using the following equipment: carbon monoxide testers, refrigerant data gauges, duct-pressure testers and blower doors. Alternatively, some utilities are considering providing incentives for purchasing testing equipment by establishing a stipend for test results. For example, one utility offers new contractors, or contractors expanding into a new region, a one-time incentive of 20% of the cost of diagnostic equipment, up to \$4,000.

5.1.4. Training Contractors

All programs acknowledge that the training of the implementing partners is critical. BPI training is common, but the type of training and the number of trained contractors varies between utilities. Here are three examples:

NYSERDA

Through NYSERDA's workforce-development program, \$9 million has been invested in job training through a statewide network of Centers for Energy Efficiency and Building Science at which nearly 1,200 students completed BPI-recognized training, as of September 2010. The program also provides 50–75% training incentives for workers who complete Building Analyst or Specialist Certifications, such as heating, envelope, or cooling. Specifically, the program provides both participating and non-participating contractors incentives for various certification, training, and accreditation. For both contractor types, the program offers reimbursement for BPI certification including:

- 75% of written and field exam fees for new certifications,
- additional 25% for staff of participating contractors that achieve new certifications, and
- 75% of field exam fee for renewal certifications.

The program also reimburses tuition for non-BPI certification classes and exam fees associated with national, energy-efficiency certifications such as those from the North American Technician Excellence (NATE) and the U.S. Green Building Council (USGBC). The program offers:

- 50% one-time reimbursement per designation, and

- additional 25% for staff of participating contractors (one-time reimbursement per designation).

For participating contractors, the program also reimburses 50% of the fees associated with new and renewing company BPI accreditations.

NYSERDA's workforce efforts are also being replicated across the nation as NYSERDA has issued more than 30 curriculum licenses to training organizations in other states.

Southface and Georgia Power

To ensure that participating contractors in the program uphold the integrity of BPI Building Analyst Professional Technical Standards and Home Performance with ENERGY STAR protocols, Southface and Georgia Power require three mentored assessments with each prospective contractor before becoming an official contractor. The additional guidance gives contractors more time to refine their skills before approaching potential clients in the field. Southface offers contractors many opportunities to expand their qualifications. For example, in 2010, Southface conducted 22 certification courses in Renovation, Repair and Painting (RRP) Lead Safety, 10 in Residential Energy Services Network (RESNET) Home Energy Rating System (HERS), and 11 in BPI Building Analyst Professional. More than 300 contractors attend these courses, and were exposed to the specifications and benefits of the BPI standards and the Home Performance with ENERGY STAR protocols.

Wisconsin Focus on Energy

For Wisconsin Focus on Energy, both consultants and performance contractors are trained as part of the network. (Consultants and allies form a network of companies that complement each other's work.) All consultants are screened and those who pass are invited to a two-week training program that includes both a RESNET HERS and BPI Building Analyst (BA) certification. All consultants are required to become Building Analyst certified. All performance contractors are required to become both BA and Envelope Professional (EP) certified. The program focuses on developing the consultant network and retaining quality and seasoned talent, which heightens the quality of assessments, and provides additional control for the program.

Installation allies are required to participate in a full-day training session that gives them programmatic, technical, and field-installation knowledge and techniques. This information is presented in a classroom using PowerPoint presentations, handouts, case studies, and professional props and demonstrations. This one-day session was offered throughout the year at different locations to facilitate attendance. In this training, allies learn methods, techniques, and materials to effectively install air-sealing, ventilation, and insulation measures in existing homes. They also learn how to effectively communicate with their customers about energy dynamics in the home and how to propose solutions to those problems.

5.1.5. Assuring Quality

All of the programs seem to recognize that assuring the quality of the contractors' work is vital since contractors represent the program. Quality assurance generally starts with training, but

quality assurance issues have arisen even after contractors have been certified. The level of quality assurance applied to contractor work varies among the utilities.

Some utilities, such as APS, have employed third-party vendors to ensure the quality of jobs. In this and other cases, the vendor verifies the first several jobs of each new contractor, but once their performance is established, the vendor checks only a sample of jobs. In the programs that we reviewed (and for which this data was available), 5-15% of jobs received QA after the initial period.

Southface has continued to provide third-party verification on paper and field work for both Georgia Power and Southface programs. Adhering to the national program requirements, 100% of the paperwork for both assessments and improvements was reviewed. In addition, field quality assurance was performed on nearly 5% of all contractors' jobs per quarter.

5.1.6. Establishing Homeowner Incentives and Financing

The level of funding or financial support is also critical to ensuring a successful program, although the programs (and contractors) vary significantly in what they charge for the initial assessment, and the types of support they offer.

Several utilities found that, in the current economy, they need to offset the initial audit costs to get the desired participation. Also, many programs found it necessary to raise the incentives in the first year.

Some utilities offered a tiered incentive rate. New Jersey offered generous financial incentives in 2010 to make home-improvement upgrades more affordable. The program tested different incentive packages during the year to evaluate consumer response. Rewarding higher incentives to jobs with the highest energy savings promoted greater energy efficiency.

Many utilities also offered financing. The financing caps and terms vary by utility, but most offered favorable terms. Some utilities allowed customers to choose either financing or rebates.

GRU's Low-Interest Energy Efficiency Loan program was critical to its program's success. The low-interest loans are designed to help homeowners purchase efficiency measures that they could not otherwise afford. The program is a cooperative effort with a local credit union, vendors, and contractors. All of the appliances, windows, and HVAC systems installed under the auspices of the loan program must be ENERGY STAR®-rated.

5.1.7. Deciding Whom to Target

As part of their marketing and outreach plans, some utilities have segmented their customers to understand their motivation. Because whole-house programs do not target the general market (i.e., they require an investment that many homeowners cannot make), utilities need to understand whom they are appealing to. Moreover, properly identifying potential participating homes can increase energy savings and program participation.

For GRU, motivating homeowners to participate in the program began with identifying the target market. The whole-house approach presents economic hurdles that other *a la carte* programs do not have. GRU examined demographic and physiographic information from its customer database and the property appraiser’s office. Many successful programs have also found that focusing on early adopters in the beginning helps build the program. Additionally, the LBNL study¹⁴ recommends identifying and recruiting opinion leaders during the early stages so that they can serve as models of the programs benefits.

5.1.8. Promoting the Program

Many of the programs are using standard methods to promote the whole-house program, including mass marketing on the radio, bill inserts, letters, and co-op advertising with contractors. But many successful programs have found that working with local organizations also helps promote the program¹⁵. Some program administrators are pursuing creative strategies to get their target audience’s attention. For example, NYSERDA has an innovative approach to engaging customers:

In 2010, NYSERDA built upon the synergies between *Home Performance with ENERGY STAR* (HPwES) and other residential energy-efficiency programs. For example, the *Shining Example* campaign successfully cross-promoted the lighting and HPwES programs. Contest winners received a free comprehensive home assessment from HPwES, and CFL makeovers for themselves and ten of their friends and neighbors. NYSERDA also encourages contractors and builders to educate customers about the powerful savings and benefits of advanced technologies, such as photovoltaic or geothermal systems, when combined with an energy-efficient home. For instance, all photovoltaic (PV) contractors must perform a “clipboard energy audit” for homeowners interested in PV or solar thermal technology. This assures that homeowners are aware of energy-efficiency issues that may reduce the cost effectiveness of installing a new PV or solar thermal system.

Once customers are aware of the program, they usually need help understanding it, since whole-house programs are more complex than standard rebate programs. Whole-house programs are difficult to explain and promote because of the multistep process and program requirements. To help streamline the program, Xcel Energy has created a welcome packet to simplify the steps and create a seamless process. The packet provides all the information the customer needs, and lays out an easy step-by-step process. It also includes case studies or “road maps” from customers that have successfully completed the program. This helps customers get comfortable with and understand the process, and it gives them an idea of what to expect. Xcel Energy also set up a dedicated phone line for customers that need a little extra help along the way. Customers can call to get guidance, advice, or information. The packet also includes a magnet with the phone number.

¹⁴ Merrian C. Fuller et al., *op. cit.*

¹⁵ Merrian C. Fuller et al., *op. cit.*

Follow-up surveys with customers at different phases in the program (e.g., those who dropped out after the audit) may provide insight into what messaging can help increase homeowner participation.

5.1.9. Getting “Deep” Retrofits Through Whole-House Programs

Several utilities have found it difficult to get their whole-house programs to get “deep” retrofits—that is, comprehensive packages of measures that produce more savings, when implemented together, than the sum of the individual measures. Many customers are only willing to go so far with energy saving measures, and typically install only two to three recommended upgrades.

Some programs have tried to encourage deeper retrofits through the design of the program. For the Xcel Energy program in Colorado and Minnesota, the customer must implement at least five energy-saving home improvements: three mandatory elements and two optional measures recommended by the auditor. Rebate levels exceed that of stand-alone rebate amounts to help cover the costs of multiple installations or performance upgrades. In the Xcel program attic insulation, air sealing, and CFLs are required measures, and the customer must select two more improvements from this list:

- Boiler
- Air conditioner with a SEER of at least 14.5
- Clothes washer
- Dishwasher
- ECM fan
- Furnace with an efficiency of at least 90%
- Occupancy sensor
- Refrigerator
- Programmable thermostat
- Wall insulation
- Water heater
- Refrigerator recycling

Other utilities and service providers are offering “packages.” The initial investment in whole-house upgrade can be too high for many customers, so in GRU territory, with guidance from one of the partnering contractors, customers can choose between four packages that fit their needs.

5.1.10. Key Takeaways

- Slow program start-up is common. It may take 2–3 years to achieve steady program participation. Likewise, these programs are typically not cost-effective in the first few years due to the initial investment in training and mentoring contractors and marketing.
- Though recruiting contractors is important, especially during the early years of the program, maintaining a highly trained and qualified group of contractors is a key to overall program success.
- Assuring the quality of the contractors' work is vital since contractors represent the program. Quality assurance starts with training, but also includes third-party quality-assurance vendors. New participating contractors must often be monitored for each job, while a small percentage of jobs being completed by established contractors are monitored at intervals. Program incentives and financing options should complement each other. The lack of financing option could hamper program success.
- Proper customer targeting and promotion are essential to program success. As indicated in the LBNL study, one touch is not enough and a multilayered marketing program is required. In addition to standard methods of promotion, many successful programs have found that working with local organizations also helps promote the program. Whole-house programs are difficult to explain and promote, but an introductory packet can lay out an easy step-by-step process, and include case studies or “road maps” from successful customers.
- Getting “deep energy savings” with retrofits will continue to be a challenge. A flex-path design with a menu of measures, while maintaining a minimum list of measures to install, is a workable approach.

5.2. Contractor Inventory

5.2.1. BPI Certifications

The Whole-House Program requires that a contractor have a member of their staff that is a BPI-certified Building Analyst (BA). Figure 4 shows that the number of individuals with active BPI certifications grew dramatically between January 1, 2010 and November 1, 2011. The number of active certified individuals grew from 65 to 1,596. The number of certifications (individuals may have more than one type of BPI certification) grew from 88 to 2,349. In particular, the number of individuals with BA certification grew from 63 to 1,540, indicating the existence of a large workforce having an important part of the qualifications required to participate in this program.

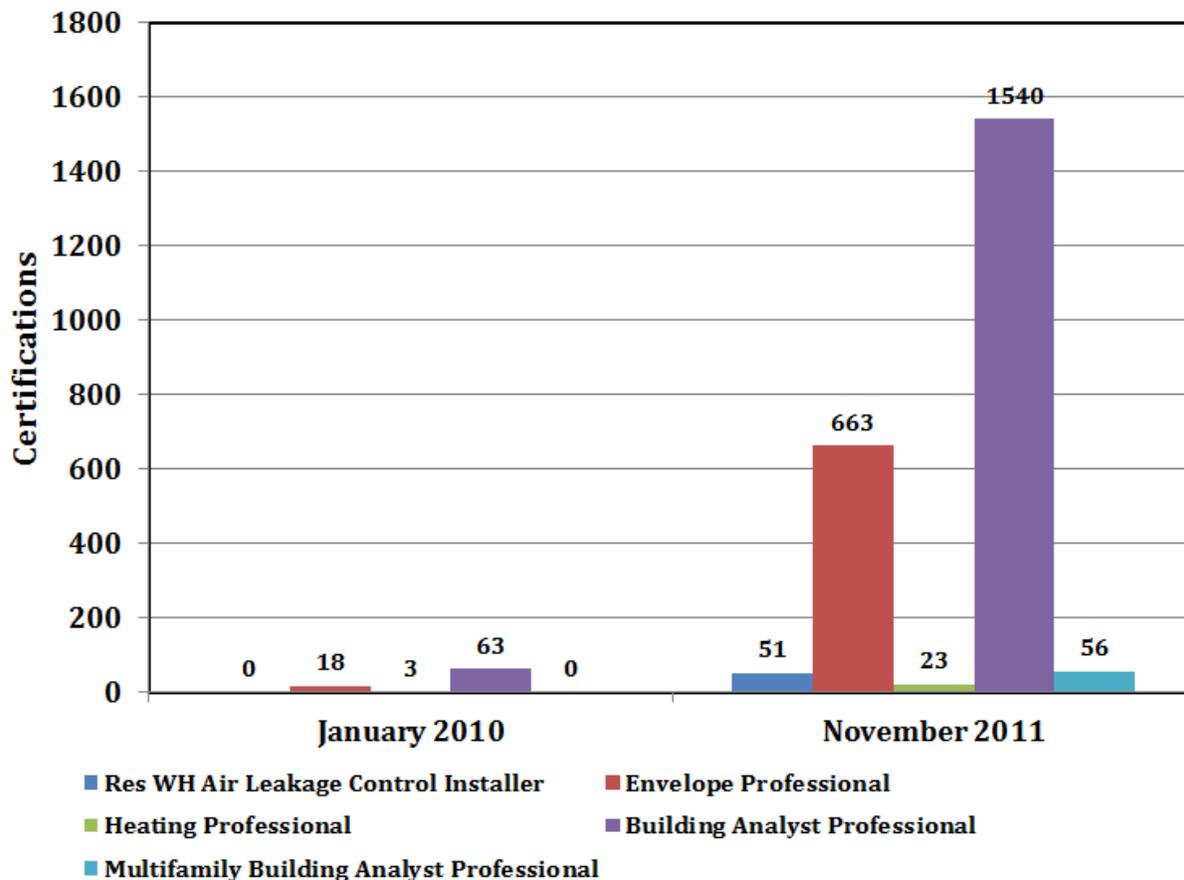


Figure 4: BPI Professional Certifications by Type of Certification

5.2.2. Key Takeaway

- The number of certified contractors has grown since California started its Whole-House Retrofit Program, especially for certified envelope professionals and building-analysis professionals.
- The number of certified analysts to support multifamily properties remains low at this time. It's possible that the upcoming Multifamily/EUC path program will boost this segment.

5.3. Program Tracking and Project File Review

This section presents the findings from our analysis of data obtained from the utilities' program-tracking data and the review of a sample of project files. The program-tracking data covered all Whole-House jobs initiated through February 17, 2012. The sample of project files represents the evaluation period, which started July 1, 2011.

Each of the utilities maintains databases for selected information that they respectively deem to be critical in operating the Whole-House Program. These databases are very different in their structure, content and user interface. In addition, both utilities have systems for maintaining

documents generated during job processing. These include various spreadsheet files, reports, notes, and other documentation. Both the contractor responsible for the job or utility staff or contractors charged with reviewing and approving jobs produce this documentation.

We used these data for two purposes. The first was to document program accomplishments. These are reported in **3.3 Program Accomplishments**. Our second purpose was to explore the topics presented in the balance of this section.

5.3.1. Data Quality

We explored the following issues related to the quality of these data.

- **Project File Availability.** Both utilities chose to store critical information only in the project-file documents. We were unable to find documentation for a significant number of cases. SCE was missing documentation for 3 of 21 jobs. PG&E was missing 5 pre-installation files for 3 jobs of the 51 examined. These 3 jobs were begun in the Pilot phase and initially managed by a different subcontractor.
- **Data Consistency.** Some information is stored in both the program-tracking database and the project files. We checked values in the database with those in project files. In the case of PG&E, we compared project files in the Green Compass database maintained by Build It Green (BIG) with the data exported from this same database. Additional records for PG&E are maintained by the Electric & Gas Industry Association (EGIA), which receives records from BIG and manages rebate payments. For SCE we compared project files stored in the EUC document repository maintained by Richard Heath & Associates (RHA) with the Milestone tracking reports provided by SCE.

Values entered were generally consistent. Homeowner names and addresses, contractor names, and job dates were 100% consistent. Table 11 shows differences in critical information on savings. These findings are all for complete Advanced Upgrade jobs and the savings would have been needed to determine the homeowner incentive. The first line of the table counts the bad or null data values found in either the database or project files for kWh, therms, or percent savings. All 52 PG&E cases had bad or null values for percent savings (the savings percentages were correctly calculated in the EGIA database). For PG&E we found 3 cases with zero savings for both therms and kWh in the database, and one case of a clearly incorrect value. We were able to verify that the incorrect value was corrected in the EGIA database. In one SCE case there were clearly incorrect or null values for therms and kWh. The second row of the table counts the cases where values were in a reasonable range but were different. Only a small portion of the cases show such differences for either utility. For PG&E we verified that one of these cases was corrected in the EGIA database.

Table 11: Difference in Reported Savings Between Tracking Data and Project Files

	Upgrade Type	PG&E (n=52)			SCE/SoCalGas (n=16)		
		kWh Savings	Therms Savings	Percent Savings	kWh Savings	Therms Savings	Percent Savings
Count of bad or null entries	Advanced	4	3	52	1	1	1
Count of differences between file data and tracking data (good entries)	Advanced	1	1	NA	2	2	2

- **Billing Record Quality and Availability.** Contractors may use billing records to analyze energy savings for a job. We also need them to evaluate the quality of the EnergyPro estimates of baseline energy use. We found billing data in 14 of 16 SCE/SoCalGas applications, and 18 of 51 PG&E applications. In one SCE/SoCalGas case, the annual electric usage was listed as 187 kWh, which is not plausible unless the homeowner has a solar electric system, which was not noted in the files. In one PG&E case, electric records were present but not gas.
- **Data Structure and Content.** The SCE project files we reviewed contained the Job Reporting Template (JRT). Almost all information about the job is contained in the JRT, including modeling inputs. These values can be automatically uploaded to a database to enable tracking of program parameters. The SCE JRT can be used as the source of inputs to the EnergyPro model. The post-upgrade JRT shows which measures were installed. Iterations of the JRT can be used to show changes made at specific sites during the quality-control review. The PG&E project files also contain JRT files, but the PG&E version has substantially less detailed information about the job.

5.3.2. House and Duct Air Leakage

Some of the Whole-House Program efficiency measures reduce leakage, and this in turn reduces heating and cooling requirements. How much these leakage rates change strongly influences the energy savings of a job. The house air-leakage rate may also indicate inadequate ventilation, which indicates the need to add mechanical ventilation. SCE’s project files included results from both pre-upgrade and post-upgrade testing (also known as test-in and test-out) of house air leakage, as measured by the blower-door CFM50 test. In SCE documentation, the house air leakage is expressed in units of air changes per hour (ACH). Figure 5 shows the distribution of leakage rates from the pre-upgrade and post-upgrade testing performed on Advanced Upgrade jobs. On average, for this sample of jobs, ACH was reduced by 35% from 0.59 to 0.38. This is in contrast to the assumption concerning ACH reduction in the draft workpaper for the Basic Upgrade, as documented in *Prescriptive Whole House Retrofit Program (PWHRP)* (WPSCREMI0004.3 revision 3) dated Aug 18, 2010. That draft workpaper assumes

that average ACH is reduced from 0.35 to 0.30 based on the Basic Upgrade measures to reduce house air-leakage.

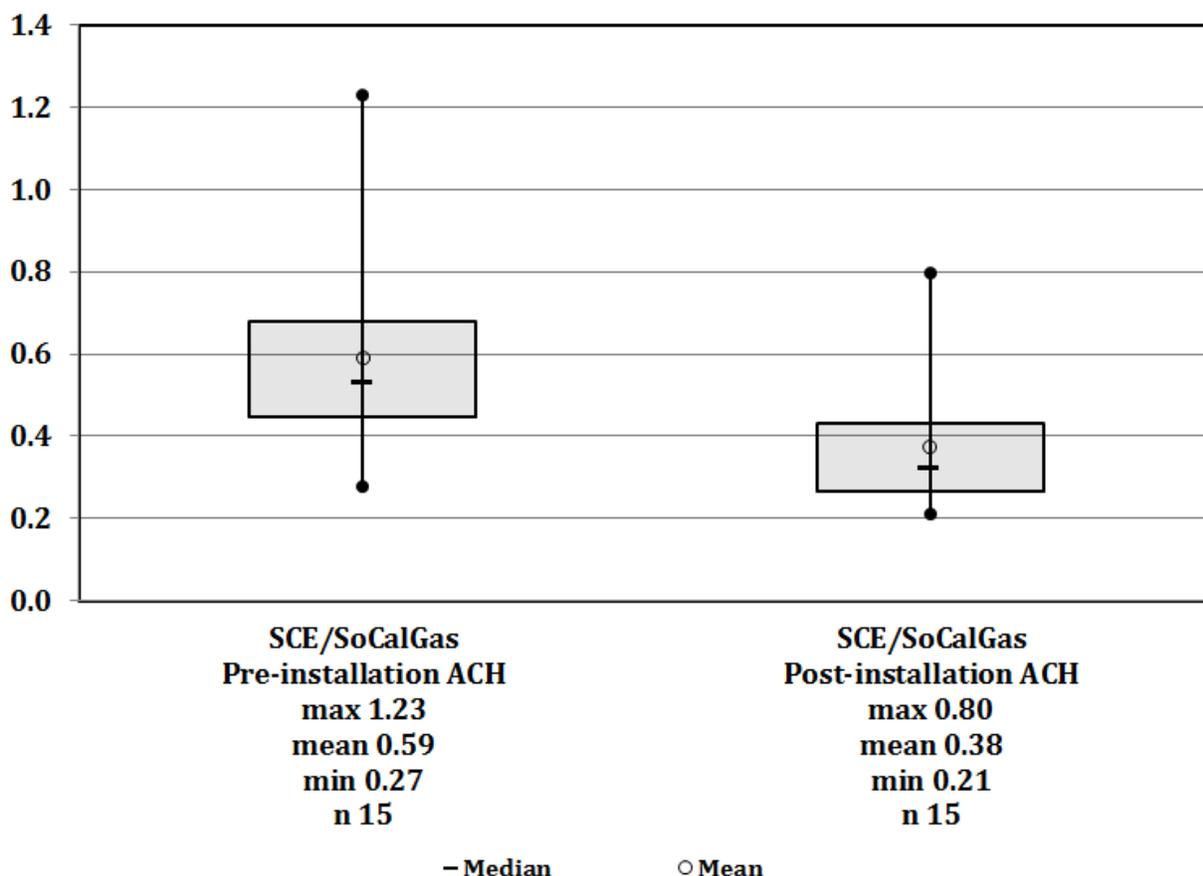


Figure 5: Pre- and Post-Upgrade Leakage Rate for SCE/SoCalGas Jobs

PG&E project files did not contain the ACH results of the pre-upgrade and post-upgrade testing. However, both utilities documented the percent reduction in infiltration rates, as shown in Figure 6. On average, sealing the house reduced infiltration by 30% in 22 SCE/SoCalGas Advanced Upgrade and Basic Upgrade jobs and by 23% in 47 PG&E Advanced Upgrade jobs. Duct leakage was reduced by more than 60% for both utilities. The SCE project files indicate that the utility’s QC review resulted in significant adjustments to the leakage values submitted by contractors in the pre-applications. The median value of the changes made by these QC activities for both house and duct leakage was 0%, however the mean was much higher due to a few jobs with very large adjustments. The impact of similar QC adjustments were not available from the PG&E data.

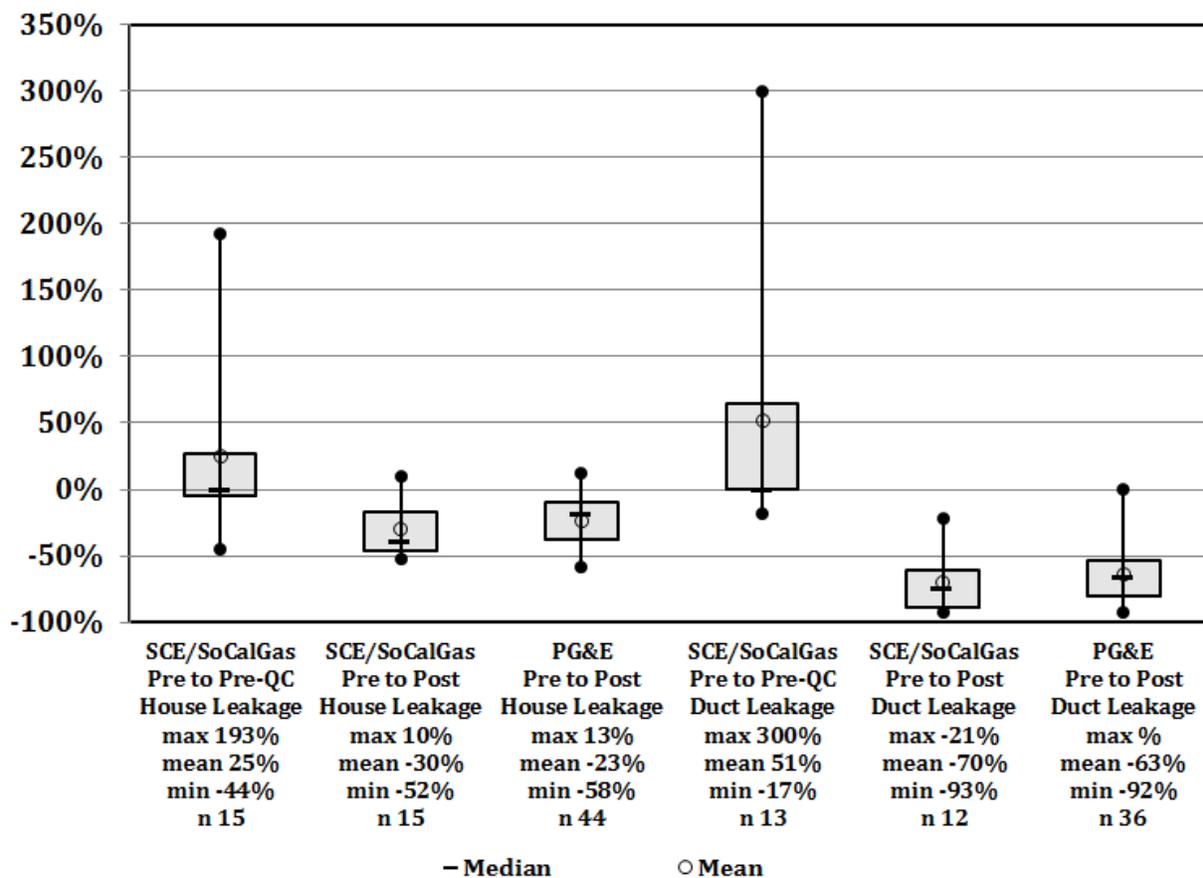


Figure 6: Percent Reductions in Whole-House-Leakage and Duct-Leakage Rates

5.3.3. HVAC/Water Heater Replacement

HVAC and water-heating equipment was replaced as part of some jobs. PG&E contractors installed more HVAC systems and water heaters than the SCE/SoCalGas contractors. For PG&E, 65% of jobs installed a new HVAC system, compared with 38% at SCE/SoCalGas sites. 29% of PG&E jobs involved water heating replacement versus 19% for SCE/SoCalGas.

The heating and cooling capacity of old and replacement HVAC equipment was available from the SCE data. Table 12 shows that, for SCE/SoCalGas jobs where HVAC systems were replaced, heating capacity was reduced by an average of 3%, and cooling capacity was reduced by an average of 36%. This data was not available for PG&E jobs.

One of the theories of the Whole-House Program is that some measures will reduce heating and cooling loads, which will allow the capacity of the HVAC system to be reduced if it is also replaced. However, other home-remodeling activities that are not part of the Whole-House job may also influence the sizing a new HVAC system. To address this issue, we determined, from the participant telephone surveys (see 4.7 Participant Survey) whether the job was part of a larger remodel. Table 12 shows that of the jobs involving HVAC replacement, none of the SCE/SoCalGas jobs and only 2 of 52 PG&E jobs were part of a larger remodel.

Table 12: Change in HVAC System Capacity

	Number of Sites Replacing HVAC System	Average Change in Heating Capacity (n=5)	Average Change in Cooling Capacity (n=6)	Number of HVAC Replacements as Part of Larger Remodel
SCE/SoCalGas (n=16)	6	-3.2%	-35.8%	0
PG&E (n=52)	31	NA	NA	2

5.3.4. Safety Issues

The Whole-House Program addresses a number of issues that could affect the safety of the home’s occupants:

- Venting combustion gases
- Whole-house ventilation rate
- Asbestos
- Measure installation

For both SCE/SoCalGas and PG&E, contractors and the QC review found a significant number of safety issues. The QC review found many possible instances of asbestos in ducts and Combustion Appliance Zone (CAZ) failures that were not found by the contractors. Table 13 shows the number of jobs for which safety issues were identified either by the contractor or QC review.

Table 13: Instances of Safety Issues Noted in File Review

Safety Issue	SCE/SoCalGas (n=16)	PG&E (n=51)
Possible asbestos in ducts - noted by inspector	7	NA
Possible asbestos in ducts - noted by contractor	3	2
CAZ failure in Test-in	4	12
CAZ failure in Test-out	6	3
CAZ failure not corrected after Test-in failure	2	0
Mechanical ventilation recommended or required - noted in pre-application	1	4
Mechanical ventilation recommended or required - noted in post-application	7	7

Table 13 show that both utilities had seven jobs that required mechanical ventilation to ensure acceptable levels of whole-house ventilation. One reason for the post-upgrade blower-door test is to determine whether additional ventilation is required for safety. However, we found no

data (contractor or QC review) in the project files for either utility that indicated whether mechanical ventilation was actually installed or, if it was, the capacity of the installed ventilation.

5.3.5. Baseline Energy Use

The contractors for Advanced Upgrade jobs use EnergyPro to estimate the savings that will be achieved by the upgrade. EnergyPro estimates pre-upgrade and post-upgrade home energy use (kWh and therms). In some cases, the project files contained the home’s billing history. For those cases, we compared recent annual kWh and therm use to the EnergyPro estimates. This analysis was possible for 13 SCE/SoCalGas and 17 PG&E Advanced Upgrade jobs. Figure 7 shows plots of the differences between modeled and billed energy use (kWh and therms), by utility.

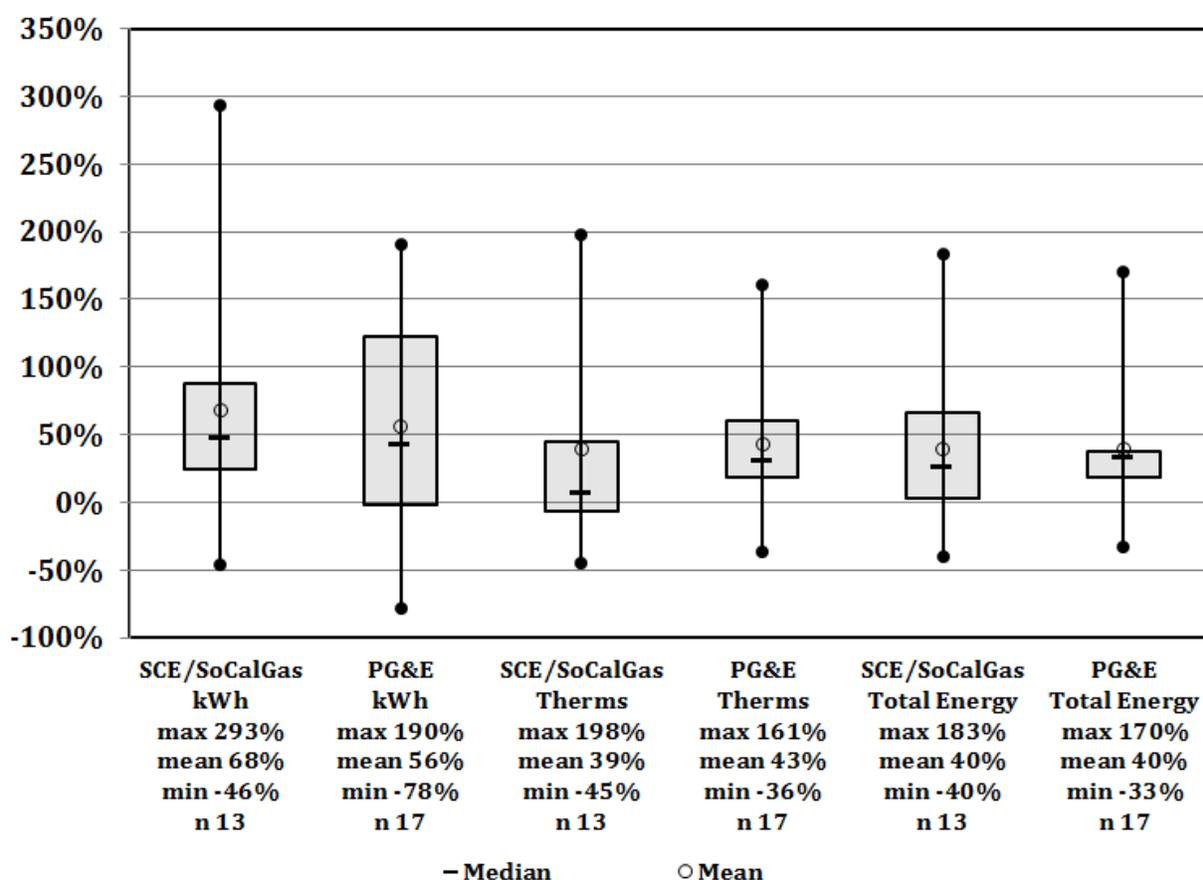


Figure 7: Differences Between Modeled Annual Energy Use and Billed Use

From this analysis, we find:

- Mean modeled total annual use was 40% greater than billed use for both SCE/SoCalGas and PG&E.
- Mean modeled annual kWh use was 68% greater than billed use for SCE, and 56% greater for PG&E.

- Mean modeled annual gas use was 39% greater than billed use for SCE, and 43% greater for PG&E.

5.3.6. Effects of QA/QC

Both utilities have contractors and staff that review Quality Assurance (QA) and Quality Control (QC) for many aspects of the work performed by contractors who complete the Whole-House jobs. The utilities document the results of these reviews in different ways and at different levels of detail. We analyzed the program-tracking and project-file data to identify some of the important effects of these reviews.

- **Adjustments to Leakage Rates.** The SCE project files indicate that the utility’s QC review resulted in significant adjustments to the leakage values submitted by contractors in the pre-applications. The median value of the changes made by these QC activities for both house and duct leakage was 0%, however the mean was much higher due to a few jobs with very large adjustments (25% for house leakage and 51% for duct leakage). The impact of similar QC adjustments were not available from the PG&E data.
- **Problems Found in Pre- and Post-Upgrade Applications.** Table 14 shows that, for the 16 SCE/SoCalGas Advanced Upgrade jobs reviewed, QC made an average of ten non-trivial changes in the EnergyPro model submitted by the contractor in the preliminary application. The corresponding rate among 51 PG&E Advanced Upgrade jobs was 1.5 changes per preliminary application.

In 301 completed PG&E Advanced Upgrade jobs, pre-upgrade applications were returned to the contractor by QC reviewers an average of 2.4 times per job. Post-upgrade applications were returned an average of 2.7 times. The SCE program-tracking data does not contain data needed to compute a return rate.

Table 14: Number of Problems Found by QC

Utility	Average Number of Non-Trivial Issues Found in Pre-Application (SCE/SoCalGas n=15 PG&E n=52)	Average Number of Times Pre-Application is Returned to Contractor (PG&E n=301)	Average Number of Times Post-Application is Returned to Contractor (PG&E n=301)
SCE	10.3	NA	NA
PG&E	1.5	2.4	2.7

Some of the information in PG&E QC reviews was documented in the form of notes written on the application forms. These notes were extracted for the PG&E sample of project files and are summarized in Table 15. Common problems include incorrect combustion-safety-test forms, errors in duct-leakage calculations, and errors inputting model data.

Table 15: Common QC Comments Made by PG&E

Reviewer Comment	PG&E Pre-application Count (n=52)	PG&E Post-application Count (n=52)
CAZ forms not filled in correctly	14	8
Duct leakage not calculated correctly	8	1
Model not consistent with other forms	14	8
High duct leakage not supported with photos	3	-

- Changes in Savings Estimates.** Contractors must estimate energy savings for each Advanced Upgrade job before the homeowner may receive an incentive. The SCE data includes contractor estimates of savings before and after the QC review for the pre-upgrade EnergyPro model (developed before measures are installed). Figure 8 plots the changes required after the QC review. SCE QC made significant changes to the EnergyPro models in 16 Advanced Upgrade jobs. However, the average change in savings due to these modeling corrections was only 2%.

Both SCE and PG&E have data on the contractor’s original pre-upgrade model and the final post-upgrade model after QC changes. In addition to the effect of QC, differences observed are due to additional data being incorporated into the post-upgrade model, such as the post-upgrade tests of house and duct leakage. In 16 Advanced Upgrade SCE/SoCalGas jobs, the mean difference in the savings estimates was 7%. The corresponding mean difference for 43 PG&E Advanced Upgrade jobs was 0%, with a very small variance. In general, the QC review of the EnergyPro model does not appear to result in significant changes to mean savings estimates for either utility.

5.3.7. Job Processing Time

The program-delivery strategies for SCE and PG&E differ. SCE has emphasized thorough QC of contractor work. PG&E has pursued a higher job count while QC and inspection procedures are being developed.

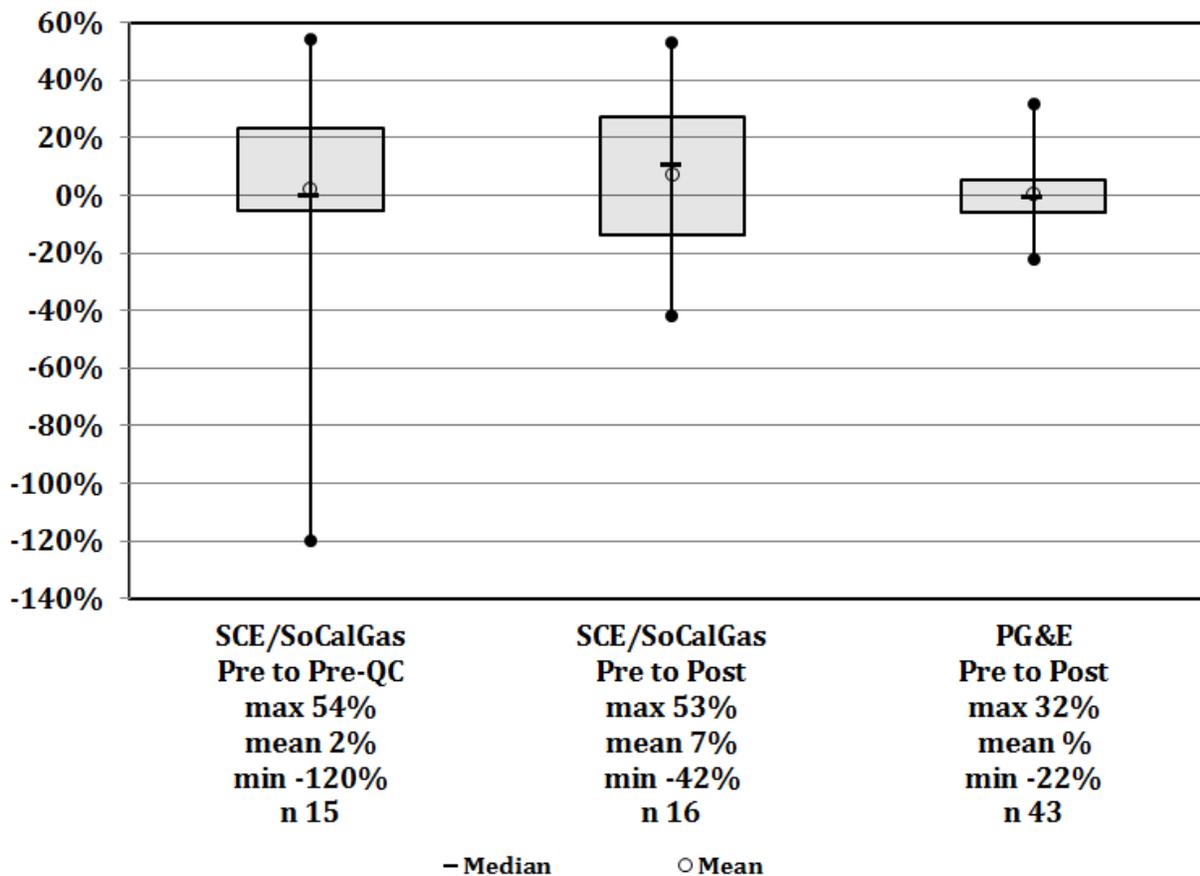


Figure 8: Percent Changes to Pre- and Post-Upgrade Savings Estimates

Table 16 shows the mean time between major job-processing milestones . SCE’s lag times, especially between receiving the preliminary application and authorizing the start of work, are significantly longer than for PG&E (35 versus 7 days). The longer lag times may partly explain why there are fewer HVAC and water-heater replacement measures in the SCE/SoCalGas jobs. Such replacements may need to be done immediately when the equipment fails.

Table 16: Time Between Milestones in Job Processing

Utility	Upgrade Type	Number of Post-Pilot Rebate Approved Jobs	Days from Preliminary Application to Work Authorized	Days from Work Authorized to Work Complete	Days from Work Complete to Rebate Approved	Days from Rebate Approved to Check Sent
PG&E	Advanced	482	7	56	17	37
PG&E	Basic	2	7	36	3	22
SCE/SoCalGas	Advanced	36	35	63	51	
SCE/SoCalGas	Basic	15	12	41	28	

Table 16 also shows the days between approving the rebate and sending the check to the homeowner. Only one check was sent for 51 SCE/SoCalGas jobs completed during the evaluation period, so it was not possible to compute a reliable mean value.

5.3.8. Key Takeaways

This section summarizes the key takeaways from our analysis of program-tracking data and the review of a sample of project files.

Data Quality

- Both utilities chose to store critical information only in the project-file documents. We were unable to find certain types of documentation for a significant number of cases..
- Some information is stored in both the program-tracking database and the project files. Values entered in the tracking databases were generally consistent with the supporting documentation. .
- Billing records could be used to analyze energy savings for a job, as well as to evaluate the quality of the EnergyPro estimates of baseline energy use. We were not able to find billing data within most PG&E project files.
- Almost all information about the job is contained in the SCE Job Reporting Template (JRT), including modeling inputs. PG&E’s version of the JRT has substantially less detailed information about the job.

House and Duct Air Leakage

- The ACH value is important in analyzing energy savings. The data indicate that the average pre-installation ACH value is 0.59 and the post-installation ACH value is 0.38, a significant improvement. These values are substantially different than those assumed in the draft workpaper for the Basic Upgrade path (0.35 to 0.30).
- SCE’s project files included both pre-upgrade and post-upgrade results of testing house air leakage. PG&E project files did not. However, both utilities documented the percent reduction in infiltration rates.
- The SCE project files indicate that the utility’s QC review resulted in significant adjustments to the leakage values submitted by contractors in the pre-applications. The impacts of similar PG&E QC adjustments were not available.

HVAC/Water Heater Replacement

- PG&E contractors installed more HVAC systems and water heaters than the SCE/SoCalGas contractors. For PG&E, 65% of jobs installed a new HVAC system, compared with 38% at SCE/SoCalGas jobs. 29% of PG&E jobs involved water heating replacement versus 19% for SCE/SoCalGas.
- The heating and cooling capacity of old and replacement HVAC equipment was available from the SCE data. For SCE/SoCalGas jobs where HVAC systems were replaced, heating

capacity was reduced by an average of 3%, and cooling capacity was reduced by an average of 36%. This data was not available for PG&E jobs.

- None of the SCE/SoCalGas jobs and only 2 of 52 PG&E jobs were part of a larger remodel.

Safety Issues

- The Whole-House Program addresses several safety issues including venting combustion gases, whole-house ventilation rate, asbestos, and measure installation.
- For both PG&E and SCE/SoCalGas, contractors and the QC review found a significant number of safety issues. The QC review found many possible instances of asbestos in ducts and Combustion Appliance Zone (CAZ) failures that were not found by the contractors.
- Both utilities had seven jobs that required mechanical ventilation to ensure acceptable levels of whole-house ventilation. We found no data (contractor or QC review) in the project files for either utility that indicated whether mechanical ventilation was actually installed or, if it was, the capacity of the installed ventilation.

Baseline Energy Use

- When possible, we compared recent annual kWh and therm use to the EnergyPro estimates. From this analysis, we found that mean modeled total annual use, mean modeled annual kWh, and mean modeled annual gas use was at least 39% greater than billed use.

Effects of QA/QC

- Utilities document the results of Quality Assurance (QA) and Quality Control (QC) reviews in different ways and at different levels of detail.
- The SCE project files indicate that the utility's QC review resulted in significant adjustments to the leakage values submitted by contractors in the pre-applications. The impact of similar QC adjustments were not available from the PG&E data.
- For the 16 SCE/SoCalGas Advanced Upgrade jobs reviewed, QC made an average of ten non-trivial changes in the EnergyPro model submitted by the contractor in the preliminary application. The corresponding rate among 51 PG&E Advanced Upgrade jobs was 1.5 changes per preliminary application.
- Pre-upgrade applications were returned to the contractor by QC reviewers an average of 2.4 times per job. Post-upgrade applications were returned an average of 2.7 times. The SCE program-tracking data does not contain data needed to compute a return rate.
- Common problems include incorrect combustion-safety-test forms, errors in duct-leakage calculations, and errors inputting model data.
- In general, the QC review of the EnergyPro model does not appear to result in significant changes to mean savings estimates for either utility.

Job Processing Time

- SCE has emphasized thorough QC of contractor work. PG&E has pursued a higher job count while QC and inspection procedures are being developed. SCE’s lag times, especially between receiving the preliminary application and authorizing the start of work, are significantly longer than for PG&E (35 versus 7 days).

5.4. Program Manager Interviews

5.4.1. Challenges Stemming from Start Up and Multiple Stakeholders

Interviews with program managers illuminated many of the challenges that the program has experienced in its first year of implementation. At the time of program staff interviews, the program had only been in full operation (post-pilot) for four months. Program staff expressed that this program has been in a “start-up” phase and that evaluators should take that into consideration when looking at its performance.

I think (what’s) important (to remember) in this whole process is that we haven’t been out in the market place that long. And everyone is wondering why we are not hitting our goals and why our volumes are a little bit lower than anticipated. And I think it’s important to remember that this is a totally new program offering and it takes a long time to transform the market so they are ready to accept this type of program. So I wouldn’t view our lower-than-expected numbers as a negative. Everybody is asking, “What are we going to change for the next cycle?” But we just haven’t had a lot of time to collect data, so it’s tough to make a lot of program changes based on the volume of jobs that we have seen to date. I think recognizing that we haven’t been in the market place that long is important, especially when you are running a market-transformation program.

– PG&E Program Staff

The high number of organizations involved in implementing the program in SCE and PG&E (see Figure 9) and the different goals, funding sources, and timelines associated with each has caused several challenges for the IOUs.

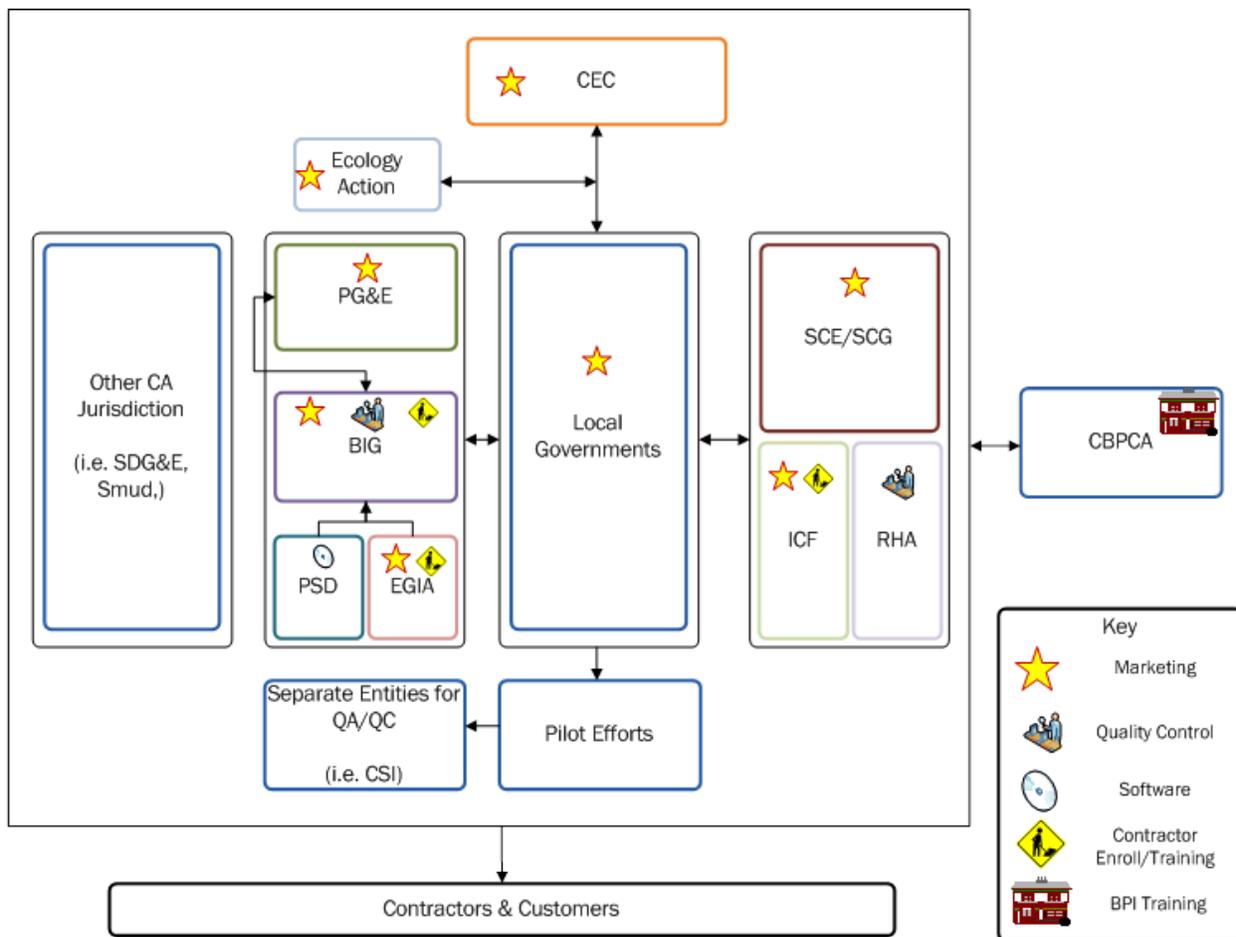


Figure 9: Stakeholders Involved in EUC

One challenge is that the IOUs implemented a program before they were fully ready from an operational and administrative perspective while there was market confusion over the program. Another is that there is some tension between the local entities and IOUs, since local entities are running on grants and ARRA funding and must implement quickly, versus the utilities that are planning for a long-term program. For example, a local government might change their incentive amounts without giving an IOU enough lead time to change their marketing materials going to customers in the same region. This environment also means that the IOUs must coordinate with each other and several other organizations to make program improvements so there is statewide consistency. For example, all parties have been trying to reach consensus around installation specifications across the state. This is still in progress and will likely differ from current specifications; therefore, the program will need additional contractor training statewide once it finalizes the specifications.

You really have the CEC, which has separate ARRA funding, and there are different funding sources than with prior utility funds. And they enter it into the utility realms and have different goals and objectives. There are definitely similar goals and objectives, but there are differences and the differences come in the form of timing. The ARRA funds had to be spent in a certain time frame and in a constricted time frame. So that was a huge challenge because a lot of movement

was made in going to market prematurely when all of the processes and the Q&A and program design elements were not ready, which, specifically for the contractors that were participating, was very frustrating. So we had, for a long time, a very hostile situation with the contractors, participating contractors, against the utilities, because we were forced to roll out before all of the design elements were fully vetted out.

– SCE Program Staff

Most of us have a joint agenda, but throughout our service territory there are different needs and different objectives throughout the local governments and the CEC and in some of the other implementer organizations. So trying to keep consistency across the service territory while still trying to work with them and help them meet their goals has probably been the biggest challenge. The challenge is that, with EUC, there is multiple funding sources. All of those funding sources have different rules and different goals.

– PG&E Program Staff

SCE has experienced several challenges marketing the program. Multiple organizations are implementing the Whole-House Program statewide, so the program implemented a statewide campaign that offers consistency. However, SCE has experienced some challenges with this, given that SCE has its own branding.

The challenge with that is each utility has our own look and feel, our own messaging and our own way of marketing our suite of offerings. We have so many different programs we offer and they all can be bundled together and relate back to each other. And so we got approval to have a statewide look and feel that created templates. [With support from an advertising agency] PG&E took the lead and created templates that were then distributed to the different utilities so we can use the templates and go to market with our individual campaign.

– SCE Program Staff

In response to this challenge, the statewide campaign created templates for marketing materials that each utility can modify.

The ARRA funding going to local governments also presented a challenge. ARRA funding to local county and city governments forced the program to go to market before it was ready from a marketing perspective. The local governments were ready to market the program before the IOUs were, especially since the IOUs were trying to coordinate all of their marketing statewide. For example, one local government was asking SCE for marketing input for its marketing materials before the program finalized the statewide campaign. Since the ARRA funding was to run out in March 2012, the local government needed to get its marketing campaign going as quickly as possible. This forced IOUs to move forward with helping local government marketing campaigns before finalizing the statewide campaign.

[It is] extremely time consuming in getting anything approved because you have so many stakeholders with varying needs. So from a single utility standpoint, I have to route my materials to upwards of 30 different people to get approval. And so the lead time to actually create something and go to market is extremely daunting. And then you have counties that, given their time line, would go out to market prior to terminology being approved or the utilities really being ready to go to market. So I think that has been the biggest struggle we have had with this program.

– SCE Program Staff

The ARRA funding has also helped the program greatly by adding additional incentives to customers in some regions. This has helped the program deliver a very strong offering to the market. The ARRA funds doubled and even tripled the incentive amounts in some regions. SCE offered up to \$4,000. In many cities and counties, the incentives were up to \$8,000, and in one city the incentives were up to \$12,000. SCE staff mentioned that there has been good collaboration, communication, and compromise with local entities overall.

SCE staff also mentioned the communication and collaboration with other IOUs as great strengths of the program.

We've been involved on the statewide level since the beginning because it was directed to us. As far as the prescriptive or the Basic, (the program) has to be statewide and the performance or the advance could have its own local flavor. So we do have standing weekly meetings with our counterparts from PG&E and SCG&E, and we receive data requests that would sometimes need a statewide collaboration, so we've been working with all other IOUs.

– SCE Program Staff

Given PG&E's varied territory and the nearly 50 counties it serves, trying to manage expectations among local entities has been a challenge. The program required a large amount of communication and coordination with local entities to ensure that it could best leverage ARRA funding to optimize program participation. Numerous entities were ready to get started promoting the program and adding incentive dollars to PG&E's program during its infancy. So PG&E held a webinar for local governments to explain PG&E's program design and implementation process, and to describe the program resources they had available.

PG&E has started issuing reports that contain high-level information to the various local governments so they understand how much activity is in their particular jurisdictions and what the savings associated with those jobs are.

Many local entities have different rebates and protocols. This creates a complex challenge for program administration.

[Local entities] have some money that is underspent and so they are reprogramming it for rebates. And the net effect is a crazy quilt of rebates all over the Bay Area with different price points and different eligibility criteria and application forms and different contacts for administration, and it's just mind boggling and complex. And it's the kind of thing that calls for regional implementation. And the need for regional consistency, from the contractors' perspective, is in direct conflict with the local governments' desire for autonomy. So that's probably the big challenge right now is that complexity that comes out of that lack of coordination.

– PG&E Program Staff

Despite the challenging environment, PG&E staff agrees that coordination with local entities has gone well. From PG&E's perspective, there is a lot of potential in the coordination by local entities because those entities have established local community networks with residents and with contractors.

In addition to them having money to support the program, I think they have done a great job with outreach and marketing and really having a better idea of what the people within their

communities want to hear. We can't have as targeted of messages as some of the local governments who can really focus on what is more important in their communities, which I think will help drive participation. So that has been great. Obviously, their support with their dollars has also been great and, to the point earlier, I think they helped drive credibility when you are talking with customers as well. They have existing networks of people who they can reach out to or who are used to hearing from cities about stuff related to their homes. So I think that is a good relationship that we have been able to use to get participation.

– PG&E Program Staff

The coordination of the [LE] outreach with the ARRA-funded programs, and pointing customers to the utility program, and in some cases adding additional dollars on top of those, has been helpful in driving participation.

– PG&E Program Staff

Some staff offered suggestions for improving the program. One large area of focus for the program is how it will succeed after ARRA funding dissipates. Several staff members suggested the following for a successful transition:

- Partner with organizations that want to contribute more money for marketing and/or incentives.
- Make financing easier for customers for these types of programs, and help market-financing options to customers.
- Keep the centralized program website, but empower the utilities to change the content, user interface, and access to data.
- Work toward a brand that fully represents a whole-house retrofit, as intended, instead of doing single measures. The brand should communicate that contractors should address the house as a system and strive to obtain the most energy savings possible. The CEC and local governments may be diluting this main message that the IOUs want to communicate.
- Get marketing creative and strategy more consistent with marketing best practices and aligned with what the program needs for messaging. Program staff suggested that having all statewide entities that are implementing the program (all IOUs, SMUD, local entities, and the CEC) meet quarterly to talk about best practices in marketing strategies, where each organization can present what is working and what is not, would help everyone learn from each other's efforts.

In the following sections, we present the main findings from the program management interviews with SCE and PG&E. As the program matures and ARRA funding runs out, the number of organizations involved will likely shrink to a more manageable size, which will help solve many of the start-up issues that the program staff described throughout these interviews. The lapsing of ARRA funding will also create the need for the program to manage program elements such as the website and to inform the market about the program incentives available to them after ARRA funding.

5.4.2. SCE Program Staff Interviews

In this section, we present detailed findings from the interviews with SCE program-managers. Our interviews covered many topics, and program managers highlighted successes and challenges throughout. Additionally, SCE staff is already implementing several solutions to the program challenges it faces, or is providing several suggestions for how to improve the program going forward. We highlight these challenges and suggestions in the relevant sections below.

5.4.2.1. Marketing

We explored the types of marketing SCE conducted for the program. SCE staff noted that it had a limited marketing budget for the program. Funding went to local entities in SCE territory to help with mass marketing such as radio, TV, and billboards. Therefore, SCE used its marketing funds to target customers that are likely to participate based on certain characteristics. We also spoke with local entities about their marketing efforts, the results of which can be found in **5.5.2 Marketing**. SCE has defined the target customers for the program as:

- Homeowners
- Homes older than 1980
- Single-family detached homes

In addition, SCE targeted their marketing based on climate zones, median family income, energy usage, the presence of central A/C systems, and whether customers participated in other SCE programs. SCE staff also tracks its marketing efforts, and has success metrics for specific types of outreach. SCE tries to promote the program based on seasons; SCE planned many outreach activities in Q1–Q3 of 2011 and decreased activity in Q4.

SCE also profiled participants to understand who is participating. SCE staff anticipated that the program would appeal most to young families who had just purchased a home. However, SCE noticed that the program has appealed instead to many “empty nesters” or retired households.

In 2011, SCE marketed the program directly to customers in the following ways:

- Email blasts to targeted customers
- Bill inserts
- Direct mailers
- Online banner ads driving customers to the EUC website
- Pandora radio spot ads
- Community events
- Magazine/print ads

Contractor-Supporting Marketing

SCE also helped contractors market the program. SCE gave contractors door hangers, buck slips for value-pack coupons, program folders with paperwork to share with customers, and signs

and tablecloths for contractors to bring to events and conferences. According to SCE staff, the highest performing program contractor successfully canvassed neighborhoods with thousands of door hangers.

SCE program-implementation staff also offered sales training to contractors focused on how to sell the program effectively. However, this has been a challenge for the program because contractors have resisted it. The program offered a sales track as part of the monthly contractor-training meetings where contractors can come for a live, half-day training session that includes multiple tracks, e.g., EnergyPro, QC, and sales. Yet contractors do not often choose the sales track. The program also offered webinars in sales training to contractors.

SCE has plans for many different kinds of marketing in the near future, including yard signs and car magnets for contractors.

Marketing Channels

SCE staff described two marketing channels that have been especially effective for the program so far. Based on contractor feedback, program staff explained that door hangers have been especially successful in getting customers to contact contractors and sign up for the program. Second, SCE found that email blasts to targeted customers have also been successful in driving interest in the program.

Providing contractors with marketing materials for them to upsell the program is the best channel we have seen. In addition, the email blasts drive a lot of traffic to the statewide website. And the statewide website is a numbers game: the more people you are driving to it, the more customers are going to [be funneled into] participation.

– SCE Program Staff

SCE also explained that a major marketing challenge is the complexity of the program, which makes it difficult to explain in short-media channels. Customers often hear only about the large incentives available. They call a contractor, and then contractors must spend a lot of time explaining the program. SCE is hoping that its online media campaign with short video clips explaining the program will help increase customer understanding of the program.

The program is trying to make the program more understandable to customers. The first part of this effort is a campaign with five online videos that help demystify and explain the program. The videos build upon one another. One is a feel-good, emotional video that attempts to get customers interested in energy upgrades in general. The following videos help explain the house as a system and the benefits of doing multiple upgrades at once. The next explains the rebates and incentives available. The final video explains the whole-house assessment process.

Marketing Messaging

SCE staff widely agrees that the incentive amount has been the most effective message, especially since, in some local areas, the incentives have been as high as \$8,000, sometimes with an additional \$4,000 of ARRA incentives. SCE staff also finds that “home comfort” has been an effective message that resonates with customers.

EUC Website

SCE staff described the EUC website as a marketing challenge. The CEC runs the main program website and SCE does not have access to the information entered by customers that go to the website (zip code, address, etc.). If SCE had access to this information, it could follow up with interested customers and develop a marketing campaign targeted at these customers. SCE suggested that the program move control of the EUC website from the CEC to the utilities and work towards a website that is more user-friendly and customer-centered.

5.4.2.2. Customer Participation

We explored some of the barriers to customer participation with SCE program staff. Staff mentioned the following as major barriers to customer participation:

- The economic downturn is a barrier.
- The program is complex and therefore difficult to explain to customers.
- The requirement of a whole-house assessment, which can cost \$99– \$700, is a barrier to some customers because there is no guarantee that they will qualify for program incentives after they pay for the assessment.
- The website is confusing to customers and they are unsure where to go after they visit it.

In addition, we asked SCE staff if the program had received any complaints from program participants. Several SCE/SoCalGas customers have complained about the time it takes to move through the program phases (from the pre-inspection, to when work can begin, and from the time the contractors complete the work to when they receive a rebate). Also, some SCE/SoCalGas customers were dissatisfied because they received smaller rebates than expected.

Financing for Customers

Another challenge is marketing a program that encourages a substantial investment by customers during difficult economic conditions, which are not subject to program control. Given these conditions, SCE staff believes that having a financing option available to customers will help the program reach its goals. Currently, there is no central financing resource. Financing programs such as PACE and Home Star were available during the program’s planning process but are no longer available. The financing currently available to customers is through smaller third parties who only cover a small portion of SCE’s service area and have varying requirements and rates.

5.4.2.3. Contractor Participation

In interviews with SCE staff, we also explored their perspective on contractor participation. According to SCE staff, 10–20% of the participating contractors are bringing in most of the jobs. These successful contractors get their customers to sign over their rebate to the contractor, and then the contractor reduces the invoice to the customer. Thus, the customer does not have to wait for the rebate. However, this model can be challenging for the contractor’s business if

SCE takes a long time to reimburse the contractor or if the incentive amount is less than anticipated.

There were a couple contractors who were paying out the money ahead of time and then waiting for us to reimburse them. And that's a tough thing to do when you have to wait for it to go through all the approvals and processing and then get a check.

– SCE Program Staff

Barriers to Contractor Participation

When asked why some contractors might not be participating in the program, SCE mentioned several potential barriers, including:

- Contractors have complained that the program is expensive for them, especially if they need to purchase equipment and diagnostic tools that they do not currently have.
- The paperwork involved is better suited for larger contractors who have dedicated administrative and sales staffs. Contractors with smaller staffs may not have the resources to participate in the program.
- Contractors may think the program is too complicated, difficult to understand, and takes too much time to go through the steps involved (i.e., modeling, submitting all paperwork, getting through the QA/QC inspection process, getting approval to build, submitting paperwork again, then waiting for a rebate). SCE mentioned that this process can take several months from the beginning to the end of a job. Given these conditions, contractors may think it is challenging to sell this program to customers.
- Some contractors have expressed dissatisfaction with the EnergyPro modeling software, the only approved software for the program. Contractors have complained that the software is not intuitive or user-friendly and has not been a good sales tool for them in the field.

5.4.2.4. Contractor Training

Contractors qualify for the Advanced Upgrade portion of the program by attending a 12-day training session to become BPI certified. Contractors qualify for the Basic Upgrade portion of the program by attending a 3-day training session. SCE finds that contractors come out of the 12-day BPI training with good exposure to diagnostic testing, such as blower-door tests and duct-blaster tests, and a good understanding of the science behind the “whole-house” approach.

However, from SCE’s perspective, the BPI training does not prepare contractors for how to apply their learning in the field. To address this issue, the program provides a 3-day training program for contractors to introduce them to the program and invite them to participate. The training takes place in a hotel setting and in rental homes so the contractors get some hands-on experience applying their knowledge to a typical home. At the end of the training, the contractors undergo a field test to prove their ability.

Yet, SCE staff finds that this training has still not prepared contractors very well for the program. Contractors typically need to conduct the work about 10 times on 10 different homes

before they are fully prepared to follow all of the program guidelines. One of the major reasons for this is that every house is different and contractors must learn the nuances along the way.

Mentoring

To further help contractors after the 3-day training session, the program assigns mentors to help contractors get jobs approved by the program as quickly as possible. The mentoring program helps contractors with EnergyPro, completing applications, field testing and data collection. The mentoring program uses a procedure that scores each contractor on each program element and then focuses follow-up training on the contractor's specific needs. The challenge of the mentoring program is that contractors must sell a job first because they need a job to use as part of the field-test component of mentoring. The program most recently approved SCE to do a first round of mentoring at rented homes to help contractors with some one-on-one training before they get a job that might qualify for the program.

The program is trying to improve contractor training. The program recently embedded some of its mentor-training program into the 12-day BPI training courses.

One of the things we've done recently was to embed our mentoring training into the BPI training. So what we were seeing in the past was the folks were coming out of BPI training and they wouldn't know the specifics of our program because BPI training is nationwide. So then we started embedding our mentors in the program at every level and they would take an hour or two here and there and teach them the specific details. So when they came out, they would know more about our program and they wouldn't have to get up to speed on that. So that has helped—the BPI training that CBPCA puts on, you know the full 3 days. And there is no curriculum, no nationwide curriculum. So ICF, the company I work for, we do BPI training. We do it in 6 days. CBPCA does it in 12. And they bill it as the Cadillac of BPI training. So I think the CBPCA course gives contractors more experience, more training, than others.

– SCE Program Implementer

SCE staff made the following suggestions for improving contractor training:

- SCE recommends that the program begin working some QC-influenced training into the contractor training that covers the QC testing procedures and requirements.
- To minimize free-ridership for the BPI training and to increase the number of jobs coming in from contractors, some SCE program staff are considering requiring contractors to pay a certain amount for the BPI training (for example, \$250) and promising contractors that they will get a refund in that amount after they submit a certain number of jobs (for example, three).
- SCE program staff is already using the QA/QC inspection process as an opportunity to educate contractors in the field. For example, program staff communicates lessons learned from recent inspections in a monthly newsletter to contractors. SCE is considering ways it can leverage its pre- and post-upgrade inspection visits to help train contractors individually. One proposed method is to ask contractors to ride along with the inspection teams and learn from their inspection process. While this may be a good training method, program staff thinks this may lead to some potential contractor dissatisfaction with the

program and become a barrier to participation, if contractors feel they are being scrutinized, particularly in the company of their customers.

The program staff also mentioned that their training for contractors has improved the quality of the contractors' work.

The other thing that has gone really well is the contractors that are in the program. Their quality of work has always been good, but now I think they are taking it to a completely higher level because they are actually doing everything that makes sense for the program as well as for the contract. And we are validating that as part of QA/QC.

– SCE Program Implementation Staff

5.4.2.5. Application Processing

Interviews with SCE program managers explored some of the program changes made since its inception. The current program originated from a pilot program, implemented by CBPCA, that was available to the public starting in December 2010. The pilot program became a full program in June 2011. At that time, SCE switched replaced CBPCA with ICFI as implementation contractors.

SCE experienced challenges internally, in how they manage the program, and externally in the marketplace. Internal management of the program has been challenging because this is a new program concept for SCE, and they had to develop many protocols and guidelines during implementation to best adapt to internal quality-control demands, and to how contractors interface with the program. SCE expressed that this is the first time they implemented a residential program of this kind—in which a program provides incentives for the whole house and not just one measure. SCE had only a few other programs to serve as models to learn from or build upon. In the beginning, the program did not have well-established guidelines, which led to issues such as construction starting on a job before the program approved a reservation request. Contractors also requested many exceptions to the program guidelines causing delays in the application process.

Since its inception, the program has been continually improving its application process for contractors. In the beginning of June 2011, the program began with a paper-based application. After a few months, the program switched to an Excel-based spreadsheet application, also known as the Job Reporting Template (JRT). Program staff noted that this change reduced delays in processing applications. The program is continuing to streamline the application process for contractors. SCE is developing a new electronic application system that will allow contractors to enter job information electronically directly into a database. We expect this new system to roll out in Q1 of 2012.

Processing applications has been an ongoing challenge for the program. Program staff noted that a small percentage of applications (less than 10%) are complete and acceptable on the first submittal. Several factors contribute to this challenge, including contractor training and the application submittal process itself. And when applications are incomplete, resolution is time consuming because of the multiple parties involved in the job, i.e., SCE staff, ICFI, RHA, the contractor, and the customer.

SCE also has the unique challenge of having a reservation-request step in their application process. This step is necessary because this program is a joint program with SoCalGas and the reservation-request step reserves funds from SoCalGas.

SCE mentioned that there are many ways for contractors to “cheat the system,” e.g., by not installing what they say they installed, or entering inaccurate data in EnergyPro to get the largest rebate possible. Therefore, SCE needs stringent quality control to protect customers and the program. However, these quality control processes led to some contractor dissatisfaction because they delayed processing applications and rebates.

The inspection process may also affect application-processing time. Because the program is new, SCE mandated a pre- and post-upgrade inspection of the first 10 jobs for each contractor (after which the contractor is put into a sampling tier based on performance). According to program staff, the current processing time for QA/QC on a job is 20 business days. SCE hopes to reduce this to 10 business days. The program is currently trying to streamline the QC process and reduce both the percentage of jobs that they QC and the protocols for what the QC team should do when they find discrepancies. The program is working to reduce the percentage of jobs that receive a pre- and post-upgrade inspection, which will greatly reduce application and rebate-processing time. For very active contractors, the program may reduce the inspections to 10% or less if they have proven their ability to abide by program guidelines in previous jobs.

The friction points are that whenever a project goes through QC, the QC vendor will inevitably find something. And whether or not it is a significant something, it's one modification of the program we are trying to resolve. So we are trying to come up with acceptable tolerances for values. So, for example, if the contractor says the house is 1200 square feet and the QC'er goes out and measures it and says it's really 1250, currently in the program there is no tolerance to say, "Well if you are within 10% of the contractor's number then you take the contractor's." So at this point, the QC'er either sends back to the contractor a request for information saying the data you provided is inaccurate and please provide new data. Or they take the QC number, which impacts the energy savings that the contractor calculated. And if it impacts it too much then the contractor will appeal it. So we are trying to get these tolerances so that we reduce the amount of back-and-forth questions being asked by QC [that] require contractors to answer them. Because you can imagine these smaller contractors that are selling and doing all that. It's basically one or two people so it's very difficult for them to reply to these RFIs. So if they get a lot of RFIs, and they are actually out there doing work, it can be a long time to get approval. So if this contractor has proven himself and gone through 10-20 jobs and gotten high marks, knows what he's doing... to reduce the QC rate would reduce the burden on him.

– SCE Program Staff

SCE program staff mentioned that the program was loosely defined in the beginning and that SCE had to create many protocols and guidelines from scratch. This led to a rocky start. However, SCE and SoCalGas worked together to create the necessary foundational elements to run the program, i.e., internal process flow charts, guidelines, training materials (such as a step-by-step guidebook for EnergyPro), handbooks and manuals, QA/QC processes, and a contractor-mentoring program. The program staff has been able to shorten application-processing times. For example, in June 2011, program staff streamlined the internal process for reviewing applications by reducing unnecessary quality-control checks in energy modeling

during the reservation request to “permission to build” stage. This reduced the duration of this step from 30 days to 5 days.

What we all pointed out after a while was what’s important in the reservation step is just to document the baseline condition of the house. Whether or not the energy model is right or wrong doesn’t matter so much, because it really matters in the end. So once we convinced program management of that, they said, “Alright. We can give contractors approval to go ahead once we’ve documented baseline conditions on the house.” And we can do that within five days. So that was the five-day process. Basically it took out the modeling at the front end, which was taking a lot of time.

– SCE Program implementation Staff

Also, staff mentioned that the JRT that replaced the initial paper application process has greatly improved contractor relations.

[The] jobs reporting template went from paper-based to the Excel spreadsheet. So I haven’t received any complaints from the contractors regarding the process. They’re happy. They’ve seen a drastic improvement, from the beginning until now, for some of those contractors that have participated from the inception of the program.

– SCE Program Staff

5.4.2.6. Program Design

SCE program staff considers the program design itself to be a great success in the marketplace. Looking at the house as a whole system is an innovative concept to bring to market. Also, SCE’s partnership with SoCalGas allows them to present a comprehensive and complete picture to the customer.

It’s really interesting that they partnered up, or really good that they partnered up with the gas company so they can walk in and go, “This is a one-stop shop. Here are all of these things you can do. We are going to model it, and if it works, we are going to give you money to reduce your bills and help us reduce our load.” It’s really innovative. I have seen one similar program to this, and that would be the Savings By Design program on the commercial side, and that program is limited because it’s only improvements above Title 24, and it’s for new construction or a major retrofit, which is also improvements above Title 24. The coolest thing about this program is, if you walk into a house and it was built in 1965 and the house is lath and plaster with no insulation and it needs a lot of TLC to bring it up to current standards, this program has the complete ability to take advantage of the existing condition and really optimize it to give the homeowner the best bang for their buck. The approach is...I wish they had it in the commercial world.

– SCE implementation Staff

Basic versus Advanced Upgrade Package

Participation in the program so far has mainly been through the Advanced Upgrade option, not the Basic Upgrade option. SCE believes this is because the program relied heavily on contractors to market and sell the program, and they prefer the Advanced Upgrade option to the Basic Upgrade option. Many participating contractors are “home performance” contractors and the Advanced Upgrade aligns better with their business model.

A lot of the contractors that are participating in our program are home-performance contractors. So they like the Advanced package better and I'm assuming that's what they're pushing most of the time to their customers because they can really help their customers save money and become more energy efficient and address all of the comfort issues that the customer has, whereas there are only a handful of Basic contractors. We saw it picked up the last couple of months, but it's not nearly as much as where the big event Advanced projects are.

– SCE Program Staff

SCE staff also made some creative suggestions for how to improve the Basic Upgrade path. One staff member suggested that instead of offering customers the option of doing 5 measures, the program could give customers the choice of up to 15 measures and allow them to pick a minimum of 2 core measures and 3 others. This would allow the Basic Upgrade path to progress as a fixed measure path, which would give the contractor and homeowner more flexibility. This may also streamline internal application processing because there is no modeling with the Basic Upgrade path.

So instead of doing 5, because the 5 Basic measures are based on DEER values, why don't we give them 15 measures and say, "Here's 2 core measures, you have to pick 2 others and by the way if you pick 2 others, we'll incentivize you not just \$1000 but the sixth, seventh, and eighth measures are worth \$100 each." So now you are at \$1300 and we allow the Basic path to progress as a fixed-measure path with clear definable measures based on pre and post testing; they test in and test out. But give them the flexibility so that they can go, "Wow I only want to do this very limited upgrade scope and it meets these criteria," and give them more options—VFDs on pool pumps, improved ceiling fans maybe (I don't know if that is a measure anymore), swamp coolers (I know that was a measure in the past). there's just a lot of things they could do to add into the Basic path as fixed measures that have already been validated under work papers with the utilities and it wouldn't be a big step to go, "Ok here's the 10 things they are going to do and we are going to check all 10 of them and they need to do these minimum to make the 10%." I think if we did that and made it more flexible to the contractor and the homeowner, it would streamline the process because there is no modeling in the Basic path and it would encourage people to look a little bit differently at the Basic path.

– SCE Program Staff

5.4.3. PG&E Staff Interviews

5.4.3.1. Marketing

PG&E staff indicated that their marketing budget for the program was minimal partly because they expected local entities to help market the program. PG&E has made several efforts to market the program to both customers and contractors. For customers and contractors, it has:

- Provided three fact sheets: one gives a program overview, one describes the Basic Upgrade package, and one describes the Advanced Upgrade package. PG&E representatives gave these fact sheets to contractors to help them promote the program, and also handed them out at events and made them available on their website to help local entities market the program.

- Conducted several events in five PG&E counties known to have high energy use. Efforts included setting up a table at community events such as farmer’s markets to try to funnel customers into workshops where they could learn more about the program and meet contractors.

PG&E staff believe that homeowner workshops attended by community leaders or local government officials have been the most effective marketing channel so far. PG&E staff thinks this channel is successful partly because it boosts trust in the program. We also asked PG&E staff for its perspective on the most effective marketing message, but most staff members thought it was too early to tell. However, some staff thought that the incentive amount was likely the most compelling message for customers.

One challenge with ARRA-funded marketing is that ARRA funding ran out in March 2012. The local entity messaging emphasized that customers should take advantage of the (additional ARRA) funding before it went away.

There is a lot more ARRA-funded marketing out in the field. And so there is, at least in the greater bay area, certainly more awareness of the program. But it’s a very complex program—challenging for our customers to understand, in some cases for contractors to deliver. And so I think we are still in the early stages of figuring out how what works for customers, as well as planning for the fact that our dollars will be expiring, for the most part, in March, and looking at how that might change both the volume and geographies and demographics of who participates.

– PG&E Program Staff

The messaging may have implied that the *program* was going away in March, which could have hurt the program by misinforming the market. PG&E staff expressed concern that local entities have created a lot of program interest, and PG&E is determining how it will maintain program interest now that the ARRA funding has run. PG&E thinks it will likely need a larger marketing budget to maintain or increase customer interest.

It has also been challenging to accurately estimate the incentive amount that customers can expect from the program. This is largely due to variability in contractors’ pricing models and variability in the mix of measures adopted. Contractors only submit the total invoice/cost to the customer, not an itemized invoice by measure, making it difficult for the program to communicate expectations to the market. Additionally, the program design is such that the anticipated energy savings from both the measures and how they interact with one another determine the customer incentive, making it difficult to give customers an accurate estimate until the program has vetted all information.

PG&E staff believes that all of the program marketing in the state has been successful in increasing whole-house awareness and behaviors among residents. Staff also believes the marketing has helped build recognition of the EUC brand statewide. Staff cited this brand-recognition building as a great program success.

Program staff believes the program needs much more marketing and outreach to help create demand, especially now that ARRA funding has run out. PG&E staff hopes it will be able to

execute its plan for home-makeover contests to help create program interest. This channel will also provide a forum in which the program can fully explain the program to customers.

This whole-house thing is tough to explain. It's complicated and we're not going to simplify it, and we shouldn't simplify it because it does cost a lot of money to do. So by doing a demonstration project of a typical house with typical people in it with typical energy problems, and then going ahead and doing a \$10K to \$15K makeover, we are going to demonstrate 40% or more energy savings to show what that looks like. And we're going to use participating contractors to do the work, and we are going to reach out to our manufacturers and distributors to donate the product. And that puts a face on it and that's what we've done in LA County where we had five winning homes across the county. That's what we propose to do here, and we found that it engages both traditional and social media because they all like contests. We think that's the best thing we've got going to engage the media for earned publicity. Forget paid advertising. We are talking about earned media that will make it compelling and give us some really great case studies that put a face on the program and showcase the contractors that are doing it right and teaching homeowners how to buy and contractors how to sell.

– PG&E Program Implementation Contractor

PG&E currently has plans for additional marketing efforts, including:

- Potential home-makeover contests
- More print materials (postcards)
- Email-based marketing

Program staff also suggested that additional marketing efforts might help drive demand, including training real estate agents to sell the program.

5.4.3.2. Customer Participation

Customer participation in the program has been lower than expected. PG&E program staff offered a number of possible participation barriers, including:

- The cost of participation. Whole-house retrofits average \$12–\$15,000 before incentives. This limits participation to upper-income customers, which is particularly challenging in a down economy. Currently, there is no single well-known or well-trusted financing resource for customers.
- A misinformed market. Some customers were under the impression that the audit and/or the retrofits were free, based on the marketing they received; PG&E has tried to dispel these impressions by giving talking points to contractors and adding a job-cost range on the EUC website.
- Customers may not be getting the savings the analysis predicted due to the rebound effect.

A classic example is a really inefficient furnace that's not delivering heat. It's so inefficient that you don't use it. Then when you weatherize the home and bring the furnace up to snuff, you start using your furnace. So you are more comfortable, you are using your energy more efficiently, but your bill may go up depending on how you use that.

– PG&E Program Staff

- Energy upgrades are not visible. Customers with money for home improvements may opt for upgrades that are more visible, such as granite countertops or a new flat-screen TV.

While the program has some participation barriers to address, PG&E staff mentioned that they have heard positive feedback from participants who are pleased with the energy savings, increased home comfort, and the incentives. Also, participant dropout rates have been very low.

We have received a number of anecdotal experiences where customers are thrilled with large rebate amounts, easy for them to participate, their house feels more comfortable, just really ecstatic that this place where they live, which is so important to them, has become a more happy, warm, comfortable place to be, to live.

– PG&E Program Staff

In addition to increased and targeted marketing efforts to address customer participation barriers (see above), PG&E staff also mentioned that the program should consider widening eligibility to multifamily properties to help increase participation. PG&E staff mentioned that the program would have to carefully craft this option to account for combustion safety.

5.4.3.3. Contractor Participation

The number of contractors that have signed up to participate in the program is higher than expected. PG&E had a goal of signing up 73 contractors to participate and currently has 140 contractors. However, PG&E has noticed that, of the 140 contractors, only about 40 have submitted a job to the program, and only 20 have submitted multiple jobs.

PG&E mentioned several barriers to contractor participation, including:

- PG&E contractors were confused about when the program might end because they had been working with SMUD and Ecology Action whose programs ended in March 2012. Program implementers need to counteract the message that the program is ending. This is especially important because some contractors who are just getting into the business may be hesitant to commit to the whole-house approach if they perceive that the program is ending soon.
- Many program staff agreed that this program is challenging for contractors who do not already have sales and administrative capacity in place. This program may be more conducive to large contractors with dedicated sales and administrative staff.

The contractors that are successful are contractors that are like [XYZ Construction]. That was a multimillion-dollar new-construction company in business for many years and knows how to run a big business with multiple field crews and has tight administrative processes before they even started the home-performance stuff.

– PG&E Implementation Contractor

Many staff agreed that a better approach to sustained program growth would be to support the larger participating contractors as much as possible and focus on growing their business instead of focusing on getting more contractors into the program.

We're interested in bringing in some more contractors, but from the perspective of hitting our volume targets, we don't need hundreds and hundreds of contractors. What we need is a smaller number of contractors who know how to run a business and who know how to operate at a large scale. And what we have is a whole bunch of contractors who are enrolled who are mom-and-pop operations, and I call them home-performance enthusiasts. They are interested in home performance, they like the stuff, they are committed to it for all the right reasons but they are not sophisticated in administrating complex systems and dealing with paperwork and running multiple crews and doing that level of coordination and that level of management and that sophisticated level of sales and that consistent quality, process control that you need in order to do scale. And it's not to be disparaging about their technical skills, but those kind of contractors, they are not going to get us to 15,000 jobs.

– PG&E Program Implementation Staff

In addition, the program is focusing on recruiting larger contractors that have yet to sign up with the program. The program has been reaching out to manufacturers and distributors (such as Global HVAC and Goodman-Amana) to educate, inform, and draw contractors into the program.

There are thousands of contractors that are effectively selling home improvement every day. Now they might be single-source contractors, an HVAC contractor, or an insulation contractor, that really doesn't currently have anything to do with home performance. But they have the systems and the infrastructure and the sales staff where they are selling a lot of stuff and doing a lot of work, and they are highly successful companies. What we're trying to do is reach out to manufacturers, distributors, to our other contractor partners, and pull in the best home improvement contractors in the industry that already know how to sell, that already have the internal infrastructure and are capitalized so they can be....they are already successful businesses. Because we know that if we can get them engaged in home performance, they are going to rise to the top very quickly.

– PG&E Program Implementation Staff

PG&E staff also recommended the following to help increase contractor participation:

- PG&E would like to let participants take the scope of work that results from an initial audit and shop around to other contractors. This could reduce costs for the participant and create price competition among contractors. However, contractors see an audit as a valuable lead, and giving one contractor's audit information to another could anger them.
- Several contractors are doing well and willing to teach other contractors how to do similarly well. Monthly webinars that feature a successful contractor might be an effective way to motivate other contractors to participate fully in the program.
- The program could support and encourage contractors by awarding them funding based on the number of jobs they complete through the program. This idea comes from the NYSEKDA model and contractors could use the funding for co-op marketing, diagnostic equipment, training, etc.
- Program staff heard that many of the high-volume contractors are using some sort of financing to help them float rebates for customers until PG&E can process a check. For example, some were obtaining funding through the California Home Buyers Fund. However, this financing ended in March 2012. In the absence of such funding, implementation staff

would like PG&E to let them continue contractor financing using some reallocated incentive funds that might otherwise go unused.

- Focus on efforts that help the top contractors grow their customer base. These contractors can then serve as models for new, smaller contractors so that smaller contractors become interested in doing more through the program.
- Provide best-practices information to contractors.

5.4.3.4. Contractor Training

PG&E program staff has dedicated much time to contractor training and support, which start with initial program-orientation trainings. PG&E staff mentioned the following efforts:

- The program conducts a monthly webinar to keep contractors abreast of program changes. These usually feature a contractor who talks about their experience in sales training and workforce development that help them successfully sell the program. These webinars help motivate other contractors to do more through the program. One webinar focused completely on how to submit good, accurate job reports to help contractors reduce errors, thereby reducing application-processing time.
- The PG&E program team provides fact sheets and email blasts to contractors that focus on where the program sees the most errors in job reports. The team has also been conducting site visits to talk contractors through problems they have had in the field as well as problems they may be having in sales and marketing. The program team finds that site visits are the most effective way to train contractors on any issues they are having in the field.
- The program team offers a dedicated contractor support line for ongoing questions.
- The program team provides mentoring (up to five free sessions) as part of its field verification and quality assurance procedures.
- The program team offers contractors ongoing marketing and sales support, but only some contractors have been interested. For example, the program-implementation team accompanied a contractor to presentations made to realtor associations.
- The program team offers more support and training to contractors who are performing well to help them scale up their activity.
- The program team measures the success of program-orientation training using attendance numbers and questionnaires. Contractors can provide feedback at webinars and can call a dedicated phone number for program feedback.

As the program matures past the start-up phase, the PG&E program team continuously assesses its contractor training and searches for improvements. To help contractors submit accurate applications, the program now gives contractors job templates that show the required information for the application. In addition, the program team focuses on its top-performing contractors, known as the program’s “key accounts.” The program team visits sites with these contractors and educates them on issues they have had with job submission, ethics, and effective business practices. They also learn how the contractor anticipates participating in the

program in the next six months or so and figures out other ways to support them. In addition, they made sure these contractors knew that the program would not end in March 2012 with the end of ARRA funding.

Based on contractor feedback, the program’s orientation training now focuses on the rationale for the program (i.e., building science and energy efficiency) to help filter out contractors who may not be interested in participating in such a rigorous program.

From the program staff’s perspective, contractor orientation and training activities have been successful and staff has seen the need for training decrease. Program staff thinks that webinars have resolved much of the program confusion.

In the near future, the program team plans to continue mentoring key accounts and will continue to focus on quality-assurance training to ensure the quality of installations through the program. Finally, the program team identified combustion safety as the most common reason for application and inspection failures. Therefore, the program team is looking at two protocols to support best practices around combustion safety. One is BPI and the other is NGAT (Natural Gas Appliance Test).

5.4.3.5. Application Processing

PG&E’s pilot program launched in August 2010 and became a full program in June 2011. CBPCA implemented the pilot program, but implementation switched to BIG when it became a full program.¹⁶ The transition from pilot to full program took time from one implementer to another, each with different job-tracking systems. CBPCA transferred any “jobs in progress” to BIG to complete. This was challenging for BIG because they did not have previous knowledge of whether and how the program approved the jobs. This delayed some contractors in completing their jobs due to changing protocols, which frustrated some contractors.

We have too many exceptional cases where there is some quirk about what the pilot did versus what we are doing. That means that we can’t treat it through our normal protocols. We have to manually handle it and go through the exception case and find a workaround or give them a waiver on our review procedures because they previously had a commitment for something else.

– PG&E Program Staff

We have pilot jobs that we call legacy jobs in our system. The data requirements in particular around combustion compliance safety are not the same between the full rollout of the program and the pilot program. So we are importing hundreds and hundreds of jobs from the pilot into our system and having to go through reviewing those jobs in a process procedure that is more flexible with the rules than the full program has caused problems. In particular, with the amount of data and the kind of data that was submitted previously to CBPCA, which we then imported to

¹⁶ However, CBPCA still deals with PG&E customers because it still handles quality control in SMUD territory. Therefore, contractors interact with both CBPCA and BIG when a customer has SMUD for electricity and PG&E for gas.

our system. So there is [a need to go] through some of those data submissions and sort those things out, make those things work within the system.

– PG&E Program Staff

As the program progressed from a pilot to a full program, protocols and guidelines also progressed. For example, the program developed specifications for qualifying equipment more fully. The program also streamlined the program-application process. Previously, contractors entered application information into Excel spreadsheets. But now the program has an electronic system, known as the Green Energy Compass, which allows contractors to submit applications online and transfers the data into a database automatically.

PG&E staff agrees that processing applications is a big challenge for the program. It takes much longer than the program and market would like. It can take up to three months from the time a contractor submits a job for approval to receiving a rebate check. PG&E staff notes that they often must return an application to the contractor for updated information up to three times before they can accept it. Incomplete applications are often the most common reason that processing an application takes longer than expected. Contractors often have difficulty with the detail required to accurately submit combustion-safety data and the EnergyPro model data to the program. Contractors often learn combustion-safety requirements for the first time as part of this program.

[We've had] a lot of combustion safety fails. Contractors not finding gas leaks and walking away from jobs with[out] addressing ventilation air combustion appliances.

– PGE Program Staff

Additionally, contractors often failed inspections early in the program because water heaters did not pass program inspections. This stemmed from contractors identifying problems with old water heaters during assessments but customers did not want to replace them. The program realized that the contractors did not know what was expected or required of them, and the program needed to do more training. It typically takes program staff only a few days to review and process information once it is complete.

I think [what] we didn't realize when we started was how much hand-holding and individual interaction these contractors were going to need for the job-application-submission process.

– PG&E Program Staff

Customers have complained about the time it takes to get an incentive check. Issuing a check requires input from the contractor, the implementer, and PG&E. In some cases, it took six months.

Delays in delivering incentives are due, in part, to a combustion-appliance-safety inspection that is required for every participant. PG&E is working to finalize safety protocols to allow them to inspect a sampling instead of each site.

There is an inspection time frame that is still required, at this stage, which can lengthen the time to receive the checks. So once we have our finalized safety protocols that contractors will be implementing, we can reduce that inspection by PG&E to a sampling percentage as opposed to 100% so that will help. And I would say the early part of next year the contractors will start

implementing that. And it's at that point that we won't require that our own folks are inspecting every job.

– PG&E Program Staff

Program staff recommended a few improvements to help reduce application-processing time:

- Currently, one implementation contractor is responsible for enrolling and approving contractors through an online form that contractors fill in. The approval process includes a background check, insurance and licensing information, seven-year felony background check, and BPI qualifications including passing Combustion Appliance Safety tests. To help enroll contractors more quickly, program staff should ask BPI for a list of certified analysts so they know that information about the contractors before the contractor tries to enroll in the program. This may help reduce delays caused by contractors entering information incorrectly.
- The program should develop a link between the program implementer's data system and PG&E's VRS system used for producing the rebate checks. Currently, the implementer has to manually pull the records that are ready for check printing, send them to the VRS, and then track them manually.
- Program implementation staff confirms that the contractor performed the combustion-safety check in the home by calling and checking with customers. Sometimes participants do not recall the safety check. Implementation staff suggests that customers sign a form when the contractor performs the safety check, which the staff can reference when they call to confirm.
- The program should consider accessing customer smart-meter data to help inform the existing or test-in conditions of the home. This would require that customers allow the program to use their data.

Additionally, during the interview process, BIG was developing an internal protocol process to work through the contractor and customer calls they get on their customer-service line. They were also training the sales force to track all the customer inquiries to link homeowner inquiries to contractors, as well as to track contractor concerns.

5.4.3.6. Program Design

Basic versus Advanced Package

Most program participation has been through the Advanced Upgrade package. The program has seen little interest or participation in the Basic Upgrade package. Although a small portion of the program jobs go through the Basic Upgrade track, the program has spent a disproportionate amount of resources supporting the Basic Upgrade package administratively.

[Basic Upgrades] happen so rarely, but we have to set up the administrative system to handle it, and we have to set up the training protocol to handle it, and we have to explain it to contractors as this hypothetical pathway that they could take. And we have to explain to homeowners this hypothetical package that they could want. Like everything is just complicated twofold and it makes the program unnecessarily complex.

– PG&E Program Staff

PG&E program staff offered several explanations for the low participation numbers in the Basic Upgrade package, including:

- The housing stock in PG&E territory may not be conducive to the Basic Upgrade package’s three required measures (air sealing, attic insulation, and duct sealing) because many homes do not have attics.
- The energy model assumptions used to design the Basic Upgrade package produce energy savings that might not be cost-effective for the customer.
- Contractors may find it challenging to attend the three-day training at the Energy Training Center in Stockton (ETC) required to become Basic Upgrade contractors. However, program staff thinks the location is necessary because the training requires hands-on understanding of building science and the ETC has a demonstration house for such training.
- More rebate money is available for Advanced Upgrade jobs than for Basic Upgrade jobs, and the Advanced Upgrade options are more customizable.

There are more rebate dollars involved. You can do a more customized approach to your home. And while the plug-and-play Basic path conceptually makes sense for onboarding a customer, when it comes down to actually making a decision about your home, you want to be making the decisions, not being told what to do, and you likely also like the idea of as much as \$4000 or more if your local government is providing rebates. [The Advanced package] makes a clearer and more exciting sell.

– PG&E Program Staff

- Most participating contractors qualify as Advanced Upgrade contractors, so they are more likely to promote the more lucrative Advanced Upgrade to customers.
- Some of the Basic Upgrade measures, such as thermostats or showerheads, may not be attractive to customers, and they do not really “fit” with other measures (such as insulation and air sealing) that are more aligned with the “house as a system” message.

EnergyPro Modeling Software

Program staff was concerned that the EnergyPro model may not account for a home’s entire energy consumption. For example, the EnergyPro software does not account for some plug load (e.g., televisions) and “vampire load.”¹⁷ The amount of savings depends only on the information

¹⁷ “Vampire load” refers to the electricity that is consumed by appliances when not being used for their primary purpose. The appliances may use power in a standby mode to receive remote transmissions, display clocks, or indicate that they are connected to a power source.

entered into the model, which typically only includes the HVAC usage and building-envelope characteristics. Therefore, when the program says that it might save a consumer 20% on energy bills, it is only 20% of the estimated energy usage entered into the model, which excludes electronic and vampire plug load. Some staff suggested that a better alternative for estimating energy savings would be a pre/post analysis instead of model-based estimates.

Program staff mentioned that EnergyPro software is the only approved CEC software for the program. However, it may not be the best for the program since it is not a helpful sales tool for communicating with customers. Contractors have had difficulty using it to explain multiple scenarios or options to customers.

Program staff is hoping that the program will allow other modeling software tools, such as RECURVE, which has a better customer interface for sales purposes.

5.4.4. Key Takeaways

- This program was in a “start-up” phase throughout 2011. This is the first program in which IOUs implemented incentives for the whole house and not just one measure. It went to market quickly with ARRA funding at a time when the program’s administrative processes were still being developed, so early problems in the application and QA/QC processes were to be expected. The IOUs are aware of the issues and are working toward solutions by establishing guidelines and improving the application forms and submittal process and QA/QC protocols. The WH/EUC program design should stay flexible to adapt to lessons learned.
- Participation has not been as high as expected in the first year. Program staff believes the economic downturn, lack of financing options, program complexity, assessment cost, and a poorly designed website have impeded participation.
- Program staff has had difficulty explaining this program in short-media channels and therefore has relied on the website and in-person workshops to help educate the market. Therefore, the EUC website is a key educational and marketing tool for the program, but the IOUs do not control its content and cannot access data for customers that visit the website.
- The IOUs had limited marketing budget and have relied mainly on local entities and ARRA funding to create program awareness.
- Staff mentioned that the communication and collaboration between IOUs is a great strength of the program and should continue.
- Contractor training and mentoring remains a challenge, but program staff is committed to assessing their efforts along the way and making adjustments.
- The IOUs are learning to effectively engage the local entities and to smooth the operational and coordination issues. However, they agree that relationships with local entities are important and will be a key component to program success.
- The use of EnergyPro Software to estimate energy savings remains a key concern.
- The Basic Upgrade option is not gaining traction and should be modified or dropped.

5.5. Local Entity Interviews

The roles of the local entities (LEs) in the program, the length of their involvement, and their knowledge of the program, market, and contractors varied greatly. Therefore, the topics covered in the interviews were unique to each LE. This section summarizes the main findings of these interviews. We maintain confidentiality for any findings that express opinions, though we do identify specific LEs if necessary to explain a factual finding. Table 17 lists the entities interviewed.

Table 17: Organizations that Participated in Local Entity Interviews

IOU	Local Entity	Quick Facts
PG&E	City of Berkeley	11 contractors; implementing several programs under EUC brand; 51 audits and 37 retrofits; 3 workshops; \$300 rebate for audit: Goal of 120 PG&E rebates
	Association of Bay Area Government	Comprised of 8 counties; \$300 rebate for audit; \$2,000 in additional incentives; Goal of 15,000 SF homes by end of ARRA had 299 by Oct 2011
	San Francisco Department of Energy	\$7,000 in additional incentives; 31 homes completed/paid, 50 in pipeline, local newspapers, mailings, presentations, door hangers, website, real-estate agent coupons; hardware store partnerships, new homeowner letter
	Contra Costa	Covering % of project cost capped at \$5000, \$300 for audits; goals were for spending; workshops;
	San Mateo	\$10,000 in addition incentives; Only 2 contractors in county; Marketing role; workshops; postcards; email; newspaper stories; door hangers; banner ads; Google search ads; Pandora ads; movie theater ads; Goal of 1000 retrofits have 180
	Fresno City	Free audits; 800 audits and 40 retrofits; radio, TV, print focused on free audits;
	Ecology Action	Marketing for 5 counties in PG&E and statewide; 3rd party resource for customers and contractors; 35 workshops; 180 awareness events
SCE	City of San Bernardino	\$6,500 in additional incentives; just beginning program, no audits or retrofits yet; bill inserts, city council meetings
	LA County	\$4,000 in additional rebates; \$400 coupons; subsidized contractors for audits; subsidized contractor training; financing; High marketing volume
	Santa Barbara County	Financing only; applications coming but no services yet; partnerships with realtors, local chambers, workforce investment boards, contractor associations, homeowner associations, & non-profits; website, mailers, rack cards, brochures, newspaper ads, email blasts; 10 available contractors in County
Both	CPUC-ED	General input into program

5.5.1. Program Successes

LEs were generally very satisfied with their relationship with the IOUs. LEs noted a number of successes in supporting the Whole-House Program in 2011:

- The program has prompted cooperation among many entities throughout the state to promote energy efficiency.

I've worked government grant work for a long time and usually you don't get this many groups in the sandbox and not have major disagreements. And we've all worked very well together and that is just unprecedented, that we've had this many agencies working together and doing so in an efficient many to serve the homeowners and to promote EE.

– Local Entity

- Communication and coordination with the IOUs has gone well and improved significantly throughout 2011.
- The program has provided significant funding and support to help residents and the state save energy
- The program's efforts have helped workforce development in the state through training and QA/QC.
- The program has helped raise awareness of the whole-house approach (as opposed to one-off measures) in the residential and contracting markets.
- Much of the feedback from residents has been very positive. The program has catalyzed people who have been thinking about doing this kind of work to their home.
- The program has helped contractors get and retain jobs.

We've seen a lot of the HVAC companies expand and give in to the WH approach instead of just concentrating on switching our HVAC systems. And that's been good for their business because it opens up a whole new avenue and makes the scope of their work, their projects a little bigger than just switching out the HVAC system.

– Local Entity

- Some LEs have been working with realtors to market the program. Realtors are using the Whole-House Program as a reason to contact potential customers, and to offer added value. They are selling the program as a way for customers to increase or safeguard the value of their homes, and to increase comfort.
- ARRA funding and the Whole-House Program in general have prompted some local governments to start an energy-focused program or department within their jurisdictions.
- PG&E has assigned a "local community energy manager" to some LEs. This was cited as a key area of success for helping LEs to best communicate and coordinate with the IOU regarding the program.
- The home-energy assessment has helped reduce some of the confusion around the Whole-House Program and has helped people understand the benefits of a home retrofit, and how the program works.

5.5.2. Marketing

Many LEs have helped market the program. LEs mentioned that the whole-house concept is new to the market so they spent considerable time trying to build awareness of concept. LEs felt that awareness must be significantly increased before program participation can significantly increase.

- LEs have found that in-person events and seminars are an effective way for implementers and contractors to present the program in necessary detail. LEs also mentioned that marketing by contractors effectively creates interest in the program.
- Messages related to comfort and conservation are often more effective than those related to cost savings when residents do not have high energy bills.

Somebody who has only got a \$150 a month bill and you are going to save them 33% of that at the cost of 10,000-\$15,000 that is not something that pencils. So if you push the money as the reason for doing it in this climate zone then you may not get very far. It maybe that we need to be pushing indoor air quality and health, comfort, those things over the money savings.

– Local Entity

- The exception is Fresno, where energy bills are high and the available capital is low. In this market, financing is much more attractive than rebates. Fresno is trying to get a financing program started.
- Some LEs think realtors are a good resource for the program as they come into contact with likely prospects while they are thinking of property values and changes to the property.
- Some LEs leveraged GIS and IOU data to identify neighborhoods and homes that are likely to have high energy bills, and used targeted mailings, which received a very good response. PG&E provided “heat maps” of energy usage in some communities to identify areas that had the greatest opportunity for savings.

5.5.3. Barriers

5.5.3.1. General Barriers

LEs experienced several program challenges:

- The program fell short of its participation goals in 2011. All of the LEs underestimated the time and expense needed to complete a job. All LEs whose programs were up and running for any significant time found that job approval from the IOUs takes longer than expected, and that the ability of the contractors to absorb and process work is not sufficient to ensure the expected throughput. Also, the participation goals for these programs were initially formulated with PACE¹⁸ in mind, but PACE did not go through due to issues with Freddie Mac and Fannie Mae.
- The EUC website can be confusing. LA County has gotten feedback from participants saying that the EUC website does not effectively guide novice users towards relevant information.

¹⁸ PACE (Property Assessed Clean Energy) is a financing structure in which loans for energy retrofits are repaid with property taxes while lowering energy costs, resulting in net gains. The Federal Housing Financing Agency has issued guidance that has largely halted residential PACE programs, because PACE loans can result in involuntary subordination of mortgage; in the event of default, property taxes must be repaid first, even if the property has been previously mortgaged (<http://www.fhfa.gov/webfiles/24017/PACE61512.pdf>).

Many other LEs said that a significant number of participants have been introduced to the program through the EUC website, so an effort to integrate the site with LE efforts could be worthwhile. LEs do recognize that the website is continuously improving.

- A qualifying home retrofit, even with rebates and financing, is often very expensive. LEs mentioned that retrofits can cost a customer \$6,000–\$14,000 or more. At this price, some residents think the rate of return is not high enough to participate, especially in temperate climates where the rate of return on energy savings is very low. LEs mentioned that proposals to increase comfort, conserve energy, and increase property value must overcome financial barriers if this program is to attract more customers.
- LEs have received feedback that the Basic Upgrade package is too strict to be attractive to many residents and that contractors do not think it is lucrative enough to justify their time. For example, San Francisco has a city ordinance that has required attic insulation for the past 30 years, but houses that already have insulation are not eligible for the program. Residents often gravitate towards the higher rebate levels of the Advanced Upgrade service. Also, generalized contractors (who are more likely to do Basic Upgrades) are swamped with less complicated non-whole-house jobs. Contractors that can do so focus on Advanced Upgrades because they can make more money on larger jobs.

The Basic package was originally envisioned to be an on ramp to the program before contractors knew building science. Before we had enough BPI certified folks, before the utilities had really gotten their heads around what it was to do WH performance. And because of delays that were out of anyone's control, not with the Draft program necessarily but with the utility WH programs, we got to the place where that Basic on ramp was not required because all the trainings that had happened while the rebate structures were getting figured out. And so I see a lot of value in the Advanced path. I see much less value in the Basic path at this point and I think that % uptakes reflect a general agreement on that point.

–Local Entity

- The marketplace is uncertain about the future of the program now that ARRA funding is no longer available. This uncertainty makes contractors reluctant to train for the program, and challenges the LEs to make any future plans to continue to support the program.
- Some LEs mentioned that there are not enough contractors to handle the workload, so even though no LE is meeting its goals, the available participating contractors are fully booked.
- Delays caused by multiple layers of stakeholders and program requirements have frustrated contractors and participants. For any issue that arises, many stakeholders become involved (i.e., the customer, the contractor, the implementation contractor, and the IOU). Contractors are mainly in the field and find it difficult to respond quickly to program requests for paperwork clarification or additional information. Delays in processing IOU rebates can delay the LE's rebate and financing efforts that depend upon the IOU's rebate information.

The requirement for a contractor to wait for a notice to proceed from the utility is a huge program obstacle. I am not saying that there shouldn't be QA in the program but for a contractor on short term jobs when they are trying to juggle these things and are dealing with

homeowners who are either busy or fickle or both to have to try to schedule jobs like these while waiting for utility approval is a huge obstacle.

– Local Entity

...contractors are spending much more time because there is back and forth that goes on over the data and the quality of the data. They leave a phone number off one of the slots and they can just go back and forth on this stuff. Kind of that level of information is too steep to begin with. I mean they haven't done the retrofit yet. Wait until they have been there and done the retrofit and then pester them for all this extra information.

–Local Entity

- The cost of a home-energy assessment can inhibit program participation. However, it can also be an incentive to commit to a retrofit after a resident has made that initial investment, and to prevent false leads by warding off homeowners who might take advantage of a free audit with no intention of performing upgrades. Home-energy assessments can cost up to \$700. Some LEs offset that cost by offering a partial rebate of \$300 for assessments, which helped overcome the initial-cost barrier.
- Confidentiality requirements have caused communication problems between LEs and the IOUs regarding energy savings and issues found during the IOU QA/QC process. For example, PG&E contractors cannot share QA/QC information with LEs, leading some LEs to hire their own QA/QC vendors. LEs also cannot measure actual energy savings without data from the IOUs.
- The EnergyPro Modeling Software often does not model energy use correctly, and does not present information useful to participants. Some contractors must double-enter the information from the home-energy assessment into two modeling programs—one to satisfy program requirements, and another to double-check energy savings and create a more customer-friendly report.
- LEs have heard that EnergyPro undervalues attic insulation, overestimates the importance of wall insulation, and has no duct-size requirements. They have also heard that the limitations of EnergyPro makes it harder to sell measures to customers that are not necessarily aesthetically pleasing, but are important for comfort and/or energy efficiency.
- Multiple programs and rebates available in the marketplace, each with different timelines and deadlines, caused some market confusion. There is also confusion over the program's delivery channel between local governments, contractors, the IOU and many other stakeholders.
- The IOUs and the program in general do not offer a very good centralized customer-service telephone line for residents. They have heard that customers call the main number and are transferred quickly to third-party service providers.

5.5.3.2. PG&E-Specific Barriers

The LEs also discussed some program challenges that are specific to working with PG&E:

- The background checks required for all contractors and their staff affected relationships with contractors, and slowed jobs down. Other IOU programs do not have this check so contractors perceive it as an unnecessary burden.
- The transition from CBPCA to BIG caused delays and miscommunication in the marketplace in 2011.

5.5.3.3. SCE/SoCalGas-Specific Barriers

The LEs also discussed some program challenges that are specific to working with SCE/SoCalGas:

- A lack of clarity about who the decision makers were at the IOUs caused delays in early 2011. This has improved somewhat, and the relationship is starting to run more smoothly. LEs have also been challenged by working with two IOUs (SCE and SoCalGas), so decisions must be reviewed by both companies, which can delay progress.
- Delays in rebate processing significantly affect LE financing programs. LEs' ability to close out loans is contingent upon the IOU rebate process, which often frustrates contractors and customers waiting for their loans and payments to come through.

5.5.4. Program Implementation Differences

Some LEs are supporting the program by offering marketing support, increased incentives, and financing. Also, some LEs support the program by implementing the program slightly differently in their jurisdictions while leveraging the IOU incentives available. For example, at the time of these interviews, San Bernardino County was about to start a pilot program (described below) for their residents.

- San Bernardino hired one contractor to do all of the home-energy assessments, but precluded them from doing any retrofit or installation work. They believe this will help customers trust the assessment recommendations because they will not think the contractors are trying to sell customers unnecessary measures. Customers will receive one discounted price from contractors, instead of having to pay up front and then wait for a rebate. Also, the county is working on a way to provide a rapid and simple rebate payment for contractors. San Bernardino pays the contractor immediately, while the homeowner is required to transfer the IOU rebate to San Bernardino. Therefore the contractor only gets paid once and does not have to wait for rebate approval.
- Fresno City is also implementing the program using a different model. Through focus groups and past experience promoting a similar program, Fresno found that they would have more success if the City sponsored free home-energy audits, so that residents would trust the source. Fresno City has a toll-free number for residents to request an audit. Customers must sign a waiver to allow IOUs to upload home-energy data to a state-controlled database. The

customer is also required to contact PG&E to retrieve 12 months of energy-usage data. After the audit is scheduled and performed, the customer receives a customized report including a cost-benefit analysis based on actual usage data from that customer. The customer can then use a program-approved contractor to get a whole-house rebate.

5.5.5. Local Entity Recommendations

LEs suggested some recommendations for how the program might improve from their perspective:

- Allow the use of easier and more flexible modeling software that gives an asset rating for the house, similar to Home Energy Score and EPS.
- Try to communicate financing options for customers to increase program participation. LEs identified the California Home Buyers Fund as a great financing tool that helps contractors sell the program in Northern California.
- Allow independent auditors to support the program. Customers sometimes distrust contractors; they think contractors are trying to sell unnecessary upgrades. Independent auditors could lend credibility to upgrade recommendations. Some customers would prefer to get an energy assessment with recommendations and then find separate quotes for the work.
- Extend the program so that LEs can have more time to help the program succeed. Funding has ended just as customer awareness is building and LEs have improved logistics.
- Offer additional incentives. Many LEs say that the IOU incentives are not enough to make the up-front investment attractive, especially in areas that have low energy bills due to mild climate. In other areas, such as Fresno and San Bernardino, the average household income is low, so measures that require even a modest up-front investment are still a significant challenge to homeowners. In these areas, financing may be a better strategy to reduce up-front costs.
- In areas that are less economically developed, such as Fresno, LEs strongly believe that the audit needs to be free for customers to take the first step. Fresno currently offers free energy audits through an outside program, and believes that this approach has been very successful in their market.

5.5.6. CPUC-ED Perspective

The CPUC wanted a “flagship program” to get deeper savings. It assumed that the state could reach 130,000 homes (1% of homes), similar to a more established NYSERDA model, but discussions with utilities revealed that they had funding for only 42,000 homes. The CPUC added funds to utilities’ local whole-house programs, hoping both to reach more homes and that Basic Upgrades would be the main program effort. However, the CPUC realizes that the program is currently more of a custom program, which presents a challenge when trying to quantify energy savings.

The largest challenge from the CPUC perspective has been getting contracts set up with program implementers, which slowed the ramp-up of the program. The CPUC understands that they likely had an unrealistic expectation for how long it would take to ramp up this type of program. Another large challenge for the program in 2011 was the lack of clarity about ARRA funding. When the program was originally designed, stakeholders did not know when funding would be available.

From the CPUC perspective the largest needs for the program moving forward are to:

- Streamline the program so that things go smoothly and contractors can get referrals to grow their businesses.
- Have utilities pre-approve only a sample of jobs, rather than all jobs.
- Readdress the EnergyPro software.
- Identify and promote contractor success stories for the program.
- Create detailed procedures that make program processes and responsibilities of all involved parties completely clear.

5.5.7. Key Takeaways

- The program has prompted cooperation among many entities throughout the state to promote energy efficiency. Communication and coordination is going well.
- ARRA funding, and the Whole-House Program in general, have prompted some local governments to start an energy-focused program or department within their jurisdictions.
- Local entities have been helping to market the program in many ways. They have found the in-person workshops to be most effective.
- Local entities have found that the effective marketing message largely depends on the region. In Fresno, where energy bills are high and the available capital is low, financing is much more attractive than rebates. Whereas, in Berkeley the environmental message is quite attractive.
- Local entities and IOUs can work together, combining data and knowledge of residents that helps with targeted marketing efforts and improves marketing effectiveness. For example, some LEs leveraged GIS and IOU data to identify neighborhoods and homes that are likely to have high energy bills, and used targeted mailings, which they claim were well-received.
- The EUC website can be confusing for customers, although it is continuously improving.
- A qualifying home retrofit, even with rebates and financing, is often very expensive. Proposals to increase comfort, conserve energy, and increase property value must overcome financial barriers if this program is to attract more customers.
- The Basic Upgrade package is too strict to be attractive to many residents and contractors do not think it is lucrative enough to justify their time.
- The marketplace is uncertain about the future of the program without ARRA funding.

- LE's have played a variety of roles for the program including marketing support, holding workshops and events, contributing to contractor training, and adding incentives to IOU offering. Some LEs also support the program by implementing a different delivery model in their jurisdictions. For example, San Bernardino has implemented a “rater model,” , in which the initial interaction is through an auditor who assesses the house and provides recommendations. The work is then completed through pre-selected contractors. Customers will receive one discounted price from contractors, instead of having to pay up front and then wait for a rebate. Alternatively, Fresno has an existing free energy audit program. The customer can then use a program-approved contractor to get a whole-house rebate.
- The CPUC wanted a “flagship program” to get deeper savings. An original goal of 130,000 homes was revised, due to funding concerns, to 42,000 homes. The CPUC understands that they likely had an unrealistic expectation for how long it would take to ramp up this type of program. From the CPUC perspective the largest needs for the program moving forward are to revise its QA/QC protocols, assess the EnergyPro software, and identify and promote contractor success stories.

5.6. Marketing Effectiveness Survey

In this section, we present the findings of the marketing effectiveness surveys described in 4.6. **Marketing Effectiveness Survey**. Throughout this section, we refer to participants in the first survey as the “targeted population” and those in the second as “workshop participants.” Where appropriate, we also include data from the participant survey, which included PG&E and SCE/SoCalGas participants and interviews with contractors who submit jobs to both PG&E and SCE/SoCalGas.

As context for this section, here is a list of the main marketing efforts implemented by various stakeholders during 2010 and 2011.

- State: mass market advertising (online, print, and broadcast)
- IOU: marketing efforts mainly began in late Summer/Fall 2011
- PG&E:
 - ▣ focused on targeted awareness tactics and events:
 - ▣ focused on events to funnel customers to workshops in 5 counties, i.e., the same 5 counties represented in the targeted population survey
 - ▣ did not use radio but some local entities did
- SCE: some online radio advertising and direct mail letters to a targeted group
- Local government partnerships: multiple methods; radio; sent out specialized materials; lots of in-person outreach events

5.6.1. Program Awareness

Table 18 shows that, among PG&E’s targeted population, awareness of the EUC program is gaining ground, but still low. Less than a third of the population is aware of “Energy Upgrade California,” even after being shown the logo online.¹⁹ Only about one in eight (13%) remembered seeing materials or displays with the logo.

Table 18: Levels of Exposure to EUC Marketing, Overall and by County (Targeted Population)

Exposure Level	PG&E Targeted Population					
	Total (n=235)	Contra Costa (n=58)	Fresno (n=6)	Placer (n=3)	San Mateo (n=64)	Santa Clara (n=104)
Aware of Energy Upgrade California or Had Seen Energy Upgrade California Logo	29%	36%	17%	33%	31%	24%
Heard Radio Ad	24%	34%	33%	33%	23%	17%
Seen Internet Ad	12%	9%	17%	33%	14%	13%
Seen Newspaper Ad	12%	14%	0%	33%	14%	11%
Seen Transit Ad	11%	19%	0%	0%	11%	7%
Seen TV Ad	10%	16%	17%	0%	9%	8%
Seen Direct Mail	9%	12%	0%	0%	8%	9%
Seen Print ads (net)	7%	7%	0%	0%	11%	5%
PG&E Brochure (or similar)	6%	7%	0%	0%	8%	5%
Energy Ambassadors Handout (or similar) (San Mateo County only)	-	-	-	-	5%	-
County Incentives Handout (or similar) (Contra Costa County only)	-	3%	-	-	-	-
Hear from Family Member, Friend, Neighbor, or Colleague	6%	7%	17%	0%	5%	7%
Seen at Local Event	5%	7%	0%	0%	5%	5%
Heard from Contractor	4%	7%	0%	0%	3%	3%
Received Email	3%	0%	0%	0%	6%	2%

¹⁹ Just over a quarter of the targeted population (26%) had heard or seen the term “Energy Upgrade California” unaided; the remaining individuals recalled after seeing the logo.

However, when we measured aided recall by showing respondents individual messaging pieces, 43% of the target population said they had been exposed to at least one type of EUC messaging. Program awareness varies across PG&E’s five counties. Awareness in Santa Clara County is lower than average.

5.6.2. Outreach Channels

5.6.2.1. Channel Prevalence

Based on self-reported use of channels within the targeted population, the program should continue to look for ways to reach customers via the internet. Table 19 shows that the vast majority of customers spend more than five hours a week on the internet, a higher percentage than those who spend the same number of hours in the next most popular channel, TV. Google is the site most visited. These findings are consistent with channel use among workshop participants.

Table 19: Use of the Internet and Frequent Free Sites Visited

	Targeted Population (n=235)	Workshop Participants (n=81)
% who spend more than 5 hours a week surfing the internet	77%	81%
Free websites customers go to frequently (multiple response)	(n=232)	(n=81)
Google	42%	53%
Yahoo	41%	38%
Facebook	12%	30%

One notable difference between the targeted population and workshop participants is that only a small proportion of the targeted population (3%) visited the EUC website while a large proportion of workshop participants (73%) visited the site—a difference likely explained, in part, by their workshop attendance.

5.6.2.2. Effective Channels for Targeted Population

Although radio is reported as being the least popular channel among the targeted population, it is also reported as being effective. Table 20 shows that, among those in the target population who are aware of the EUC program, more than a quarter first heard about it on the radio.

Despite the role of radio in outreach, only a few early participants mentioned it as a way they heard about the program (see Table 33).

Table 20: Effective Channels for Targeted Population

Channel	Those in the Targeted Population Who are Aware of the Program (n=71)
Radio	27%
Direct mail	18%
Newspaper	11%
Word of mouth	10%
Internet	10%
Television	10%

5.6.2.3. Effective Channels for Workshop Participants

For workshop participants who heard about the workshop and the program by participating in the workshop, email, word-of-mouth, and local events were all effective channels (see Table 21).

Table 21: Where Workshop Participants Heard About Workshops

Channel	Workshop Participants (n=81)
Email	22%
Family Member, Friend, Neighbor, or Colleague	17%
Local Event	16%
Direct Mail	11%
Newspaper Ad	10%
Internet Ad	9%
Radio Ad	5%
A Contractor	4%
Television ad	1%
Transit Ad	1%
Other	4%

Among workshop participants who heard about the program *before* they attended a workshop, word-of-mouth and events were the most effective channels for raising awareness of the program. Table 22 shows the percentage of participants that heard about the program through each marketing channel. Notably, radio is a main channel among workshop participants; about 1 in 8 heard about the program on the radio.

Table 22: Effective Channels for Workshop Participants

Channel	Workshop Participants who Learned about the Program before the Workshop (n=25)
Word of mouth	24%
Events (e.g., farmer's market)	20%
Radio	12%
Email	8%
Internet ad	8%
Television ad	8%
Newspaper ad	4%
A contractor	4%
Billboard or transit ad	4%
(Other)	4%
(Don't know)	4%

5.6.2.4. Banner Ad Testing

We tested the banner ad shown in Figure 10 in both the targeted population and workshop participant surveys.



Figure 10: Banner Advertisement

Overall, the banner ad does not appeal to the targeted population; only 16% were likely to click on it. About half responded negatively to the ad.

5.6.3. Messaging

5.6.3.1. Perception of Program Name Meaning

To workshop participants and those in the targeted population who are aware of the program, “Energy Upgrade California” means saving energy at home. Table 23 shows how survey respondents described multiple aspects of the program that were associated with saving energy through rebated equipment upgrades in the home. Only a few respondents “don’t know” what the program means, and a smaller percentage of the targeted population respondents thinks it might be related to Smart Meters.

Table 23: Perceptions of Program Name Meaning (Multiple Response)

Perception	Those in the Targeted Population Who are Aware of the Program (n=71)		Workshop Participants (n=81)	
	Percentage	Rank	Percentage	Rank
Save energy/ energy efficiency/conservation	52%	1	60%	1
Related to home/house	28%	3	33%	2
Rebates	13%	5	22%	3
Equipment upgrades	31%	2	19%	4
Related to California/state government collaborating to improve efficiency	10%	6	16%	5
Cost savings for energy efficiency	3%	10	15%	6
Clean/ New Energy	20%	4	4%	8
"Green"	6%	7	4%	8
Related to Smart Meters	3%	10	0%	11
Other	4%	9	5%	7
Don't know/ Can't think of any	6%	7	4%	8

5.6.3.2. Perception of Program Sponsorship

In both the targeted population and workshop participant surveys we explored customer perception of program sponsorship among those who were exposed to EUC advertisements in the prior 12 months. Table 24 shows that most customers in the targeted population name PG&E, not local governments, as a program sponsor. Only a few of the targeted population identified other program sponsors. However, workshop participants are more likely to name both PG&E and local governments as program sponsors.

Table 24: Perceptions of Program Sponsorship Among Customers who were Exposed to EUC Advertisements in the Prior 12 months (Multiple Response)

Perceived Sponsor	Targeted Population (n=61)		Workshop Participants (n=44)	
	Percentage	Rank	Percentage	Rank
PG&E	54%	1	68%	1
State of California	12%	3	7%	5
(California) Public Utilities Commission	10%	4	5%	8
Retailer/Manufacturer of energy efficient equipment	8%	5	0%	14
Other non-profit	2%	7	2%	11

Perceived Sponsor	Targeted Population (n=61)		Workshop Participants (n=44)	
	Percentage	Rank	Percentage	Rank
City/County government	0%	8	23%	2
California Energy Commission	0%	8	9%	3
Other government organization	0%	8	7%	5
SCE	0%	8	5%	8
Other utility or energy provider	0%	8	5%	8
SMUD	0%	8	2%	11
SoCalGas	0%	8	2%	11
Other	5%	6	7%	5
Don't know	21%	2	9%	3

5.6.3.3. Past Message Resonance

Responses of both the targeted population and workshop participants provide little insight about which past marketing messages resonate most. Unaided, customers did not recall specific messages, and only a few could recall any messages. Table 25 shows that the most frequently recalled messages among those in the targeted population include “the environment/saving energy” and “rebates,” while workshop participants recalled “rebates/incentives” and the “ad featuring the home being sick.”

In future marketing efforts, the program should continue to lead with messages of “lower bills” and “rebates.” Table 26 shows that, of the five benefits of participation presented in a PG&E EUC program brochure, respondents in both surveys cited “lower bills” and “incentives” as the strongest motivation to participate in the program.

Table 25: Message Resonance Among Customers who were Exposed to EUC Advertisements in the Prior 12 months (Multiple Response)

Message	Targeted Population (n=61)		Workshop Participants (n=44)	
	Percentage	Rank	Percentage	Rank
None/ Don't remember	61%	1	45%	1
Can recall how saw ad but not specific messaging	15%	2	27%	2
The environment/ saving energy	8%	3	5%	5
Rebates/ Incentives	5%	5	7%	3
Lower bill	3%	6	2%	7

Message	Targeted Population (n=61)		Workshop Participants (n=44)	
	Percentage	Rank	Percentage	Rank
"Reduce energy use. Save Money. Create jobs." (Whole or part)	2%	7	2%	7
Ad featuring the home being sick	0%	8	7%	3
"Don't miss the window." (Whole or part)	0%	8	2%	7
"Did you know that if you do several home energy improvements at once you can achieve greater energy savings?" (Whole or part)	0%	8	2%	7
Other	8%	3	5%	5

Table 26: Top Motivating Marketing Messages for Participation

Motivation	Brochure Description	Targeted Population (n=235)		Workshop Participants (n=81)	
		Percentage	Rank	Percentage	Rank
Lower bills	Upgrading your home to be more energy efficient can mean lower bills every month.	49%	1	31%	2
Incentives	Depending on the upgrade you select, you may be eligible to receive incentives of up to \$4,000. That's money in the bank for something you may have been planning to do anyway.	37%	2	49%	1
The environment	Making your home more energy efficient helps the environment--an important step that everyone should take.	7%	3	10%	3
Comfort	When your home is more energy efficient, it can be more comfortable--cozy and warm in the winter and cool in the summer.	6%	4	10%	3
Participating contractors	Contractors participating in this program are specially trained to find improvements that an average homeowner wouldn't. They may find more energy savings that will save you money.	1%	5	0%	5

5.6.3.4. The Role of Comfort in Customer Motivation

The degree to which comfort motivates customer participation in the program varies. For respondents in both the targeted population and workshop participant surveys it was a

secondary motivator. Yet for participants, comfort is a main driver of participation (see Table 34 on page 102) that may resonate more when they start to work with contractors or after retrofits are complete.

5.6.3.5. Specific Messaging

To gauge the effectiveness of messaging, we tested three different print ads:

- A PG&E statewide brochure explaining the program (Figure 11)
- A San Mateo County local ad for the Energy Ambassador program, emphasizing local champions (Figure 12)
- A Contra Costa County handout explaining incentive levels (Figure 13)

Up to \$4,000 in energy-upgrade incentives. Don't miss the window.

What is Energy Upgrade California?

It's a limited-time opportunity to get up to \$4,000 in incentives just for making qualifying energy-efficiency upgrades to your home.

The Energy Upgrade California™ program was created to help California reduce energy use. So, if you're ready to do more than turn down your thermostat to make your home more energy efficient, consider upgrades designed to make your systems work together to help lower your utility bills.

The program is a partnership between the California Energy Commission and the California Public Utilities Commission, and it's financially supported in part by local utility companies.

Energy Upgrade California is a win-win for everyone. California wins with decreased long-term energy use, and homeowners win by saving money.

What is a whole-house approach?

Instead of doing a few home improvements here and there to make your home more energy efficient, think about your whole home as a complete system. Heating, air conditioning, and water heating all work together to help you live comfortably while lowering your utility bills. And Energy Upgrade California gives you the professional resources you need to take a whole-house approach.

There are two upgrade packages that qualify for incentives.

Basic Upgrade Package
The Basic Upgrade Package focuses on the building shell—including installing and upgrading insulation and patching ductwork. This package qualifies for incentives of up to \$1,000.

Advanced Upgrade Package
The Advanced Upgrade Package is a comprehensive plan focused on the Basic Upgrade Package components, plus installing new systems (heating, cooling, and water heaters), replacing ductwork, upgrading single-pane windows, and more. This package qualifies for incentives of up to \$4,000.

Basic Package	Advanced Package Options
<ul style="list-style-type: none"> • Air sealing • Attic insulation • Duct sealing • Hot water pipe insulation • Thermostatic shutoff valve • Carbon-monoxide monitor • Combustion safety testing • Low-flow showerheads (recommended) 	<p>Basic Upgrade Package plus:</p> <ul style="list-style-type: none"> • High-efficiency furnace • Energy-efficient cooling • Water heater system • Energy-efficient windows • Duct replacement • Wall insulation • Other custom energy-saving measures

How to get started.

If you live in a single-family home, you may qualify for these types of incentives. Visit www.EnergyUpgradeCA.org for more information or contact a participating contractor for a home energy assessment.

energy upgrade CALIFORNIA
www.EnergyUpgradeCA.org

Figure 11: PG&E Promotional Brochure (All Counties)

Not sure where to start with your energy efficiency projects?

You need a Personal Energy Review!



What is a Personal Energy Review?

A Personal Energy Review (PER) is a free, two-hour visit to your home from Sustainable San Mateo County (SSMC).

During that visit staff or volunteers will:

- Cover the basics of building science
- Ask questions about your home and energy use habits
- Evaluate your PG&E bills
- Perform a visual inspection
- Explain the Energy Upgrade California rebate program
- Answer all your questions
- Help you plan your next steps



How do I sign up?
 Online sign-ups at www.SustainabilityHub.net/PER
 or contact
 EA@SustainableSanMateo.org
 650.638.2323



Already had an Energy Upgrade CA assessment or project completed in your home?

We want YOU to become an Energy Ambassador!



What is an Energy Ambassador?

Energy Ambassadors are people who are interested in spreading the word about the advantages of home energy efficiency and the Energy Upgrade California rebate program.

How do I become an Energy Ambassador?

Have a party!

How does it work?

Working with your Energy Upgrade contractor, Sustainable San Mateo County will use your home as a case study to present the benefits of understanding your home's energy, retrofitting and the rebate program.

We'll help invite your friends and neighbors, set up and clean up, and provide snacks and refreshments. You just sit back and tell your friends how your Energy Upgrade project has improved your home and your life.



Join the Party!
 For more information:
www.SustainabilityHub.net/EA
 EA@SustainableSanMateo.org
 650.638.2323



Figure 12: Energy Ambassador Promotional Flyer (San Mateo County)

Get up to \$10,000 plus
3% financing for 15 years
for energy improvements
to your home!



**energy
upgrade™**
CALIFORNIA
IN CONTRA COSTA COUNTY

Homeowners in Contra Costa County are eligible for multiple Energy Upgrade California incentives.

The table below identifies three major incentives. Depending on your ability to meet the eligibility requirements, you can combine all three programs, accessing potentially more than \$10,000 in rebates and grants plus 3% financing over 15 years.

All programs require that you use a contractor from each program's Participating Contractors.

Source	Incentive Amount	Eligibility
PG&E Rebate www.EnergyUpgradeCA.org		
PG&E	Basic Package Rebate: \$1,000	Upgrade must include the following: Air sealing, attic insulation, duct sealing, insulation of hot water pipes, low-flow shower heads, carbon monoxide detector, and combustion safety testing.
	OR	
	Advanced Package Rebate: \$1,500 – 4,000	15% energy savings* \$1,500 for 15% energy savings, \$5,000 for each additional 5% energy savings
Contra Costa County Rebate www.EnergyUpgradeCC.org		
Contra Costa County	Rebate: 20% of project costs, up to \$2,000	Project valued at \$10,000 or less 20% energy savings* Participation in PG&E Advanced Package No windows or doors in project scope
	OR	
	Rebate: 25% of project costs, up to \$5,000	Project valued at over \$10,000 20% energy savings* Participation in PG&E Advanced Package No windows or doors in project scope
California Homebuyer's Fund (CHF) Program www.CHFLoan.org		
CHF	Grant: Up to \$1,250	Current mortgage and property taxes Current income between \$52,180 - \$144,480
	Loan: 3% fixed interest; 15 year term	

* Energy savings must be demonstrated by Participating Contractor using test-in test-out methodologies.

Need more info?

Visit each program's website or call the County with questions
or to request a workshop in your area: (925) 335-1178
EnergyUpgradeCA.org | EnergyUpgradeCC.org | CHFLoan.org

Figure 13: Incentives Handout (Contra Costa County)

Table 27, Table 28, and Table 29 show how the respondents perceived each of these marketing pieces.

Table 27: Test of Marketing Print Collateral - PG&E Promotional Brochure

	Targeted Population (n=235)	Workshop Participants (n=81)
Those who viewed this ad said that...		
it MOST made them want to contact the program	40%	44%
they were very likely (8-10 rating) to seek out more information on the topic	30%	46%

	Targeted Population (n=235)	Workshop Participants (n=81)
they understood the differences in the two types of upgrade packages (brochure only) (8-10 rating)	44%	60%
This ad is trying to get me to...		
get energy upgrades to home / get home upgrades	33%	40%
improve home energy efficiency (general)	27%	---
save energy	17%	---
incentives / rebates / loans available	---	31%
raise awareness / become aware of the program	---	17%

Table 28: Test of Marketing Print Collateral - Energy Ambassador Promotional Flyer

	Targeted Population (n=235)	Workshop Participants (n=81)
Those who viewed this ad said that...		
it MOST made them want to contact the program	11%	12%
they were very likely (8-10 rating) to seek out more information on the topic	18%	23%
they understood the Personal Energy Review (8-10 rating)	59%	59%
they understood the Energy Ambassador information (8-10 rating)	51%	46%
This ad is trying to get me to...		
get an audit/evaluation/review of energy use	40%	33%
spread word to others in community/share experience	25%	11%
find ways to save / find out more about EE options	14%	---
either get an assessment or become an ambassador	---	14%
represent PG&E / do work for PG&E / become a salesperson	---	11%

Table 29: Test of Marketing Print Collateral - Incentives Handout

	Targeted Population (n=235)	Workshop Participants (n=81)
Those who viewed this ad said that...		
it MOST made them want to contact the program	33%	37%
they were very likely (8-10 rating) to seek out more information on the topic	25%	33%

	Targeted Population (n=235)	Workshop Participants (n=81)
they understand the type of incentive packages (8-10 rating)	43%	47%
This ad is trying to get me to...		
get EE home upgrades / make home more energy efficient	34%	21%
get rebates or incentives	18%	37%
get a loan / get financing	18%	
get home upgrade/Improve home (general - does not mention EE specifically)	18%	---
sign up to participate / contact the program	---	20%

Of the three materials, the statewide brochure resonated most with the targeted population and workshop participants. Comparatively high proportions of respondents stated they would likely seek out more information in response to this compared to other ads. Yet, for many of those in the targeted population the message in this ad was not as clear as that in the ad promoting local champions (i.e., Energy Ambassadors).

5.6.4. Encouraging Participation

5.6.4.1. Main Barriers to Participation

Both surveys included several questions about what might encourage respondents to take subsequent steps and sign up for the program. Reviewing data from these questions, we conclude that participation requires more than just awareness; customers need more information. However, there is a consistent difference per customer type. Those in the targeted population are more likely to focus on the need for information, while workshop participants are more likely to focus on cost. This difference likely reflects the additional information that participants received at the workshop, decreasing their need for more information.

Table 30 shows that, when asked directly what the program could do to help customers sign up, most of the targeted population respondents answered “more information” and “higher incentives.”

Table 31 shows that, when asked to identify the biggest barrier to participation from a list, most of the targeted population again answered “more information was needed” and “the initial cost is too high.”

Table 30: Ways the Program Could Help Customers Sign Up for the Upgrades (Multiple Response)

What Would Help?	Targeted Population (n=68)		Workshop Participants (n=56)	
	Percentage	Rank	Percentage	Rank
More information	29%	1	9%	7
Higher rebates/ more financial incentives/ cheaper upgrades	22%	2	32%	1
Send information by mail	19%	3	0%	10
More information on costs	9%	5	11%	6
More outreach	9%	5	2%	9
More information on financing	4%	9	13%	5
More information on benefits of participation	4%	9	0%	10
More information on measures covered or provided	3%	11	0%	10
Lower the rules / requirements / restrictions to participate	1%	12	16%	4
More information / better contractors	0%	13	20%	2
Other	9%	5	4%	8
Nothing	19%	3	18%	3
Don't know	9%	5	0%	10

Table 31: Biggest Barriers to EUC Participation

Barrier	Targeted Population (n=68)		Workshop Participants (n=56)	
	Percentage	Rank	Percentage	Rank
I need more information about the program	66%	1	2%	7
The initial cost is too high	13%	2	34%	1
My home doesn't need any of the upgrades sponsored by the program	7%	3	9%	5
I haven't had time to contact a contractor	3%	5	18%	2
Renter/does not qualify for program	3%	5	14%	3
I cannot get financing to cover the project cost	1%	7	9%	5
Other projects to complete first	1%	7	0%	9
I haven't found a contractor yet	0%	9	13%	4
Other	4%	4	2%	7

5.6.4.2. Workshop Effectiveness

Findings from the workshop participant survey indicate that workshops effectively impart more information and motivate people to sign up for the program. Table 32 shows that nearly a third signed up for the EUC program and state that the workshop influenced their decision to participate in the program.

Table 32: Conversion from Workshop to EUC Program Participation

	Workshop Participants (n=81)	Mean Program Influence Score (0-10 scale)
Signed up for Energy Upgrade California	31%	8.1
Got an energy assessment from a contractor	30%	-
Pursuing a project through EUC (work has either started, is about to start, or is complete)	17%	-

5.6.4.3. EUC Website

The program currently has one statewide, EUC website which, according to several stakeholders, has several problems. Using focus groups, LA County delved deeply into the website and illuminated several of these. The program should implement the associated recommendations.

Overall, the website has the potential to become an important information source for customers, and there is some evidence that it already facilitates participation. More than half of the early participants we surveyed visited the site and gave it moderate to high ratings on a few key indicators (see Table 35 on page 103).

5.6.5. Key Takeaways

- Among PG&E’s targeted population, awareness of the EUC program is low and has room to grow. Less than a third of the population is aware of “Energy Upgrade California,” even after being shown the logo online.²⁰
- Workshops are an effective marketing and outreach tool in driving program participation and interest.
- The statewide program brochure resonates well with customers.

²⁰ Just over a quarter of the targeted population (26%) had heard or seen the term “Energy Upgrade California” unaided; the remaining individuals recalled after seeing the logo.

- Among customers that know little about the program, program knowledge and information are the largest barriers to participation. Amongst workshop participants who received in-depth program education, cost was the largest barrier.
- Overall, the website has the potential to become an important information source for customers, and there is some evidence that it already facilitates participation. However, it has several problems. Using focus groups, LA County delved deeply into the website and illuminated several of the issues.

5.7. Participant Survey

5.7.1. Participant Survey Results

Table 33 shows that participants primarily hear about the program from their contractor, family or friends, and utility letters. In PG&E territory, a significant percentage of participants also hear about the program through their mortgage lender.

Table 33: How Participants First Heard about the Program

Source	Total (n=78)		PG&E (n=62)		SCE/SoCalGas (n=16)	
	Percentage	Rank	Percentage	Rank	Percentage	Rank
Contractor	32%	1	34%	1	25%	1
Family / Friend	15%	2	16%	2	13%	3
Letter from utility	9%	3	5%	4	25%	1
Mortgage lender / loan officer / real estate agent / bank	9%	3	11%	3	0%	4
EUC Website	1%	5	2%	5	0%	4

Participants rate multiple factors as being important in their decision to participate in the Whole-House Program, indicating that it takes many factors to motivate homeowners to do a whole-house job. Table 34 lists participant motivations. “Home comfort,” “reducing energy use,” and “taking advantages of utility incentives” are among the top motivations.

Table 34: Participants' Motivations for EUC Participation

	Total (n=78)		PG&E (n=62)		SCE/SoCalGas (n=16)	
	Mean Score	Rank	Mean Score	Rank	Mean Score	Rank
Improving the comfort of your home	4.7	1	4.7	1	4.6	3
Reducing your energy usage	4.6	2	4.6	2	4.6	2
Incentives available from the utility	4.6	3	4.6	3	4.7	1

	Total (n=78)		PG&E (n=62)		SCE/SoCalGas (n=16)	
	Mean Score	Rank	Mean Score	Rank	Mean Score	Rank
Saving money on your energy bills	4.5	4	4.5	4	4.5	4
The home energy assessment you received	4.2	5	4.3	5	3.8	9
Incentives available from your city or county	4.1	6	4.1	6	4.4	5
Replacing failing or broken equipment	4.0	7	4.0	7	4.1	7
Reducing the environmental impact of your home	4.0	8	4.0	9	4.1	6
Addressing health and safety issues in your home	4.0	9	3.9	10	4.1	7
Improving the air quality in your home	3.9	10	4.0	8	3.6	10
Increasing the value of your home	3.6	11	3.7	11	3.4	11

Note: Means are on 5-point scales where 1 means “not at all important” and 5 means “very important.” All means are derived using valid responses, i.e., a few data points were removed when respondents stated “don’t know” or refused to answer.

Table 35 shows that just more than half the participants visit the EUC site at some point in their participation. Generally, these participants give the website high marks on a few key indicators of website quality.

Table 35: Participants EUC Website Visitation and Feedback

	Total (n=78)		PG&E (n=62)		SCE/SoCalGas (n=16)	
	Mean Score	Rank	Mean Score	Rank	Mean Score	Rank
Visited Site	53%		52%		56%	
Information was easy to understand	8.3	1	8.5	1	7.7	2
Gave a good understanding of program offerings	8.2	2	8.2	2	8.2	1
Accurately reflected my program experience	7.9	3	8.2	3	6.9	3

Note: Means are from those visiting the site, and are derived from 11-point scales where 0 means “completely disagree” and 10 means “completely agree.”

We collected extensive information to profile the early program participants, which is outlined in Table 36. Notable findings include:

- Nearly all jobs were stand-alone jobs, not extensions of a remodel.
- Nearly half of the participants have a household income of less than \$100,000.

- Nearly half used financing to pay for their EUC upgrades.
- Many participants completed an EUC job at a time when they were purchasing a new home and/or when they needed to replace an HVAC system.

Table 36: Participant Characteristics

	Total	PG&E	SCE/SoCalGas
Project Type	(n=78)	(n=62)	(n=16)
Stand Alone	90%	90%	88%
Extension of Existing	10%	10%	13%
Life Events	(n=78)	(n=62)	(n=16)
Recently Retired	15%	19%	-
New Home Purchase	28%	32%	13%
Timing	(n=78)	(n=62)	(n=16)
Needed HVAC Replacement	42%	44%	31%
Payment Type	(n=78)	(n=62)	(n=16)
Used Cash	77%	74%	88%
Financing	45%	50%	46%
Household Income in 2011	(n=75)	(n=61)	(n=14)
Over \$150,000	31%	34%	14%
\$100,000 to \$150,000	23%	18%	43%
\$75,000 to under \$100,000	8%	8%	7%
\$50,000 to under \$75,000	19%	18%	21%
\$35,000 to under \$50,000	12%	11%	14%
Under \$35,000	8%	10%	-
Number of People (including children) in Household	(n=78)	(n=62)	(n=16)
1	6%	8%	-
2	49%	52%	38%
3	24%	19%	44%
4	14%	15%	13%
5 or more	6%	6%	6%
Number of Children in Household	(n=73)	(n=57)	(n=16)
0	59%	63%	44%
1	23%	19%	38%
2	14%	14%	13%
3	3%	2%	6%
4	1%	2%	-

	Total	PG&E	SCE/SoCalGas
Participant Age	(n=78)	(n=62)	(n=14)
18-24	3%	3%	-
25-34	13%	15%	7%
35-44	18%	19%	14%
45-54	25%	23%	36%
55-64	20%	15%	43%
65-74	16%	19%	-
75 and older	5%	6%	-
Year House was Built	(n=78)	(n=62)	(n=14)
2001 and more recent	-	-	-
1991 to 2000	10%	11%	6%
1981 to 1990	13%	11%	19%
1971 to 1980	13%	11%	19%
1961 to 1970	14%	11%	25%
1951 to 1960	18%	18%	19%
1941 to 1950	15%	19%	-
1940 or earlier	17%	18%	13%
Length of Ownership	(n=78)	(n=62)	(n=16)
Less than 10 years	44%	48%	25%
6-10 years	14%	13%	19%
11-15 years	8%	6%	13%
16-20 years	10%	8%	19%
21-25 years	4%	2%	13%
26-30 years	6%	8%	-
More than 30 years	14%	15%	13%
Length of Intended Future Ownership	(n=68)	(n=52)	(n=16)
Less than 5 years	4%	6%	-
6-10 years	21%	23%	13%
11-15 years	7%	10%	-
16-20 years	12%	12%	13%
More than 20 years	56%	50%	75%
Education	(n=77)	(n=61)	(n=16)
Less than high school	-	-	-
High school graduate	6%	5%	13%
Some college, vocational , or technical school	22%	20%	31%

	Total	PG&E	SCE/SoCalGas
College graduate	42%	49%	13%
Post graduate education	30%	26%	44%
Race/Ethnicity	(n=76)	(n=62)	(n=14)
White/Caucasian	72%	77%	50%
Hispanic, Mexican, Latino, Puerto Rican, Hispanic	9%	5%	29%
Chinese	9%	10%	7%
Other Asian, Pacific Islander	5%	3%	14%
Indian, South Asian	3%	3%	-
Mixed, Multiracial	1%	2%	-

Table 37 shows that participants were highly satisfied with the program overall, and provided many reasons for their satisfaction. For example, a significant proportion was especially happy with the program incentives. Participants’ suggestions for improving the program, collected through follow-up questions, also indicated high satisfaction with the program. The two most frequent suggestions were “None” and “Publicize it more.” But participants also offered many other suggestions, indicating that the program has room to improve.

Table 37: Overall Satisfaction and Suggestions for Improvement

	Total	PG&E	SCE/SoCalGas
	(n=78)	(n=62)	(n=16)
Overall Satisfaction (*)	4.6	4.7	4.1
Program Experiences of Satisfied Participants (4 or 5 rating)	(n=70)	(n=58)	(n=12)
Positive Experiences			
The financial incentives/rebates were good/made it affordable	40%	36%	58%
House is more comfortable	29%	28%	33%
Met expectations/no problems (general)	23%	24%	17%
The retrofit is saving me money	23%	22%	25%
Program/service is good/easy/helpful	20%	21%	17%
The retrofit is saving me energy	16%	19%	-
Contractor/staff was good, professional, nice, etc.	11%	12%	8%
Satisfied with improvements/equipment/appliances	9%	10%	-
House is better for my health/safety	4%	5%	-
Negative Experiences			
It took a long time to receive rebate/haven’t received rebate	10%	9%	17%
Too much/cumbersome paperwork	6%	7%	-
No results/no difference in bill/home comfort	1%	2%	-

	Total	PG&E	SCE/SoCalGas
Poor quality of work/didn't do what was promised	1%	-	8%
Program Experiences of Neutral and Dissatisfied Participants (1-3 rating)	(n=7)	(n=3)	(n=4)
Positive Experiences			
Satisfied with improvements/equipment/appliances	14%	33%	-
Negative Experiences			
It took a long time to receive rebate/haven't received rebate	71%	67%	75%
Contractor/staff was not good, professional, nice, etc.	43%	33%	50%
Too much/cumbersome paperwork	29%	33%	25%
Poor quality of work/didn't do what was promised	29%	-	50%
No results/no difference in bill/home comfort	14%	33%	-
Participant Suggestions for Improvement	(n=72)	(n=57)	(n=15)
None	22%	26%	7%
Publicize it more	19%	21%	13%
Better communication/customer service/program information	17%	16%	20%
Shorten the time it takes to get rebates/incentives	14%	12%	20%
Better training for contractors	13%	16%	-
More money (rebates, incentives, free goods, etc.)	10%	9%	13%
Decrease the number of parties involved/streamline process	10%	5%	27%
Other	8%	7%	13%
Loosen contractor restrictions/be able to use any contractor	7%	7%	7%
Make the process easier to understand	4%	4%	7%

Note: Scores are on a 5-point scales where 1 means “very dissatisfied” and 5 means “very satisfied.”

We asked participants whether they have talked about the program with family and friends. If they said yes, we asked what they talked about. If they said no, we asked what they might have talked about. Most participants talk positively about the program. Table 38 lists several topics on which participants focus when relaying their experience. Although negative comments were minimal, most dissatisfaction was related to the rebate processing time and the desire for better customer service from program staff—especially the desire to have fewer points of contact regarding the program to facilitate better program communication.

Table 39 indicates that participants are satisfied with the contractors who assessed their homes. Participants rated these contractors highly on several key indicators, and nearly all would recommend these contractors to others. Participants rated contractors lowest on their knowledge of available financing options.

Table 38: What Participants Say About the Program

	Total	PG&E	SCE/SoCalGas
Participants who have talked about the program	(n=78)	(n=62)	(n=16)
	90%	95%	69%
What they talked about	(n=70)	(n=59)	(n=11)
The availability of rebates / incentives / program is a good deal	44%	42%	55%
I recommend the program / contractor to them	39%	39%	36%
General program benefits / good program	37%	37%	36%
Explained various upgrades / improvements that were done	29%	25%	45%
Increase efficiency / Saving energy	10%	10%	9%
Increase in home comfort	9%	7%	18%
Savings on utility bill	7%	5%	18%
Negative comment about the program	6%	3%	18%
Other	1%	1%	-
Participants who have not talked about the program	(n=78)	(n=62)	(n=16)
	10%	5%	31%
What they would have talked about	(n=8)	(n=3)	(n=5)
Do it / worthwhile / affordable	63%	67%	60%
Negative experience	38%	33%	40%

Table 39: Participant Satisfaction with Contractors

	Total	PG&E	SCE/SoCalGas
Satisfaction with assessment contractor's...	(n=78)	(n=62)	(n=16)
Explanation of the home energy assessment process	4.6	4.6	4.6
Level of knowledge about the work to be done	4.5	4.6	4.3
Answers to questions	4.5	4.5	4.6
Professionalism	4.5	4.5	4.3
Knowledge of available rebates	4.5	4.5	4.3
Knowledge of available financing options	4.1	4.2	3.9
Recommendation	(n=75)	(n=60)	(n=15)
Would recommend the assessment contractor	92%	93%	88%
Satisfaction with equipment	(n=76)	(n=60)	(n=15)
Overall quality of the equipment installed by the contractor	4.7	4.7	4.5
Satisfaction with the contractor who performed the upgrades	(n=78)	(n=62)	(n=16)
Overall quality of the work performed by the contractor	4.4	4.4	4.5

Note: Mean scores are on a 5-point scale where 1 means “very dissatisfied” and 5 means “very satisfied.” All means and percentages are derived using valid responses, i.e., a few data points were removed when respondents stated “don't know” or refused to answer.

Table 40 shows that participants who received an assessment report are satisfied with the report overall and find it comprehensive.

Table 40: Participant Reaction to Assessment Report

Reaction	Total (n=54)	PG&E (n=44)	SCE/SoCalGas (n=10)
Satisfaction with the report	4.6	4.6	4.6
Comprehensiveness of the report	4.4	4.4	4.6

Note: Means are on 5-point scales where 1 means “very dissatisfied”/“not at all comprehensive” and 5 means “very satisfied”/“very comprehensive.” All means are derived using valid responses, i.e., a few data points were removed when respondents stated “don't know” or refused to answer.

Table 41 shows that contractors’ estimates of the utility incentives that participants are likely to receive through the program are generally accurate. The majority of the participants state that the final incentive amounts they received were roughly the same as those their contractors estimated. Approximately equal percentages of participants say that their IOU incentives were higher and lower than expected, so there is no apparent systematic bias by contractors in either direction. Table 41 also shows that the majority of participants also applied for non-IOU, i.e., “premium” incentives.

Table 41: Participant Experience with Incentive Estimates and Amounts

	Total (n=71)	PG&E (n=61)	SCE/SoCalGas (n=10)
How the actual incentive amount compared to the contractor's estimate			
Roughly the same	76%	79%	60%
Lower than expected	13%	10%	30%
Higher than expected	11%	11%	10%
Applied for incentives from organizations other than the utility	(n=71)	(n=60)	(n=11)
	63%	57%	100%

The survey collected information on additional, “premium” incentives the participants may have received from organizations aside from the incentives they received from their utilities. Table 42 shows that participants received a combined average of \$4,746 from both IOU and non-IOU other sources (63% of participants received premium incentives). On average, the additional incentives amounted to 68% of the IOU amount they received. Contractors in these areas believe that if these local incentives go away, that business will significantly decrease.

Table 42: IOU and Premium Incentives Received

	Incentive Amount		
	Low	High	Mean
IOU Incentives (n=65)	\$1,000	\$4,000	\$2,827
Premium Incentives (n=65)	\$0	\$7,300	\$1,919
Total Incentives (n=65)	\$1,500	\$10,800	\$4,746

Table 43 outlines several effects of program participation on the knowledge and behavior of participants. First, the vast majority of participants gained energy-related knowledge from participating in the program. For example, a significant proportion know how to make their homes more efficient, and half know how much their energy use should decrease as a result of the job upgrades. Second, over half of the participants surveyed manage energy use differently since they completed their energy upgrades. Among these participants, the most popular action is heating homes at a lower temperature.

Table 43: Effects of Participation on Knowledge and Behavior

	Total	PG&E	SCE/SoCalGas
Knowledge	(n=77)	(n=61)	(n=16)
Gained energy-related knowledge	82%	85%	69%
Particular Knowledge Gained (multiple response)	(n=62)	(n=51)	(n=11)
What needed to be done to make home more efficient	35%	41%	9%
The benefits of certain upgrades/additions/improvements	34%	33%	36%
Reminded of various ways to save energy	31%	31%	27%
HVAC, heating, cooling, insulation	27%	27%	27%
Awareness of the importance of using high energy efficiency appliances	19%	16%	26%
Awareness of the benefits of treating the whole house as an energy system	18%	16%	27%
Other	8%	8%	9%
Knowing how much energy usage should decrease	50%	53%	38%
Actions Taken	(n=78)	(n=62)	(n=16)
Managing energy use differently	55%	55%	56%
Particular Actions Taken	(n=43)	(n=34)	(n=9)
Operate at a lower temperature for heating	47%	41%	67%
Monitor energy/general awareness around how to use energy	28%	29%	22%
Programmable thermostat	21%	26%	0%

	Total	PG&E	SCE/SoCalGas
Operate at a higher temperature for cooling	16%	9%	44%
Turn off lights	16%	18%	11%
Use more natural ventilation	12%	12%	11%
Set temperature and leave it	9%	9%	11%
No longer use inefficient appliances	9%	9%	11%
Install CFLs	9%	12%	0%
Use the CAC/HVAC more frequently since it can now be used more efficiently	2%	3%	0%
Other	2%	3%	0%

Table 44 lists the survey items used to assess participants’ levels of awareness, knowledge, and attitudes (AKA). These were selected from the statewide AKA-B measurement protocol currently under development.

Table 44: Participants' Agreement with Awareness Knowledge Attitudes-Behaviors Statements

Model Stage	Statement	Total (n=78)				PG&E (n=62)				SCE/SoCalGas (n=16)			
		Agree (7-10)	Disagree (0-3)	Mean	Std Dev	Agree	Disagree	Mean	Std Dev	Agree	Disagree	Mean	Std Dev
	Environment- Energy Connection												
Awareness/Knowledge	Completing a comprehensive package of modifications to my home, including sealing leaky windows and doors, insulating walls and attics, insulating all hot water systems, and using all high-efficiency appliances will result in very deep savings.	82%	4%	8.2	2.3	82%	5%	8.3	2.4	81%	0%	7.9	1.8
Concern	I was concerned enough about the environmental impacts of energy use that I completed a comprehensive package of home modifications to help.	58%	18%	6.8	3.0	59%	16%	6.8	2.8	56%	56%	6.7	3.6
Responsibility	I would feel a little guilty about harming the environment if I didn't do all I could to my home to make it energy efficient.	53%	17%	6.4	2.8	55%	13%	6.6	2.6	47%	47%	5.5	3.5

Model Stage	Statement	Total (n=78)				PG&E (n=62)				SCE/SoCalGas (n=16)			
		Agree (7-10)	Disagree (0-3)	Mean	Std Dev	Agree	Disagree	Mean	Std Dev	Agree	Disagree	Mean	Std Dev
Comfort Attitudes													
Awareness/Knowledge-Comfort	Completing the full package of home modifications that includes sealing areas around windows and door, insulating walls and attics, insulating all hot water systems, and using all high-efficiency appliances would significantly increase the comfort of a home.	87%	0%	8.6	1.7	88%	0%	8.7	1.7	81%	0%	8.1	1.7
Concern-Comfort	My/our home had problems with drafts and cold or hot spots that I/we addressed with our recent energy upgrade.	82%	12%	8.0	2.8	85%	8%	8.2	2.6	69%	69%	7.3	3.7
General Energy Attitudes													
Awareness/Knowledge-General	I wasn't sure whether my home was energy efficient or not.	45%	36%	5.5	3.6	45%	32%	5.7	3.5	44%	44%	4.9	4.0
Concern-General	I'm really not sure that my home needs to be as energy efficient as possible.	24%	59%	3.5	3.2	26%	60%	3.6	3.3	19%	19%	3.2	3.0
Responsibility General	I feel that it is my job to do as much as possible to my/our home to reduce energy use significantly.	83%	4%	8.1	2.0	85%	3%	8.1	1.9	75%	6%	8.1	2.4

Note: All means and percentages are derived using valid responses, i.e., a few data points were removed when respondents stated “not applicable,” “don't know” or refused to answer.

The early participants in this sample strongly agreed with the knowledge and awareness items,²¹ which addressed the savings and comfort benefits of the whole-house or comprehensive approach. Likewise, participants agreed strongly with the item regarding home comfort, reflecting the participants’ own motivations for program participation (see Table 34). However, much smaller majorities agreed with items measuring, “concern” for and

²¹ The one knowledge/awareness exception, “I wasn’t sure whether my home was energy efficient or not,” may have been too ambiguous for respondents to answer easily, considering that the temporality was vague. Respondents may not have understood what moment the item referred to, e.g., before participation, before assessment, before agreeing to the retrofits, etc.

“responsibility” for the environment, suggesting that these are not as important to participants as comfort and savings.

Table 45 shows that the majority of participants implement all the home assessment recommendations. In the remaining cases, a lack of funds is the main reason that participants implement only some of the recommendations.

Table 45: Implementation of Recommendations

	Total	PG&E	SCE/SoCalGas
Portion of recommendations completed	(n=72)	(n=57)	(n=15)
All	60%	61%	53%
Some	40%	39%	47%
Reasons for not completing all recommendations	(n=28)	(n=21)	(n=7)
Could not afford the rest of the work / Ran out of money	64%	62%	71%
They were unnecessary	21%	24%	14%
They were relatively unimportant / not effective for savings	18%	19%	14%
Planning on completing some in the future	7%	10%	0%
They were not covered by the rebate	7%	5%	14%
Did not want to have that additional work / disruption in the home	4%	0%	14%
Haven't had the time to follow-up or schedule the work	4%	5%	0%

Table 46 shows that the vast majority of participants believe that their utility bills are or will be lower because of program upgrades.

Table 46: Change in Utility Bill (Participant Opinion) Due to the EUC Upgrade

Change in Bill	Total (n=78)	PG&E (n=62)	SCE/SoCalGas (n=16)
Higher than past bills	5%	5%	6%
Lower than past bills	81%	82%	75%
Same as past bills	8%	8%	6%
Too early to tell	3%	2%	6%
Don't know	4%	3%	6%

5.7.2. Key Takeaways

- Participants were highly satisfied with the program overall.
- Participants primarily heard about the program from their contractor, family or friends, and utility letters. Most participants talk positively about the program to family and friends.

- The vast majority of participants gained energy-related knowledge from participating in the program, and more than half reported that they manage energy use differently since completing their upgrades.
- Contractors’ estimates of the utility incentives that participants are likely to receive through the program are generally accurate.
- The majority of participants implement all the home-assessment recommendations, though some do not, due to lack of funds.
- Nearly half of the participants have a household income of less than \$100,000, and nearly half used financing to pay for their EUC upgrades.
- Although negative comments were minimal, most dissatisfaction was related to the rebate processing time and the desire for better customer service from program staff.

5.8. Contractor Survey

In this section, we present detailed findings from the contractor interviews. Contractors are generally satisfied with the program, but also identified many areas of friction and suggested several improvements.

5.8.1. Marketing

Contractors’ observations about marketing strategies include:

- The EUC website appears to be effective for generating leads for low-volume contractors. They rely heavily on the website and marketing by the program and by local entities to generate leads.
- High-volume contractors who have the resources to compliment EUC marketing efforts have found door hangers and flyers in targeted neighborhoods to be effective (Table 47).
- Most low-volume contractors expressed interest in getting trained in marketing.

Table 47: Contractors' Quotes Regarding Effective Messaging

Contractor Type	Quote
Low-Volume	"1st Saving Energy, 2nd is Comfort. Though they don't realize what comfort is till after the job is done." (Low-Volume Contractor on what is an effective marketing message)
High-Volume	"Return on investment is first. Cost and how much rebate they will get. Comfort and safety are nice, but secondary. The problem is you don't know how much the rebate amount will be until after you do the assessment."

Contractor Type	Quote
Davis Energy Group	We work in a small geographic area that have green" early adopters. We emphasize the assessment and use it as a teaching tool to lead into the one-stop" solution to stop energy waste. For example, you can install a 1.5 ton air conditioner instead of a 5 ton, but only if you use a Whole House approach. In a temperate climate you should be able to be comfortable for 10-20 cents per square foot per year. People who have \$300-\$400 utility bills per month are convinced by that. We focus on standard equipment that is tested and requires little maintenance, so we don't push tankless water heaters or sola-thermal, which helps ROI. We also stress comfort as part of the ROI."

5.8.2. Satisfaction and Barriers to Participation

Contractors are satisfied with the program overall (Table 48), though SCE's contractors are slightly less satisfied than PG&E's. Contractors discussed several issues that lowered their satisfaction:

- Nearly every contractor interviewed said that the paperwork required and the constant back-and-forth with the program while completing an application delays their work and the rebate disbursement (Table 49, Table 50, and Table 51). It also raises the overhead for contractors. One contractor said the program may cost them an additional \$700 in administrative time to give someone a \$2,000 rebate. This investment also causes mid-sized and smaller contractors who do not have a robust administrative staff to spend less time in the field completing retrofits.
- Contractors report that processing rebates can take months (Table 49). This is discouraging customers from participating (especially if their HVAC is broken and they want a quick replacement). It also raises the overhead for contractors. Many contractors said they spend a lot of time managing customer expectations, and customer frustration with rebate delays and program complexity. Some contractors also recognized that this issue is likely due to the newness and complexity of the program, and will likely improve over time.
- Many contractors are not pleased with the test-in structure, especially with the QC reviewer Richard Heath and Associates, Inc. (RHA) (Table 49). Delays in RHA's verification of energy modeling cause completed jobs to be rejected due to inadequate savings levels. When there are discrepancies between the contractor's initial on-site modeling calculation and the modeling verification, as there often are, a revised model can result in lower expected savings. This lower estimate can disqualify a job from rebates, and because contractors cannot wait for verification, the job has usually already started under the assumption of a certain rebate level. This situation causes time-consuming appeals and discontent among both contractors and customers. Contractors also believe that the minimum of four testing visits (the contractor test-in and test-out, then the QA/QC test-in and test-out) causes customers to balk; they must take at least four days off of work to participate.
- Smaller contractors, and those that have been around for a long time, are not pleased with being introduced to the whole-house concept for the first time and then being monitored

so closely and asked to produce a lot more information than they are used to. This will likely hinder the program’s ability to turn contractors into home-performance advocates.

- Many large-volume contractors indicated that smaller HVAC and insulation contractors are “selling against the program” (Table 49). These contractors are listed as program-approved, which helps them generate leads. However, when working with customers who need a new HVAC system, they say that the program is a hassle to work with, and underbid other program contractors, assuring the customer that bypassing the program is quicker and better. This began as a reaction to the high administrative and time costs associated with participation.
- IOUs and local entities are also unclear about the future of the program now that ARRA funds have run out, making it difficult for them to determine the right amount of resources and training they should invest.
- Two-thirds of contractors (non-participating, inactive, and low-volume contractors) mentioned they had jobs in 2011 that would have qualified for the program, but chose not to send them through the program (Table 52, Table 53). Each contractor completed an average of 14 jobs each outside of the program in 2011.

Table 48: Contractor Program Satisfaction Ratings

Program Satisfaction Mean Scores (0-10 scale)	PG&E		SCE		Total	
	n	mean	n	Mean	n	Mean
Inactive	4	7.8	4	8.3	8	8.0
Low-Volume	4	6.5	4	7.8	8	7.1
High-Volume	4	8.0	4	6.0	8	7.0
Davis Energy Group	2	6.0	5	5.4	7	5.6
Total	14	7.2	17	6.8	31	7.0

Paperwork Satisfaction Mean Scores (0-10 scale)						
Program Satisfaction Mean Scores (0-10 scale)	PG&E		SCE		Total	
	n	mean	n	Mean	n	Mean
Inactive	4	3.3	4	6.3	8	4.8
Low-Volume	4	3.8	4	4.0	8	3.9
High-Volume	4	3.8	4	1.8	8	2.8
Davis Energy Group	2	4.0	5	2.6	7	3.0
Total	14	3.6	17	3.6	31	3.6

Table 49: Contractor Barriers to Submitting Jobs to the Program

Barriers Tested	Non-Participating (n=8)	Inactive (n=8)	Low-Volume (n=8)	Total (n=24)
Upfront investment	63%	--	--	63% (n=8)
The paperwork required	75%	38%	63%	58%

Barriers Tested	Non-Participating (n=8)	Inactive (n=8)	Low-Volume (n=8)	Total (n=24)
The incentives are not high enough	63%	38%	75%	58%
The sales and marketing required	63%	50%	50%	54%
Rebate processing time	38%	63%	50%	50%
The training required	63%	50%	25%	46%
The availability of local trainings	75%	0%	38%	38%
Not sure if the program will be around for a long time	50%	25%	38%	38%
The necessary tools needed to do the assessment and upgrade work	--	50%	25%	38% (n=16)
The reputation of the program	0%	--	--	

Table 50: Contractors Who Say Paperwork is Barrier to Participation

Contractor Type	PG&E		SCE		Total	
	n	%	n	%	n	%
Non-Participating	4	50%	4	100%	8	75%
Inactive	4	50%	4	25%	8	38%
Low-Volume	4	50%	4	75%	8	63%
Total	12	50%	12	67%	24	58%

Table 51: Contractors' Quotes on Paperwork and QA/QC Requirements

Contractor Type	Utility	Quote
Low-Volume	SCE	"The paperwork is prohibitive, takes a long time, and requires its own training"
High-Volume	SCE	"Most contractors out there sell against the program. It is a lead generation service, they tell people how awful the program is and say 'let me give you a good price'. I hear it all the time."
Low-Volume	PG&E	"We are a small company and the paperwork is time consuming. [The paperwork] doubles for each other program, because they all need their own [paperwork]. Like CHF."
High-Volume	PG&E	"[Dissatisfied because of the] sheer amount of paperwork. It changes all of the time. Local governments ask for different things, each application has several iterations."

Contractor Type	Utility	Quote
High-Volume	SCE	"People don't feel like it is worth their time. Also, since everything has to be verified by a 3rd party, they have to take a lot of time off of work for test in, verification, test out, and verification forth test out. That is 4 days out of their work schedule just to fill the program requirements."
High-Volume	SCE	"Eliminate quality control for Test In...[contractors should be able to] provide pictures and information instead of waiting for a test-in that wastes time."

Table 52: Contractors Completing Jobs Outside of the Program

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	%	n	%	n	%
Non-Participating	4	75%	4	50%	8	63%
Inactive	4	100%	4	50%	8	75%
Low-Volume	4	25%	4	75%	8	50%
Total	12	67%	12	58%	24	63%

Table 53: Qualified Jobs Not Submitted to Program in 2011

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	Number of jobs	n	Number of jobs	n	Number of Jobs
Non-Participating	3	22	2	130	5	152
Inactive	4	22	2	32	6	54
Low-Volume	1	5	3	6	4	11
Total	8	49	7	168	15	217
Average jobs/contractor		6		24		14

5.8.3. Contractor Training

5.8.3.1. Whole-House Awareness

The program is successful in raising awareness of the whole-house approach and in educating a portion of the contractor workforce about the value of the whole-house approach, and the contractors are generally satisfied with the training they received through the program (Table 54).

Honestly I think the number one sales tool contractors use is being able to point out issues while they are in the house. If someone invites you into their home to point out where the problems are and we are able to do that, that's a pretty good sales tool. To show people that this is the

state of your duct sealing, this is your insulation, this is why it is so cold here, really being able to get into it and show the physical results of our testing, that is probably the number one sales tool and the reason we got into BPI.

– High-Volume Contractor

Table 54: Contractor Satisfaction with Program Training

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	Mean	n	Mean	n	Mean
Inactive	4	7.5	4	9.0	8	8.3
Low-Volume	4	6.5	4	9.0	8	7.8
High-Volume	4	7.3	4	6.8	8	7.0
Davis Energy Group	2	7.0	5	5.8	7	6.1
Total	14	7.1	17	7.5	31	7.3

5.8.3.2. Workforce Development

The program has successfully incentivized large and mid-sized contractors to build up a trained BPI- and whole-house-oriented workforce.

- Many program contractors who have completed at least some jobs have hired and trained multiple new employees specifically because of the program (Table 55, Table 56), and some plan to hire more (Table 57).
- Most contractors have learned new job skills through the program (Table 58)—energy modeling, air sealing, combustion safety, energy auditing, insulation, sales, EnergyPro, etc.
- Nearly all contractors report that their recent hires are not temporary.
- Contractors report that the new hires usually receive program training after being hired, but some received it before.
- Many contractors who have completed at least some jobs are planning to hire new staff because of the program. Contractors generally believe that they will hire these new employees for an indefinite period, and many will become BPI-certified.
- Only one contractor mentioned having to lay off two employees due to a lack of demand for the program.

Table 55: Contractor Employees Hired Because of Program

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	# of employees	n	# of employees	n	# of employees
Low-Volume	4	4	4	40	8	44
High-Volume	4	28	4	48	8	76
Davis Energy Group	2	14	5	22	7	36
Total	10	46	13	110	23	156
Average/Contractor	-	5	-	8	-	7

Table 56: Proportion of Contractors That Expanded Staff Due to Program

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	%	n	%	n	%
Low-Volume	4	50%	4	50%	8	50%
High-Volume	4	75%	4	25%	8	50%
Davis Energy Group	2	100%	5	80%	7	86%
Total	10	70%	13	54%	23	61%

Table 57: Proportion of Active Contractors that Plan to Add Staff

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	%	n	%	n	%
Low-Volume	4	25%	4	100%	8	63%
High-Volume	4	0%	4	50%	8	25%
Davis Energy Group	2	50%	5	40%	7	43%
Total	10	20%	13	62%	23	43%

Table 58: Proportion of Participating Contractors that Learned New Job Skills

Contractor Type	PG&E		SCE/SoCalGas		Total	
	n	%	n	%	n	%
Low-Volume	4	75%	3	67%	7	71%
High-Volume	3	100%	4	75%	7	86%
Davis Energy Group	2	100%	4	50%	6	67%
Total	9	89%	11	64%	20	75%

5.8.4. Contractor Attitudes Towards Energy Efficiency

Table 59 shows that a strong majority of participating contractors believe that a comprehensive approach to energy efficiency provides more comfort, provides cost benefits, and helps the environment.

- Participating contractors are more likely to be convinced about the comfort than the cost benefits of the comprehensive approach, though they are strongly convinced of both. We considered the possibility that these contractors were responding in a socially desirable way. To assess this, we also report the percent that chose the very strongest response category, believing that the social desirability bias may not go so far as to cause them to choose the very strongest endorsement. Under this criterion, 69% gave a 10 to the comfort statement, and 51% gave it to the cost statement. So, a majority gives the very highest rating to both benefits.
- Nearly all participating contractors agree that there is a connection between household electricity use and the environment. Somewhat fewer are concerned about it, and somewhat fewer feel a strong responsibility to do something about it in their profession. An analysis considering only those who choose the strongest endorsement of these statements still shows that these contractors believe the connections (85%), are concerned about it (67% and 54%) and feel a responsibility to address it (54%).
- Participating contractors feel a similar level of responsibility to save energy at their own home as they do in their profession. This may reflect a fairly solid basis for believing in what they are selling, although there is room for improvement here.
- Nearly all participating contractors intend to promote energy efficiency to their customer.

5.8.5. Program Design

5.8.5.1. Basic Upgrade Path versus Advanced Upgrade Path

Most customers who qualify for the Basic Upgrade also qualify for the Advanced Upgrade and can get a larger rebate. Contractors dislike doing Basic Upgrade jobs because the size of the job is not worth the paperwork or testing, so they try to sell the Advanced Upgrade whenever possible. Many will not do Basic Upgrade jobs as a matter of policy. Many participating contractors are “home-performance” contractors that tend to market or push Advanced Upgrades more than Basic Upgrades because it better aligns with their business model.

Table 60: Contractors' Quotes on the Basic Upgrade Path vs. Advanced Upgrade Path

Contractor Type	Quote
Inactive	"[The Basic] does not cover many types of homes. Many do not have central heaters or duct work."
Inactive	"[The Basic] is only a partial job. If a contractor isn't eligible to do the advanced package, you really have to team up with another company to do the combustion testing, which lowers your profit more and is more hassle. It is also a lower rebate."
Low-Volume	"[I tell customers, for the Basic Upgrade] you have to do the test and everything anyway. Go through advanced and get a bigger rebate."
Low-Volume	"Almost everything we do is for the Advanced package. Most of the time you could submit a Basic path job as an advanced and get more rebates."
High-Volume	"It is very hard to get your (Basic) paperwork processed through [the program]. It is supposed to be quicker and streamlined, but [the program] doesn't see very much of these, so it takes longer. The addition of the Test-in/test Out (where it wasn't required before) makes it take longer, so it loses some of its advantage."
Davis Energy Group	"[The Basic Upgrade] isn't cost effective. The amount of time it takes to educate the consumer and do the audit, it isn't worth it for \$1500. It isn't even really home performance."

5.8.5.2. Financing

Contractors agreed that financing plays a key role in their ability to sell upgrades to customers. Many believe that the way to ensure this program's success is to make it easier for customers to get financing for these types of programs and to help market those financing options to customers (Table 61).

They also said that financing was the primary reason they get jobs, and the lack of it is the primary reason they do not get jobs.

Table 61: Contractors' Financing Quotes

Contractor Type	Utility	Quote
High-Volume	SCE	"LA County 2% financing is working. PACE was great, I bet everyone would do that."
High-Volume	PG&E	When asked why customers who have had assessment do not participate: "It's almost always a lack of funding. The main stumbling block to the EUC program is the lack of available capital. The Whole house concept has been pushed very hard, and when you are doing a Whole House retrofit, we've had them anywhere from thirty to eighty thousand dollars. Now with no good way to come up with that money, like the CHF program that we have there, the rebates are kind of worthless because the folks can't afford the money up front to have the work done."

5.8.5.3. EnergyPro Modeling Software

Contractors' attitudes towards EnergyPro vary.

- Non-participating contractors are often not familiar with the software, and have heard that it takes significant training to use effectively. Among contractors who use EnergyPro regularly, some believe that it is adequate for the job and saves time by allowing energy modeling, something that they had not used before.
- Other contractors, especially those who are highly trained or who complete a larger number of jobs, note that EnergyPro is highly inaccurate in some areas—overestimating some insulation, underestimating air sealing, incorrect weather assumptions within climate zone borders, etc.
- Contractors who have sufficient resources often use additional modeling software, such as ReCurve, as a sales tool, since (unlike EnergyPro) it can produce an energy-audit report that is easy for customers to understand.

Table 62: Contractors' Quotes on EnergyPro

Contractor Type	Quote
Non-Participating	"I don't feel comfortable about doing one of these jobs without mentoring, even though I am BPI certified and have gone to the EUC workshop. The training I have is fine, but it doesn't cover a lot off issues on the ground, like dealing with various types of appliances. Also, I'm not familiar with EnergyPro software. I know I need it, but I've never used it or been taught how to do it, even though I have been through the EUC workshop. I want to go to more trainings, but they are far away and don't occur very often."
Low-Volume	"It takes a lot of guesswork out, saves time from doing it manually. It does take a long time to learn."

Contractor Type	Quote
Low-Volume	Doesn't model air-infiltration well, which is one of the BPI standards. That would allow us to make a better sell to the customers.
Low-Volume	Doesn't allow input of current usage. Which would be useful to sell the job to the customer.
High-Volume	"We have to tweak EnergyPro to get results, especially for more advanced measures that don't fit in the model."
High-Volume	"Climate zone borders are tricky, since it can use the average" home in that area, but the difference between an "average" home and an actual one can be dramatic"
High-Volume	"We use ReCurve to create a report to show to the homeowner. It includes pictures and homeowners can see what is going on".

5.8.5.4. Floating Rebates

Contractors we interviewed typically do not float the rebate for participants, but the few who do float rebates believe that it encourages participation. Those who do not currently float the rebates for their participants also believe that doing so would increase participation. Finally, most of these contractors are interested in getting a loan from the utilities to be able to float rebates, however some are concerned about EnergyPro modeling and how it could impact the loans.

When asked if floating rebates is helpful in recruiting customers to the program, one contractor said:

Yes, as long as there is some assurance. Sometimes EnergyPro misses something, and the rebate is not as large as it was assumed. When that happens, we are stuck with the smaller rebate.

– Low-Volume Contractor

5.8.5.5. Premium Incentives

Contractors expressed several specific views about additional incentives:

- Contractors believe that, while the available rebates are attractive to customers, they are often not enough to attract customers who wouldn't be able to afford the measure upgrades without the rebates. The additional supplemental rebates available to residents of Los Angeles County are popular, and contractors see them as making a significant difference in their ability to sell jobs.
- In general, contractors strongly support subsidized energy audits. In areas where these subsidies are available, contractors have received significant leads from these programs. However, a contractor's schedule fills up with low-profit-margin (or loss-leader) energy audits for customers who never intend to make improvements when the audit is paid for completely. Therefore, many contractors would like audits to be subsidized partially, not fully.

- In some lower-income areas, such as Fresno or San Bernardino, local programs offer free audits through a single dedicated audit contractor. These areas have chosen to offer free audits through the local government to help incentivize low-income residents to make any kind of energy-efficiency improvement (not-necessarily through the program).

Table 63: Contractors’ Quotes about the Impact of Premium Incentives

Contractor Type	Quote
Low-Volume	"Upfront assessment cost is prohibitive. A lot of leads were a result of CHF, which is over."
Low-Volume	"Free assessments don't attract projects."
High-Volume	"Additional rebates from LA County. The rebates are so huge."(In response to what messaging motivates customers)
High-Volume	"We have fortunately had a rebate for assessment work, for a short amount of time, probably the last six months or so, and that's been a real boon because you can tell people about the program and suggest that they get this assessment, which everybody needs anyway and actually get the cost of that covered. We work with a couple [assessment subsidizing groups]. In Mendocino county it's Ecology Action, and Sonoma County its Sonoma county energy independence Program (SCEIP). Both of those rebates are ending at the end of the month though."

5.8.6. Key Takeaways

- Contractors are satisfied with the program overall, though SCE’s contractors are slightly less satisfied than PG&E’s.
- The program is successful in raising awareness about and communicating the value of the whole-house approach, and in providing enough demand to justify hiring more employees.
- High-volume contractors found that door hangers and flyers in targeted neighborhoods are effective. Low-volume contractors found the EUC website to be effective. However, low-volume contractors may be using the website for leads but not encouraging program participation. Therefore the IOUs should continue to require contractors to submit at least one job within 12 months in order for a contractor to be listed on the EUC website.
- A number of process-related challenges affect contractor satisfaction—the paperwork required, application delays, the test-in structure, and rebate-turnaround time.
- Two-thirds of contractors (non-participating, inactive, and low-volume contractors) mentioned they had jobs in 2011 that would have qualified for the program, but chose not to send them through the program. Some claim that smaller HVAC and insulation contractors are “selling against the program”.
- Nearly all participating contractors intend to promote energy efficiency to their customers, and they feel a similar level of responsibility to save energy at their own home as they do in their profession.

- Most customers who qualify for the Basic Upgrade also qualify for the Advanced Upgrade and can get a larger rebate. Contractors dislike doing Basic Upgrade jobs because the size of the job is not worth the paperwork or testing.
- Financing plays a key role in their ability to sell upgrades to customers.
- Some believe EnergyPro is adequate and saves time by allowing energy modeling. However, high-volume contractors note that EnergyPro is inaccurate in some areas.
- In general, contractors strongly support subsidized, though not free, energy audits.

5.9. Contractor Training Assessment

This section presents the findings of the contractor training assessment. This assessment focused on the training provided by SCE to its EUC contractors.

5.9.1. Training-Relevant Contractor Characteristics

The contractor survey revealed that most contractors have 4 to 15 employees, with an average of 9, a minimum of 0 (a one-person company), and a maximum of 50. The contractors perform audits, repair and install HVAC equipment, and work with lighting, windows and doors, insulation, and paint. Some also install solar equipment and provide plumbing, remodeling, and new-construction services.

The contractors surveyed had between 1 and 12 BPI Building Analysts on staff, with an average of 4.

The contractors had mixed feelings about BPI certification. Many suggested that it does not fully prepare them to succeed in the EUC program. Many said they would benefit more from hands-on training and a greater focus on energy savings and performance, like that offered by HERS (Home Energy Rating System).

Most surveyed contractors received BPI training from CBPCA²² (about 40%) or Everblue. Several contractors are themselves BPI trainers, and train their own staff.

- An average of four staff per contractor attended the Participation Workshop. Many commented that the session provided a good factual overview, but little practical help with participating in the program.
- After attending the Basic Upgrade training offered by the EUC program, 60% felt sufficiently prepared.
- The EnergyPro training was, in general, well received; some commented that the training would benefit from more detail regarding HVAC systems.

²² CBPCA (California Building Performance Contractor Association) is a “trade association that develops, trains and promotes whole-house energy-efficient retrofitting for contractors and professionals in the building performance industry.”

Other experience cited by the contractors includes:

- About 25% have been involved in HVAC Quality Installation jobs.
- About 60% have received some type of formal HVAC load-sizing training.
- About 30% have received Job Reporting Template (JRT) and EnergyPro mentoring.

5.9.2. Participation Workshop

The training to qualify contractors for the EUC program begins with the two-hour Participation Workshop, which is required for at least one person from each contractor. Contractors may either attend an online webinar, or attend the workshop in person. We attended the online Participation Workshop webinar on December 15, 2011. This webinar was conducted by two instructors—one from ICF and the other from BKi. In our opinion, the instructors were very knowledgeable and provided a high-quality presentation.

The primary purpose of this workshop is to orient contractors to the requirements and features of the EUC program. This workshop provides an overview of the program and its goals, a description of the scope of the work, information about marketing and sales support, and an explanation of participation requirements. It also describes how contractors can enroll in the next available training classes.

The agenda for the presentation we attended was:

- What is Energy Upgrade California?
- Incentives and Requirements
- Contractor Eligibility Requirements
- Home Performance Contracting Training
- Contractor Support
- Sales and Marketing
- Next Steps

The Participation Workshop provides a very good “pitch” for the EUC program. This workshop served well to introduce contractors to the EUC program and present a concise factual overview of the program. Essentially, it meets the program requirements. One weakness is that it could integrate more practical help getting contractors started with the program.

As with many of the training components of the EUC program, the webinar version of this session consisted of a PowerPoint presentation with two presenters. There was no interaction with the online participants, other than occasional questions presented online to the contractors about particulars with their businesses.

To the extent the session encouraged participation in the EUC program, we can say the materials supported behavior change. However, there were no job aids or worksheets to help in taking action. This workshop did include motivation to action by describing the program’s

benefits for contractors and how the training and the program both focus on the needs of contractors.

To some extent, this workshop applied-adult learning principles and practices, such as presenting a contractor-perspective orientation and a description of the usefulness of the session. However, there were no interactive activities, practice, or application, and there were no formal training objectives. We derived objectives from the content and concluded that they meet the program requirements.

In general, there should be discussion about expectations of contractors regarding the degree of thoroughness required by the EUC program. Specifically, the presentation lacked details on expectations of the contractors regarding job processing, i.e., the incentive reservation form, incentive application forms, reporting, EnergyPro, documentation, and others. Contractors should be informed about the modeling requirements of the program and that they will need to purchase and use EnergyPro software.

The presentation also lacked details about the level of rigor required by the program for Quality Assurance (determining whether products and services meet required quality levels) and Quality Control (determining whether processes and tests performed meet program protocol requirements). It also did not mention that there would be on-site inspections of the contractors' work, and that the work would be compared to the program standards.

5.9.3. Basic Upgrade Training

The Basic Upgrade home-performance training is mandatory for contractors who are not certified by the Building Performance Institute, Inc. (BPI), and who want to participate in the EUC Basic Upgrade jobs. It is not mandatory for businesses who have a BPI-certified Building Analyst on staff. The intent of this training is to give contractors the skills and knowledge required to perform home upgrades and effectively implement the Basic Upgrade measures.

The training we reviewed is titled “Basic Training, Energy Upgrade California,” a three-day course developed by the California Building Performance Contractor’s Association (CBPCA). This course includes one day in the classroom and two days of in-field practice. ICF contracted with CBPCA to provide the Basic Training.

The training is intended for contractors entering into the building-performance-construction industry, regardless of their experience level. However, to participate in the EUC program, contractors must be licensed California contractors, such as a General B, C-2 or C-20. After contractors attend and pass the course, their names are added to the online list of Basic Upgrade participating contractors.

This course covers best-practice remediation skills, house-as-a-system concepts, basic building-science training in the building envelope (e.g., insulation), duct sealing, combustion testing, and specific skills required to survey a home. The materials cover testing, inspecting, surveying a home’s systems for energy consumption, testing indoor air quality, and assessing building durability. Participants also learn how upgrades will benefit occupants’ health and energy costs.

The sections of the Basic Training course are:

- Overview of Basic Training
- The Occupant Interview
- Home Site Inspection
- Combustion Safety and Worker Safety
- Envelope Air Tightness and Blower Door Testing (Infiltration)
- Ventilation
- Insulation and Air Barrier Performance
- Distribution Systems (Ducts)
- Appliances and Water Heater
- BPI – Building Analyst Professional – Technical Standards
- BPI – Envelope Professional Standards
- EUC Utility Partnership and Website Information

We did not attend this class, but assessed it by reviewing a hard copy of the training materials (a student workbook), which consisted of reproduced copies of the class PowerPoint slides and reproduced copies of BPI Technical Standards documents.

Of the Basic Upgrade program measures (air sealing, attic insulation, duct sealing, hot water pipe insulation, combustion appliance safety testing with installation of a CO monitor), the training covered all but one. We found no content on the thermostatic shut-off valve (which helps reduce waste by controlling hot water until you are ready to use it).

This training generally meets program requirements. Given that two of the three days are in the field, we can assume students have opportunities for practice and would be able to perform the required EUC Basic Upgrade tasks to an acceptable degree after attending the training.

To the extent this class encouraged participation in the EUC program, we can say the materials supported behavior change. However, there were no job aids or worksheets to help in taking action. This class did include motivation to action by describing the benefits for homeowners of the program measures.

To a small degree, this workshop applied adult-learning principles and practices, such as presenting a contractor-perspective orientation and a description of the usefulness of the session. However, there were no documented interactive activities, practice, or application. Although there were examples and stories that connected new learning to the participants' prior learning and experience, the classroom materials only provided a single instructional method: lecture.

There were no formal training objectives. The objectives we derived from the content mostly meet the program requirements. The only content we received regarding training objectives was a Basic Training course outline, which simply listed the high-level content headings. This

class did have an organizing plan, presented in the workbook as class organization and class schedule. There was a good match of training objectives (derived) with the Basic Upgrade measures, (except, as mentioned above, there was no training for low-flow showerheads with thermostatic-activated flow-restriction valves). We assumed some hands-on practice occurs during the two days in the field.

Basic Upgrade jobs require pre- and post-upgrade duct-leakage and blower-door tests. The workbook contained PowerPoint slides that introduced the blower door, but we did not see any specific hands-on training on this tool, or instructions for doing the home-performance tests. We assume the blower door was demonstrated in the field.

In the Basic Upgrade class materials, some sections have advance organizers (a tool used by training developers that helps the learner recall and transfer prior knowledge to new information being presented) that are repeated in the training with the current topic highlighted. The Basic (and Advanced) Upgrade class has several “pop quizzes” but the correct answers are not documented. We assume the instructor reveals the correct answers in the class and students are instructed to write them in their workbooks. In addition, the pop quizzes were on content that was not in the written text of the workbook. There is content on customer relations (the “Occupant Interview”), but there was no documentation of practice or exercises for these skills.

For this class, we recommend incorporating worksheets that the students can use in the field, documentation and review of hands-on practice in all of the training modules, and methods for demonstrating proficiency, e.g., identifying asbestos and measuring insulation.

5.9.4. Advanced Upgrade Training

To implement the EUC program Advanced Upgrade measures, a contractor must have at least one person on staff with a BPI Building Analyst certificate. SCE offers the training that contractors need to prepare for the BPI certification exam and to become qualified to participate in the EUC program.

BPI is a national organization that describes itself as “a standards development and credentialing organization for residential energy efficiency retrofit work” and states that they help “support programs through professional certification, contractor accreditation, and quality assurance services.”

BPI’s home-performance training prepares students to take the BPI certification exams and is designed and presented by independent third-party training organizations. BPI supports training through a network of affiliate organizations, but BPI does not endorse or approve the specific training.

There are several BPI “designations” for different types of certifications. The BPI-Building Analyst is the type relevant to contractor eligibility for the SCE EUC program. The description of Building Analyst is “go beyond a traditional energy audit to perform comprehensive, whole-home assessments, identify problems at the root cause and prescribe and prioritize solutions based on building science.” Contractors can choose one designation, or all of them. The BPI-

certified professional designations are based on house-as-a-system fundamental building science.

During this assessment, we have found that being a BPI-certified Building Analyst does not necessarily guarantee the skill set required succeed in the EUC program. One reason is that BPI certification can be obtained with no formal training—an individual only needs to pass the certification exam.

Another reason is that there are several dozen third-party versions of the BPI home-performance training delivered at different venues in California and throughout the U.S. The quality and depth of this training varies widely. The training can be delivered in a classroom and in the field, or presented online for those who prefer self-instruction. Total training time ranges from 0 to 12 days in the classroom and in the field.

These examples demonstrate the variety of BPI Building Analyst (Energy Auditor) training:

- The 12-day version offered to SCE contractors by the California Building Performance Contractors Association (CBPCA).
- A 3-day online course
- A 5-day course presented by CleanEdison (Building Analyst Training)
- A 6-day course offered by ICF International
- 5-day course presented by Everblue Training Institute (Everblue Building Analyst & Envelope Professional Training)
- 6-day course presented by Center for Sustainable Energy California

Specific shortcomings of some of the BPI training include insufficient practice for EUC fieldwork, and a loose alignment with some EUC program measures (air sealing, weatherization).

If contractors have a Certified BPI Building Analyst either on staff or under contract, they do not need to attend any other training, and can enroll with the EUC program and implement either the Basic Upgrade or Advanced Upgrade measures.

Because there are many different versions and given the scope of this assessment, we could not evaluate all BPI training. For this assessment, we reviewed the Advanced Upgrade training offered by SCE.

The Advanced Upgrade BPI-certification training offered by SCE is titled “Home Performance with ENERGY STAR®.” This 12-day training developed by CBPCA provides both in-class and in-the-field sessions, and emphasizes how a house is an integrated system.

This course covers the content found in the 3-day class, with additional content on the same topics. Contractors arrange to attend the training through ICF and the training is delivered by CBPCA.

This course has four levels, each a three-day session.

- **Level 1: Introduction to Home Performance**, covers building science, home performance, and BPI standards as background for home-performance testing. Topics include identifying

duct leakage, improving HVAC equipment airflow and efficiency, and balancing and mixing room air quality. Level 1 also covers pre-diagnosis tasks, example customer-interview questions, site inspection, sketching the home layout, a combustion-safety-testing worksheet, and more.

- **Level 2: Introduction to Field Testing**, includes two days of a hands-on training in a test house and one day of classroom work. Content includes a continuation of building-science principles and covers best remediation practices, indoor air quality (IAQ), lighting, combustion safety, insulation diagnosis, and quality insulation installation. In this session, students practice with a blower door, duct-leakage tester, and an infrared camera.

In Level 2, instructors provide several printed technical documents that describe certain home-improvement testing procedures and protocols:

- “BPI Technical Standards for the Building Analyst Professional”
 - “Testing In & Testing Out Requirements for BPI Accredited Contractors,” which describes all of the BPI testing requirements
 - “BPI Technical Standards for the Envelope Professional”
 - “BPI Technical Standards for the Heating Professional”
 - “BPI Technical Standards for the Air Conditioning and Heat Pump Professional”
 - “Combustion Safety Test Procedure for Vented Appliances”
- **Level 3: BPI Review and Written Test**, is conducted in the classroom. Most of the session (two and one-half days) reviews the material covered in Levels 1 and 2. On day three, students take written exams to qualify for certifications as Building Analyst, Envelope Professional, Heating Professional, and A/C Heat Pump Professional. (This is the first of two tests required to become BPI certified. Participants can advance to Level 4 after passing the written test.)
 - **Level 4: BPI Hands-On Field Practice**, is conducted entirely in the field. This session presents a review of the BPI technical standards and processes in preparation for the BPI exams. Students practice with the blower door, manometer, and combustion analyzer, and review the combustion-safety diagnostics and action levels.

We reviewed the training materials (student workbooks), which primarily consisted of reproduced copies of the class PowerPoint slides, home-diagnostics worksheets, and reproduced copies of BPI Technical Standards documents that describe certain home-improvement testing procedures and protocols. We did not attend this class, but we assessed it by reviewing the materials. This 12-day course provides a solid foundation for Advanced Upgrade work, an adequate combustion-safety curriculum, and some hands-on practice with diagnostic tools.

This CBPCA training fits fairly well with the EUC combustion-safety testing, but has some shortcomings. For example, this training does not seem to address the safety risks brought about by oversealing older homes, whose kitchen fans may not exhaust to outside. It may help to create program-specific standards and protocols based on BPI training and integrate the

standards offered by the AGA (American Gas Association), NGAT (Natural Gas Appliance Testing), and accepted weatherization techniques.

The EUC program requires that all Basic Upgrade measures be implemented as part of each Advanced Upgrade job. As stated in our review of the Basic Upgrade training, all of the Basic Upgrade measures were covered except the thermostatic shut-off valve.

This training generally meets program requirements. Given that half of the 12 training days are in the field, we assume students have opportunities for practice and some of the more experienced contractors would be able to perform the required EUC Advanced Upgrade tasks to an acceptable degree after attending the training.

However, by itself, and even with the other required mentoring sessions and online training, the BPI training does not provide the extensive hands-on experience required to adequately prepare many contractors to perform the Advanced Upgrade measures and fieldwork. Contractors new to this field have difficulty and require additional practice performing the required tasks. Many contractors who may not have attended this training have mentioned the need for additional training to address some of the performance gaps, e.g., occasional failure with air sealing, attic insulation, duct sealing, hot-water-pipe insulation, combustion testing.

To the extent this class encouraged participation in the EUC program and described the many opportunities for contractors, we can say the materials supported behavior change. However, there were no job aids or worksheets to help take action to this end. As with the Basic Upgrade training class, this class included motivation to action by describing the benefits for homeowners of the program measures.

To a small degree, this class applied adult-learning principles and practices, such as presenting a contractor-perspective orientation and describing the usefulness of the session. However, as with the Basic Upgrade training, with the exception of a home-diagnostics worksheet, there were no documented interactive activities, practice, or application. Although there arguably were examples and stories that connected new learning to the participants' prior learning and experience, the classroom materials only provided a single instructional method: lecture.

There were no formal training objectives. Objectives we derived from the content mostly meet the program requirements. This class did have an organizing plan, presented in the workbook as class organization and class schedule. Generally speaking, there was a good match of training objectives (derived) with the Advanced Upgrade measures.

This training could benefit from the addition of documented hands-on practice of field-testing procedures and protocols, such as installation quality of insulation, identification of asbestos, and others. We assume some hands-on practice occurs during the six days in the field. We also recommend practice with program-specific deskwork (entering data in forms, energy modeling), and remedial training for specific performance gaps (asbestos, air sealing, etc.).

Many Advanced Upgrade jobs require a pre- and post-upgrade duct-leakage and blower door tests. The workbook contained PowerPoint slides that introduced the blower door and pressure concepts, but we did not see any specific hands-on training on this tool or instructions for doing the home-performance tests. Again, we assume the blower door was demonstrated in the field.

In the Advanced Upgrade class materials, some sections have advance organizers that are repeated in the training with the current topic highlighted. The Advanced Upgrade class has several “pop quizzes” but the correct answers are not documented. We assume the instructor reveals the correct answers in the class and students are instructed to write them in their workbooks. In addition, the pop quizzes were on content that was not in the written text of the workbook.

For the most part, we found no documentation of practice or exercises for many of the skills covered in the class. However, there is a well-designed data-collection worksheet with pages for Pre-diagnosis Tasks, the Customer Interview, Site Inspection (including a place to sketch the house), Combustion Safety Testing, Infiltration (Envelope Tightness), Ventilation, Insulation and Air Barrier Performance Inspection, Heating Equipment, Cooling Equipment, Ducts, Appliances, and Lighting.

For this class, we recommend incorporating documentation and review of hands-on practice in all of the training modules, as well as methods for demonstrating proficiency. Also, many photographs of such things as insulation, ductwork, weather stripping, asbestos, lack explanations of what is important or memorable about the situation. We assume the instructor describes what is important to remember, and that the students write it down in their workbooks.

5.9.5. Mandatory Mentoring

Mandatory mentoring, also referred to as mandatory on-the-job mentoring or hands-on field mentoring, is conducted in at a test home for teaching home-performance diagnostics. These mentoring sessions are intended to observe the current knowledge and skills of the contractors, and not to provide training.

After qualifying for and enrolling in the EUC program, mandatory mentoring sessions are required of one person from each contractor for both program levels (Basic and Advanced). Three sessions are required, and must be completed within 30, 60, and 90 days, respectively, of being accepted into the program.

Although these sessions are often referred to as training, there are no formal training materials. These sessions include observation and evaluation of contractors, and some small degree of feedback. Contractors are given a score on their work.

Each mentoring session covers fieldwork and data collection, Job Reporting Template (JRT) with job processing, and EnergyPro modeling (for Advanced Upgrade contractors only). For the fieldwork and data collection mentoring, the assessment is based on BPI standards and the program’s QA and QC inspection assessment. The JRT/Job processing and EnergyPro mentoring is pass/fail.

The mentoring sessions are typically conducted in small groups of four to six contractors. Instructors are CBPCA-trained whole-house experts. The mentoring is designed to review program-documentation requirements and software use. The intent of the mandatory

mentoring sessions is to provide an opportunity to ask questions and clarify procedures and the proper methods for completing the work.

Because this is not formal training, there are no workbooks, training objectives, or exercises to be reviewed or assessed.

Many contractors claim to want more mentoring, but too few request appointments. We recommend making it as easy as possible for contractors to request and receive mentoring. We realize that mentors are busy and scheduling is an issue. Contractors consider some mentoring sessions more useful than others. In-person EnergyPro and JRT sessions rated well, but field sessions got mixed reviews.

One possible idea is to use remote-desktop software for JRT or EnergyPro mentoring to increase access and flexibility. Also, the program could offer contractors field training or consultation when they submit some of their first jobs.

We recommend developing a standardized mentoring design and evaluation protocols. We also recommend collaboration between ICF and RHA to develop the process and/or specific reference materials for use in mentoring. ICF and RHA could jointly develop and co-teach training for internal contractor “QA/QC inspectors” and/or designated program mentors. In addition to one-on-one evaluation mentoring, provide remedial training adapted to individual contractor needs, based on QA/QC findings.

5.9.6. Embedded Mentoring

Part of the EUC program embedded mentoring, in which an ICF representative attends Advanced Upgrade training sessions and supplements the training with EUC program-specific content. This is presented as PowerPoint slides with content and purpose similar to that found in the Participation Workshop, but with additional content related to the EUC program.

These presentations emphasize that contractors attending the SCE Advanced Upgrade training are required to be signed up with the EUC program, guide the contractors through filling out program forms, and provide a better understanding of the program requirements, rebate details, job processing, and other tasks that are part of the program. The purpose is not only to prepare contractors for the BPI exam, but to bring them up to speed on the EUC program as well.

The embedded mentoring sessions in the Advanced Upgrade BPI training serve their purpose well. However, there were no formal training objectives, and these presentations could benefit from applying instructional-design and adult-learning principles.

5.9.7. Online Learning Center Training

The EUC program’s Online Learning Center offers on-demand, self-paced training for contractors, and helps fill a need for targeted training. Participation in this training is mandatory for at least one person from each contractor. The Online Learning Center went live

in the first week of January 2012, and the training was developed by Bevilacqua-Knight, Inc. (BKl).

The purpose of the center is to provide a means of documenting the proficiency of contractors in certain tasks, and to provide targeted content for specific mentoring and training. In-house contractors might also find it useful to assign specific online courses at the center to staff members.

Recent program requirements state that the training must be completed within 30 days of acceptance as a Participating Contractor, and contractors must have a minimum score of 85% on all modules. “A participating contractor will not be allowed to submit their first job into the program until this is accomplished.”

Currently, there are four required online courses, and each course lasts about 30 minutes. The EUC Contractor Handbook contains more details about the courses.

- **JRT Administration Course** provides a detailed explanation of how to properly complete and submit the JRT (Job Reporting Template). This course presents a series of short videos that explain how to fill in the various spreadsheet tabs. Contractors can download the Excel spreadsheets from the Contractor Resources Page on the EUC website. There are separate templates for the Basic Upgrade and the Advanced Upgrade measures. This information is used to complete the Reservation and Application forms.
- **Energy Modeling Course (EnergyPro)** provides EnergyPro modeling training, and is presented as multiple video modules.
- **Job Processing Course** provides instruction on completing data-submission forms, job processing, and work-quality standards. Application and reservation forms are fairly complex and must be completed accurately.
- **Combustion Safety Course** provides remedial combustion-safety training.

Exams built into the courses help document contractor proficiency and identify areas that need to be reviewed. Trainees must pass the final exams to participate in the program.

Online quizzes and exams include several types of questions:

- Select one (multiple choice)
- Select all (choose all that apply)
- Matching
- True/false (exams only)
- Ranking (exams only)
- Short answer (exams only)
- Likert scale (exams only)

Other online resources for contractors include:

- SCE/SoCalGas QA/QC Inspection Guidelines

- EnergyPro Handbook
- EUC Contractor Updates (monthly email update on the latest program developments and information)
- Student User Manual (instructions for using the Learning Center, signing up for courses, taking the courses and exams, etc.)

The online materials are a library of helpful, self-paced classes that are useful to BPI-certified contractors who did not attend the 12-day CBPCA Advanced Upgrade course. For example, the Combustion Safety Course provides a review for all contractors regardless of certification status or experience level.

To a great extent, each of these classes directly corresponds to some of the discovered performance gaps. For example, some contractors have had difficulty filling in the JRT forms or application forms accurately. The Job Processing Course covers these topics. Other contractors are not properly testing combustion safety and are not passing QC inspection. The online Combustion Safety Course provides remedial training and can address this performance gap.

These Online Learning Center courses are well designed and presented. There are short videos that explain and demonstrate certain tasks, such as filling in Excel spreadsheets or using the EnergyPro modeling software. An advantage of videos is that they can be viewed several times if necessary.

Another notable feature of the training is the embedded quizzes, which are interactive and a test comprehension before moving on to the next topic. The built-in exams help to document contractor proficiency and identify areas that need to be reviewed. There is a good variety of types of online quizzes and exams.

These courses support desired behavior change and indirectly motivate students to take action to improve their understanding of certain topics. The training incorporated adult-learning features such as the built-in quizzes, which provide feedback. Because the materials are presented online, there was no student workbook. We did not receive formal training objectives for these courses, though there may have been some. We derived some objectives from the content.

For the Online Learning Center, we have several recommendations:

- Add the capability to record exam scores for multiple staff members per contractor, for use as an internal training tool; there is currently only one score per contractor.
- Consider expanding the topics covered to include a series of “Field Inspection Review” modules for items such as BPI processes and standards, reviewing building measurements (windows, floor area, etc.), identifying asbestos, and assessing insulation and weatherization.

Suggest to contractors that they assign an in-house person as the EUC “Internal QA/QC Inspector.” This person should be a BPI-certified individual who would be responsible for attending all program-required training and participating in the required initial mentoring sessions. The in-house “guru” would direct company staff to complete the learning center

training modules or request mentoring, and would perform internal training, as needed, for the contractor's staff. This person would also observe the work of others at his business and approve the work.

5.9.8. Contractor Performance Gaps

Training design typically looks at the gaps in the performance of persons being trained to perform certain tasks. For this assessment, interviews with key program staff, the contractor surveys, reviews of job paperwork, and associated QA and QC findings uncovered performance gaps. We cannot conclude that these performance gaps are directly caused by inadequacies in the training materials we reviewed. However, many of these performance gaps can likely be addressed by remedial training or observational review. But some performance gaps are caused by problems with the structure and procedures required by the program itself.

Performance gaps fall into three categories:

- **Assessment Gaps** are problems with identifying, recognizing, or measuring existing conditions at a job.
- **Implementation Gaps** are problems with implementing or executing the energy-related measure in the job.
- **Procedural Gaps** are problems related to following the administrative or procedural protocols of the program.

5.9.8.1. Assessment Gaps

Characterizing Insulation

One of the most common findings is that contractors often inaccurately measure attic area, the quality of insulation coverage, or the R-value of insulation.

Some contractors have difficulty in accurately judging the quality of coverage as poor, fair, or good. In addition, the locations at which they measure insulation depth vary and can affect the estimated R-value. This issue delays jobs and affects estimates of energy savings.

Contractors are failing to specify insulation R-values for walls, buried ducts, and occasionally floors, as required by the EUC program. One possible reason for this issue is that the areas where required measurements are taken can be hard to reach or difficult to measure. Also, some contractors may not have experience taking these measurements. During QC, the program notifies contractors of required insulation measurements or descriptions and the job is put on hold while the contractor addresses the issue.

To help mitigate this problem, ICF has provided training at contractor meetings that educates contractors in methods for measuring insulation and reasons why measurements may be derated in QC. The program has established acceptable levels of variance between contractor and QC measurements to help minimize job delays.

Recognizing Asbestos

A common finding is that contractors have not properly identified potential asbestos-containing materials. If they find asbestos, contractors cannot test ventilation (using blower doors or duct-pressurizing instruments) and other measures. Common locations where asbestos goes unidentified are the air-duct boots and paper wrappings.

Contractors can usually identify the asbestos in cardboard ducts and transite pipe. (Transite flue pipes are made of a fireproof composite of asbestos cement. If broken, the asbestos can be released.) However, contractors often miss asbestos in air-duct “boots” (where the duct and ventilation grille are joined) and wrappings. Also, some rice paper looks very similar to asbestos—some of the rice paper contains asbestos, some does not. Occasionally, improper asbestos remediation leaves a boot with asbestos in place or fails to remove the wrapping. Often, a single boot is left over from previous work located in an easy-to-miss section of the ductwork.

This issue risks the safety of residents, delays jobs, and affects estimates of energy savings.

Recognizing this problem, ICF has provided targeted training for contractors at some of the monthly contractor meetings, including presenters from the Air Quality Management District as well as a certified asbestos consultant to educate the contractors on what asbestos is and what it looks like. The program QC staff uses safety letters to notify homeowners and contractors of hazardous situations. The job is put on hold until a certificate of abatement is provided.

Identifying Air Leaks

A common finding is that contractors fail to meet air-sealing requirements in the houses they are upgrading. If a house is not properly sealed and ventilation levels are high, the conditioned inside air is exchanged with outside air too often. The program requires a maximum of 0.35 air changes per hour (ACH), which is the number of times the entire air volume within the house is exchanged in an hour, or an improvement of at least 14% from an initial baseline value.

The lack of proper air-sealing can be caused by failing to detect air leaks, or improperly caulking or weather-stripping. Incorrect ACH readings may be caused by an improperly executed blower-door test. Failing to meet this requirement delays jobs and affects estimates of energy savings.

During QC, the program notifies contractors of a failure to achieve minimum air-sealing requirements, and puts the job on hold while the contractor addresses the issue.

Mismeasuring Building Envelope and Floor Area

Contractors commonly provide measurements for walls, windows, floor area, and total conditioned space that cannot be verified in the QC inspection. This issue affects estimates of energy savings.

Differences in values might be due to inexact measurements (particularly of irregular areas), or inaccurate estimation by the contractor.

During QC, the program provides modified values to the contractor who is given a chance to appeal.

Recognizing Inadequate Ventilation for Combustion Appliances

Many contractors are unfamiliar with the appropriate amount of combustion air volume (CAV) required to safely operate appliances. This is most often a problem with water heaters. Inadequate space for ventilation risks the safety of residents.

This is important for safety, but is not included in current BPI Building Analyst technical standards. Specifications for appropriate CAV levels can be found in Natural Gas Appliance Testing (NGAT) standards.

During QC, the program instructs contractors to establish an adequate level of combustion air according to NGAT standards, and may put the job on hold while the contractor addresses the issue.

Determining Efficiency or Capacity of Water Heater or HVAC Systems

Contractors occasionally incorrectly document the efficiency of domestic hot water (DHW) heaters, the Seasonal Energy Efficiency Ratio (SEER) of HVAC units, or the BTU ratings for furnaces. Incorrect values affect estimates of energy savings.

It is possible that contractors read these values from the nameplate incorrectly, inaccurately estimated them, or incorrectly recorded them during JRT data entry.

During QC, the program provides modified values to the contractor, who is given a chance to appeal.

5.9.8.2. Implementation Gaps

Oversealing Homes

Another less common finding is that contractors are sealing some homes tighter than is permitted by the ASHRAE Building Airflow Standards. In some cases, contractors do not properly identify the need for mechanical ventilation. For example, when contractors conduct blower-door tests, they compare the results to the standard requirements for ventilation. If natural ventilation is inadequate, the contractor must install or recommend mechanical ventilation to increase the ventilation to required levels. A home without the proper ventilation risks the safety of residents.

The recent emphasis on energy efficiency has led contractors and home builders to focus on sealing homes very tightly. However, even a tight home needs adequate ventilation for combustion safety, and low ventilation levels will increase combustion-safety risks.

During QC, the program refers contractors to the documents that describe the BPI requirements for mechanical ventilation, uses safety letters to notify homeowners and contractors of potential hazardous situations, and may put the job on hold while the contractor addresses the issue.

Substandard Combustion-Safety Testing

Some of the contractors are having difficulty properly testing gas combustion safety. A common finding is contractors test and pass water heaters and furnaces that our QC inspectors test and

fail. Specifically, spillage tests (tests to determine whether the venting is working properly) often fail under natural ventilation conditions as well as in the “worst case” (appliances are turned on, exhaust fans are turned off, and negative pressure created). CO levels measured by QC inspectors exceed the acceptable thresholds specified by BPI safety test procedures. These differences in test results may be caused by some contractors being unfamiliar with proper locations on appliances for taking measurements or how to set up combustion appliance zones for “worst-case” testing. This problem risks the safety of residents and delays jobs.

To achieve better results, the program is instructing contractors to carefully follow the testing steps provided in the QC inspection guidelines that are available from QA/QC (RHA). The BPI procedures provide step-by-step instructions for how to take measurements and at what reading levels further action is required. Contractors can refer to these documents in the field. During QC, the program uses safety letters to notify homeowners and contractors of hazardous situations, informs them if the appliance needs servicing, and may put the job on hold while the contractor addresses the issue.

Acting on Combustion Safety Risks

Contractors occasionally fail to recognize or act on combustion appliances with gas leaks, that are in disrepair, or that otherwise risk the safety of residents.

The contractors’ failure to take appropriate actions when unsafe conditions are present may be due to lack of knowledge on the part of the contractor, or the use of ineffective methods for testing for leaks.

During QC, the program uses safety letters to notify homeowners and contractors of hazardous situations, informs them if the appliance needs servicing, may give the contractor specific instructions for remedying the situation, and may put the job on hold while the contractor addresses the issue.

5.9.8.3. Procedural Gaps

Omitting Basic Upgrade Measures in Advanced Upgrade Jobs

Though contractors are now required to complete Basic Upgrade measures as part of Advanced Upgrade jobs, they commonly neglect to implement one or more of the Basic Upgrade measures, such as low-flow showerhead or pipe insulation. This delays jobs.

This problem may exist because contractors with experience installing only Advanced Upgrade measures are unfamiliar with Basic Upgrade measure, or they do not understand program requirements.

During QC, the program notifies contractors that they fail to meet program requirements for installing Basic Upgrade measures, and may put the job on hold while the contractor addresses the issue.

Entering Data in Program Forms

When entering data into the Job Reporting Template (JRT), Application, or Reservation forms, contractors commonly format the data incorrectly, commit typographical errors, enter

incomplete data, or omit pieces of data entirely. Common examples include utility service account numbers, job costs, and required signatures. Incomplete or erroneous data delays jobs.

One possible cause of this problem may be that the forms were completed by different people referring to different sources. Contractors must often supply the same information for multiple purposes, including the JRT, EnergyPro inputs, and the Application and Reservation forms. Contractors commonly fail to submit matching information, which can delay jobs and affect estimates of energy savings. Some errors in the JRT and forms can be expected—contractors must fill out forms that contain hundreds of individual data-entry fields.

The JRT requires a massive amount of data entry. For example, it requires a high level of detail regarding a home’s existing state, specifications and measurements regarding the upgrade work performed, and fields that seem unrelated to the work performed. The number of required fields related to work performed could be overwhelming on its own, but requesting data for unrelated things such as kitchen appliances or utility bill usage is a burden for contractors. Covering these additional fields in the training detracts from training on entering critical fields.

The Online Learning Center has training modules that provide instruction in the JRT and Job Processing. Monthly contractor updates have reported the most common errors, and have provided tips for entering data more accurately. JRT data entry has been streamlined with instant format checking within the spreadsheet, and instructions next to each field now help identify incorrect entries. The JRT now contains many helpful tables and calculation methods. Also, QA has been greatly streamlined, i.e., transferring QA responsibility to the QC contractor and allowing QC to begin while QA is in process.

5.9.9. Gaps in Training Topics

Although SCE’s EUC training activities are extensive, several important training topics are still not addressed. These are discussed in this section.

Comprehensive Envelope and Weatherization Standards

BPI Building Analyst certification focuses primarily on combustion-safety testing, and lacks sufficient standards related to effective home weatherization. This lack of comprehensive standards for weatherization contributes to lower installation quality and energy savings. Weatherization standards are not within the scope of the BPI Building Analyst Technical Standards, but are covered in the BPI Envelope Professional standards. RHA has filled gaps in BPI standards as needed to perform their inspections.

Typical Combustion-Safety Scenarios

The BPI training materials cover most safety and testing protocols well, but not all that might be found in homes. A lack of comprehensive combustion-safety standards contributes to inconsistency in training and mentoring, and confuses contractors about proper methods. RHA, as an experienced QA/QC inspector, provides guidance for some of these situations.

The BPI Building Analyst Technical Standards have not been significantly updated since 2005, and do not include procedures for certain combustion-testing scenarios as comprehensively as

American Gas Association (AGA) and Natural Gas Appliance Testing (NGAT) standards. Also, BPI does not cover many of the weatherization issues important to achieving high energy savings. RHA has filled certain gaps in the BPI training, which has improved consistency in testing protocols and has helped to define certain vague or incomplete testing requirements.

Instructions for Combustion Testing

Dozens of BPI certification classes are offered throughout the country. The EUC program only requires contractors to pass the BPI certification test to qualify to participate in the program. The quality and depth of the training varies greatly and the various versions are inconsistent. Often, inexperienced instructors teach incorrect testing methods.

For example, some versions of the BPI training have erroneously instructed contractors to ignore combustion appliances “outside of the building envelope,” have provided improper Combustion Appliance Zone (CAZ) testing methods, or have shown improper locations for taking measurements. The resulting misconceptions increase the likelihood contractors will fail to detect significant safety risks, add to contractor confusion, and can delay jobs.

ICF and RHA have tried to remediate issues stemming from inconsistent BPI training as jobs are submitted.

5.9.10. Gaps in Who Gets Trained

Our assessments also found important gaps in who was receiving training.

Contractors Certified Outside the Program Do Not Learn About Embedded Mentoring

Within the program-sponsored BPI training conducted by CBPCA, ICF injects “embedded mentoring” content, which contains program-specific information. Because many of the contractors receive BPI training elsewhere, they do not benefit from this content. This lack of program-specific training can lead to contractor confusion, a lack of preparedness, and delayed jobs. ICF and RHA have been attempting to remediate issues stemming from inconsistent BPI training as jobs are submitted.

Different Backgrounds Require Different Training

The contractor survey indicates that contractors need additional training. Suggested topics vary widely and include fieldwork topics such as combustion safety, weatherization, and insulation, as well as program “paperwork” training for EnergyPro, JRT entry, and Job Processing.

Each contractor, and their staff members, have different backgrounds and challenges in the program. The training needs vary based on their specializations and experience.

ICF’s implementation of the Online Learning Center was a big step toward delivering the targeted training that contractors need. The mentoring sessions provide another primary method of delivering targeted training.

5.9.11. Single Lead Trainer within Each Contractor

To date, the EUC program does not require that a single employee at the contractor’s business be responsible for attending all required training sessions, for educating and training company employees who are performing the work, and to be responsible for verifying and signing off on all the work done by other employees at EUC jobs.

Program management is currently considering a requirement that one individual from each contractor be designated as the internal QA/QC inspector and trainer. These internal inspector-trainers or “program gurus” would be required to attend and comprehend all program training.

This function will help improve the overall success of the contractor’s business, and can affect the overall quality of the work, particularly when multiple employees perform EUC tasks.

5.9.12. Communication Between QA/QC and Mentors

As a rule, there are few lines of communication between the program mentors and the QA/QC personnel. This has caused misunderstandings of certain program issues. For example, mentors have been unable to inform contractors why certain measures were denied, or why combustion safety tests have failed, why findings regarding insulation assessments are being de-rated, and why blower-door expectations are not clear.

As the program grows, more official program mentors will need to be trained by ICF. Program mentors would benefit from interacting with the QA/QC side of the program. Some channels of communication exist between program mentors and QA/QC personnel, but these channels could be strengthened.

5.9.13. Key Takeaways

This section summarizes the key takeaways from our assessment of SCE’s contractor training, which identify gaps in training.

Assessment Gaps

- Contractors often inaccurately measure attic, wall, window areas, floor area total conditioned space area, the quality of insulation coverage, or the R-value of insulation.
- Contractors often do not properly identify potential asbestos-containing materials.
- Contractors often fail to meet air-sealing requirements in the houses they are upgrading.
- Many contractors are unfamiliar with the appropriate combustion-air volume (CAV) required to safely operate appliances. This is most often a problem with water heaters.

Implementation Gaps

- A less common finding is that contractors are sealing some homes tighter than is permitted by the ASHRAE Building Airflow Standards.
- Some of the contractors have difficulty properly testing gas-combustion safety.

- Contractors occasionally fail to recognize or act on combustion appliances that leak gas, that need repair, or that otherwise risk the safety of residents.

Procedural Gaps.

- Though contractors are now required to complete Basic Upgrade measures as part of Advanced Upgrade jobs, they commonly neglect to implement one or more of the Basic Upgrade measures, such as low-flow showerheads or pipe insulation. This delays jobs.
- When entering data into the Job Reporting Template (JRT), Application, or Reservation forms, contractors commonly format the data incorrectly, commit typographical errors, enter incomplete data, or omit pieces of data entirely.

Gaps in Training Topics

- BPI Building Analyst certification focuses primarily on combustion-safety testing, and lacks sufficient standards related to effective home weatherization.
- The BPI training materials cover most safety and testing protocols well, but not all that might be found in homes.

Gaps in Who Gets Trained

- Within the program-sponsored BPI training conducted by CBPCA, ICF injects “embedded mentoring” content, which contains program-specific information. Contractors certified outside the program are not exposed to this embedded mentoring.
- Each contractor, and their staff members, have different backgrounds and challenges in the program. The training needs vary based on their specializations and experience.

5.10. On-Site Inspection and Testing

5.10.1. Results for Four PG&E Jobs

On-site inspections at four PG&E Advanced Upgrade job sites following the contractor’s submittals of final applications found significant problems in modeling, submitted savings, and safety. At two of the four sites, significant differences were found between the submitted building model and the actual building parameters. PG&E’s QC review had not identified these problems. Gas leaks not identified by the contractor were found at two sites. At one site, floor insulation was installed with exposed paper that is intended to be covered with sheetrock due to a fire hazard. House- or duct-leakage test results were significantly different in two cases. All measures were found to have been installed, and the quality of installation was generally good. Savings were re-estimated using EnergyPro and data collected during the inspection. We found that the savings percent had been overestimated by 10 to 23%. Table 64 shows the results of the findings and comparisons.

Table 64: On-Site Inspection and Modeling Results

	Percent Change in Percent Savings	House Leakage	Duct Leakage	Model Parameters	Measures Installed	Measure Quality	Safety
Site 1	-23%	Failed - inspector was unable to reach -50 pascals pressure; contractor reported successful test	Pass	Fail - significant differences were found in building layout	Pass	Pass	Pass
Site 2	-21%	Pass	Fail - leakage was more than double that submitted	Fail - significant differences were found in building layout	Pass	Fail - attic insulation not uniformly applied	Fail - gas leak found
Site 3	-10%	Pass	Pass	Pass - minor discrepancies found	Pass	Pass	Fail - floor insulation constitutes fire and mold hazard as installed; gas leak found
Site 4	-10%	Pass	Pass	Pass - minor discrepancies found	Pass	Pass	Pass

At one site, our staff found an apparent fire and mold hazard due to incorrect installation of floor insulation. Figure 14 shows pictures of these conditions.



Figure 14: Apparent Instance of Fire and Mold Hazard

5.10.2. Key Takeaways

- On-site inspections following the contractor’s submittals of final applications found significant problems in modeling, submitted savings, and safety.
- Gas leaks not identified by the contractor were found at two sites.
- House- or duct-leakage test results were significantly different in two cases.
- All measures were found to have been installed, and the quality of installation was generally good.
- We found that the savings percent had been overestimated by 10 to 23%.

5.11. Comparison of eQUEST and EnergyPro

This section documents the results of our comparison of eQUEST and EnergyPro. These two energy models were used to estimate energy use and savings for two homes where PG&E completed Advanced Upgrade jobs. We developed models based on billing data, data collected by the program staff, and an on-site inspection by a member of our team, after the job was complete.

Consistent with the procedures of the Whole-House Program, contractors used many default values to develop both the EnergyPro and eQUEST models. These values are based on typical conditions, not those observed for any specific home. Default values included schedules for lighting, appliances, and occupancy. The use of these default values limits the ability of either model to accurately estimate the energy use of any particular home. However, program staff would have to collect substantially more data for a home to avoid using these default values.

The EnergyPro residential module, used in this analysis, does not provide outputs with the same level of detail as eQUEST. A lower level of detail means that the effects that specific inputs have on the model cannot be fully understood. This also affects confidence in the model results.

5.11.1. Pre Period Energy Use

We developed a baseline model for each home using equivalent inputs to eQUEST and EnergyPro. The estimates of energy use for these models were compared to total annual energy use (expressed as MMBtu per square foot of floor area) and to monthly energy use for electricity (kWh) and gas (therms). For this comparison, we selected an annual billing period that best represented the conditions before the Whole-House job. For the first home, Table 65 shows the comparison of annual billed use to model estimates for each model. Figure 15 compares electricity use by month and Figure 16 compares gas use by month. The annual use estimated using EnergyPro was 169% higher than utility bills, while eQUEST was 226% higher. This difference is mainly due to a greater sensitivity of eQUEST to duct leakage.

Table 65: Site 1-1057 Energy End Use Comparison

	kBtu / Square Foot-Year	% of Utility Bills
Utility Bills	47.5	—
EnergyPro	80.3	169%
eQUEST	107.3	226%

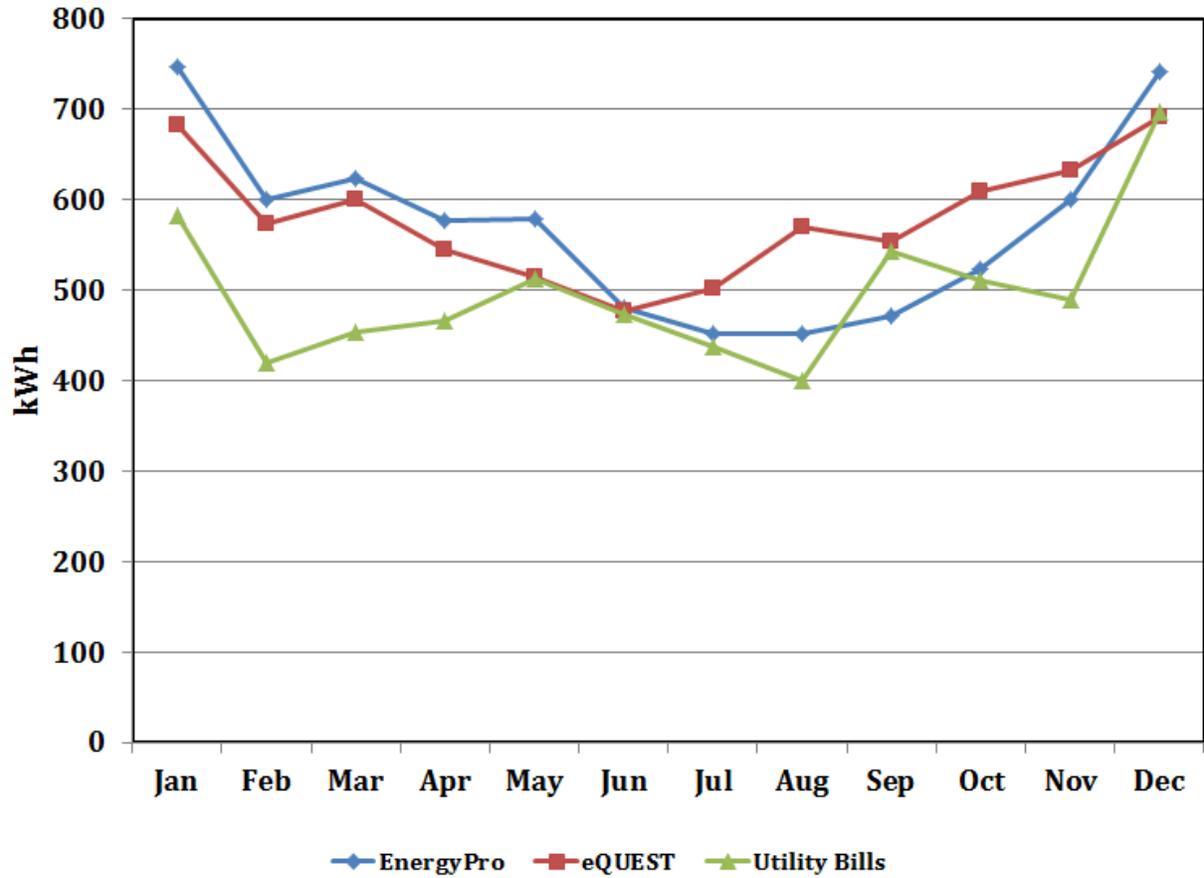


Figure 15: Site 1-1057 Monthly kWh Comparison

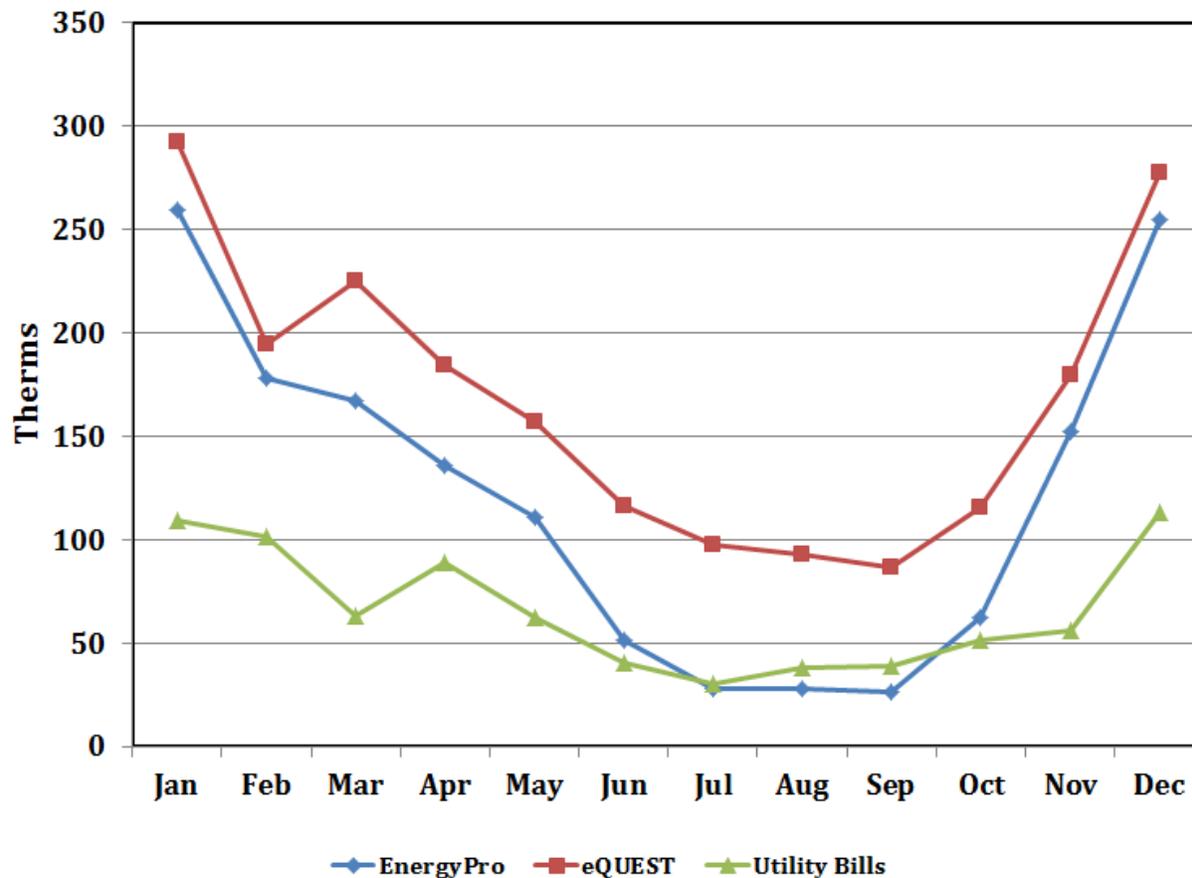


Figure 16: Site 1-1057 Monthly Therms Comparison

Table 66 compares annual use for the second home. Figure 17 and Figure 18 compare monthly electricity and gas use, respectively. The annual use estimated by EnergyPro for the second home was 136% higher than utility bills, while eQUEST was 156% higher, mainly due to higher space-heating energy relative to EnergyPro.

Table 66: Site 2-1058 Energy End Use Comparison

	kBtu/Square Foot-Year	% of Utility Bills
Utility Bills	46.8	---
EnergyPro	63.6	136%
eQUEST	73.1	156%

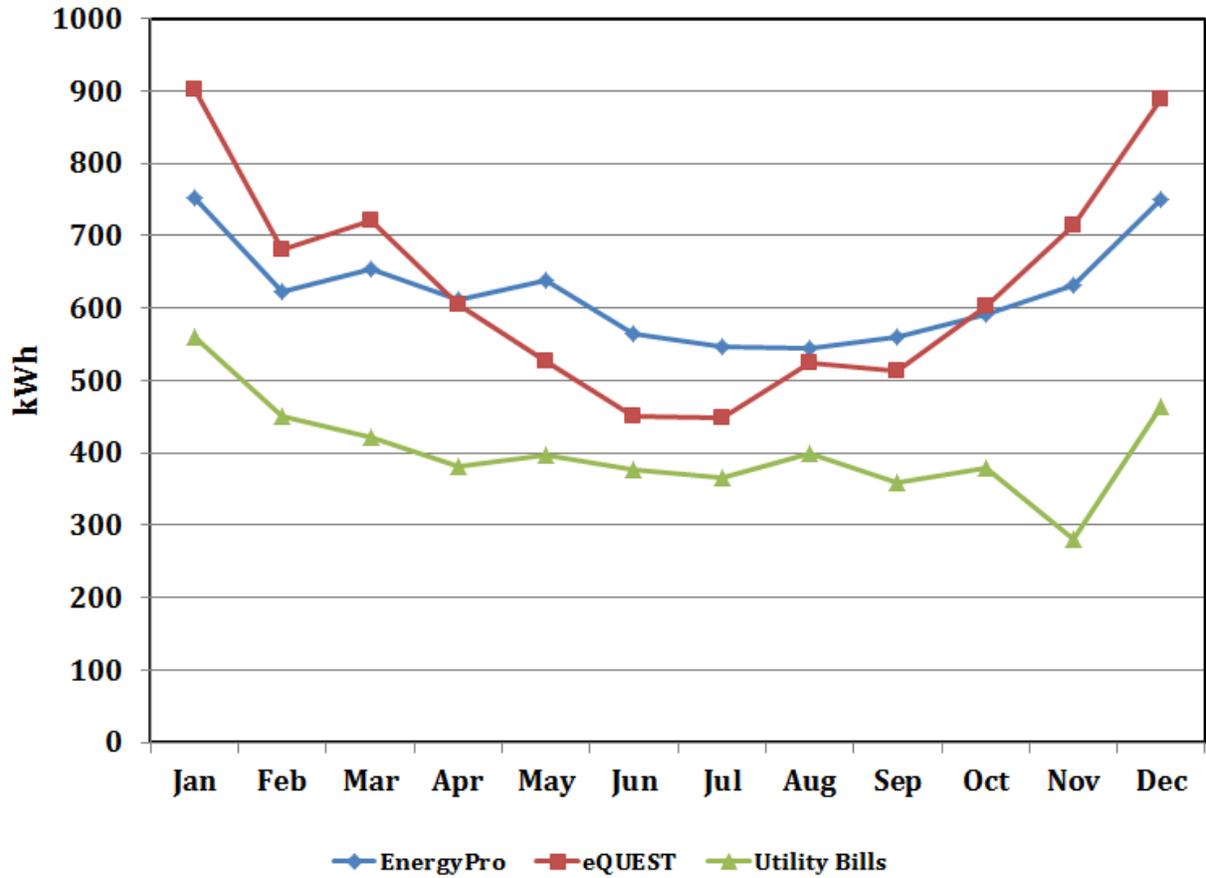


Figure 17: Site 2-1058 Monthly kWh Comparison

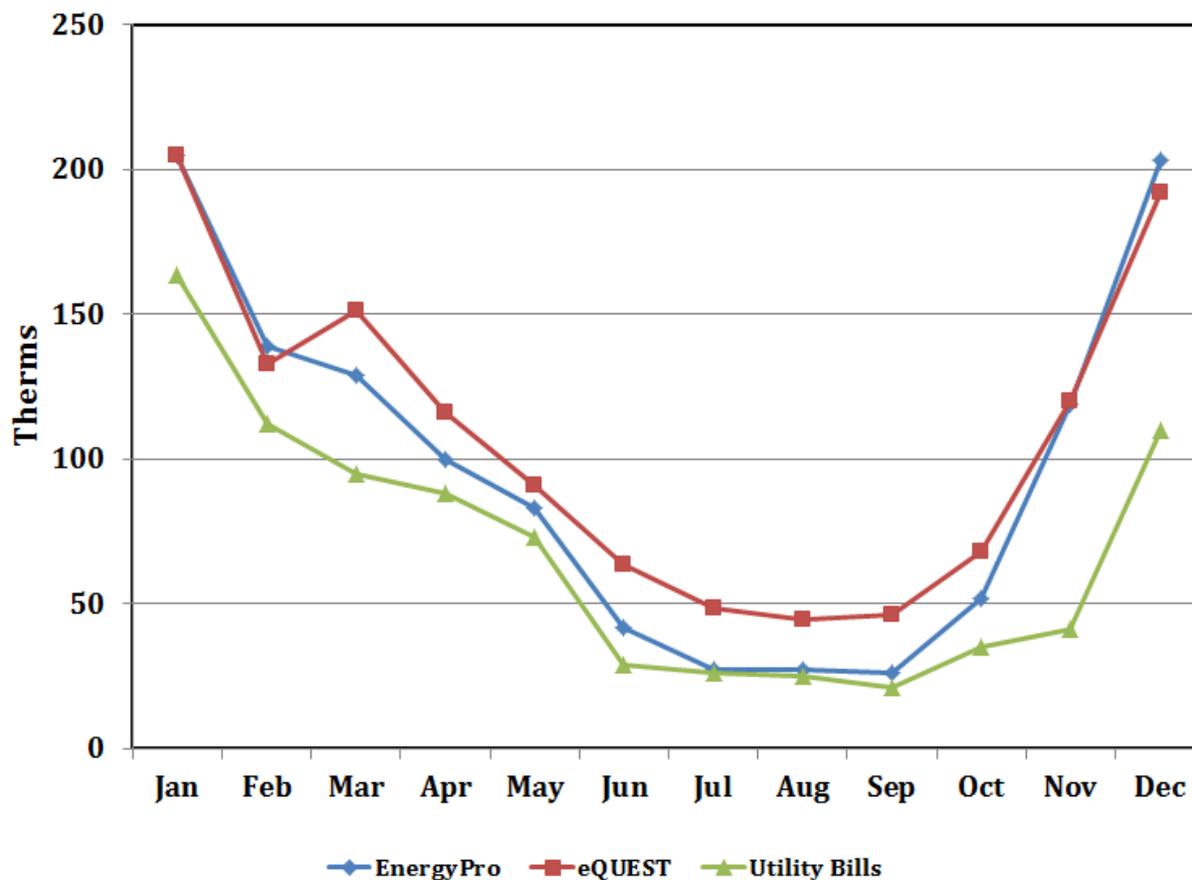


Figure 18: Site 2-1058 Monthly Therms Comparison

5.11.2. Measure Savings

We developed an eQUEST model using the same measure inputs as EnergyPro, where possible. Figure 19 shows the savings estimated by each model for the separate measures and for the package of measures. Results show much higher savings in the eQUEST model, primarily because that model is more sensitive to duct leakage. We developed similar models for the second home. Figure 20 shows those results. Again, savings were much higher for the eQUEST model, primarily because the eQUEST model is sensitive to the u-value of the roof.

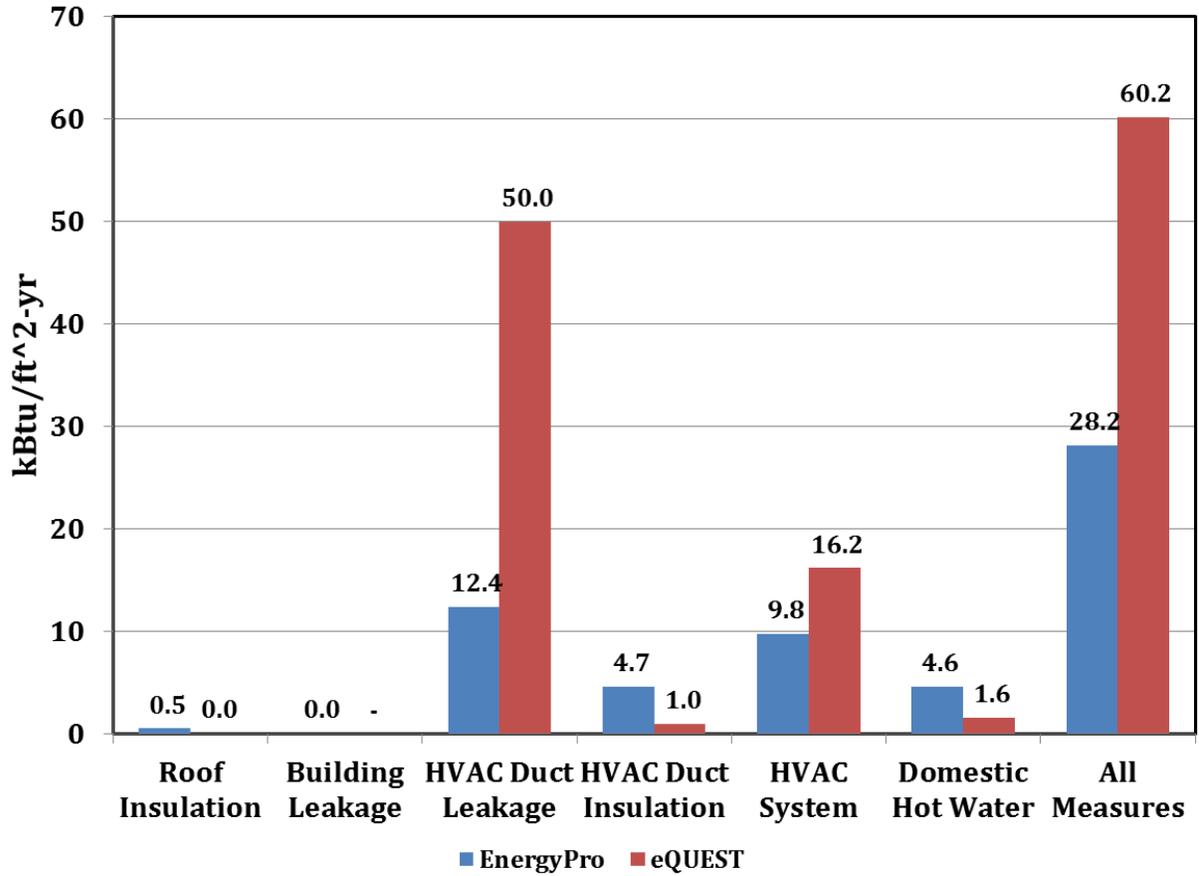


Figure 19: Site 1-1057 Measure Savings Comparison

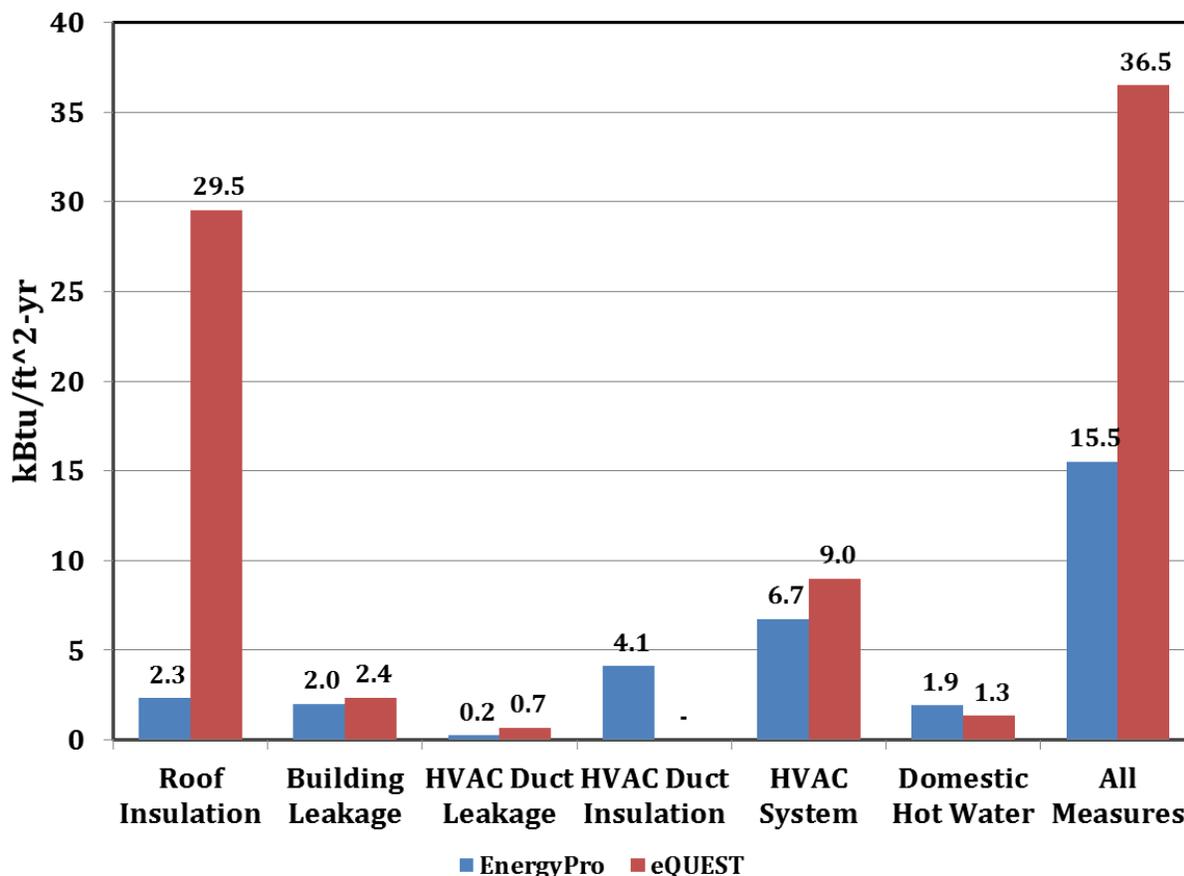


Figure 20: Site 2-1058 Measure Savings Comparison

5.11.3. Model Sensitivity

The individual measure savings estimated by eQUEST and EnergyPro were significantly different because eQUEST is more sensitive to measure-related inputs than EnergyPro. For example, as the percent of duct leakage is increased, energy use increases at a much higher rate in eQUEST than in EnergyPro, resulting in exaggerated savings for the duct-leakage measure. Figure 21 shows the results of the analysis of duct-leakage sensitivity we performed for both homes. Figure 22 shows the sensitivity of the models to changes in the roof U-value. Given the construction of the homes, we could only perform this analysis on the second home. It shows eQUEST to be much more sensitive.

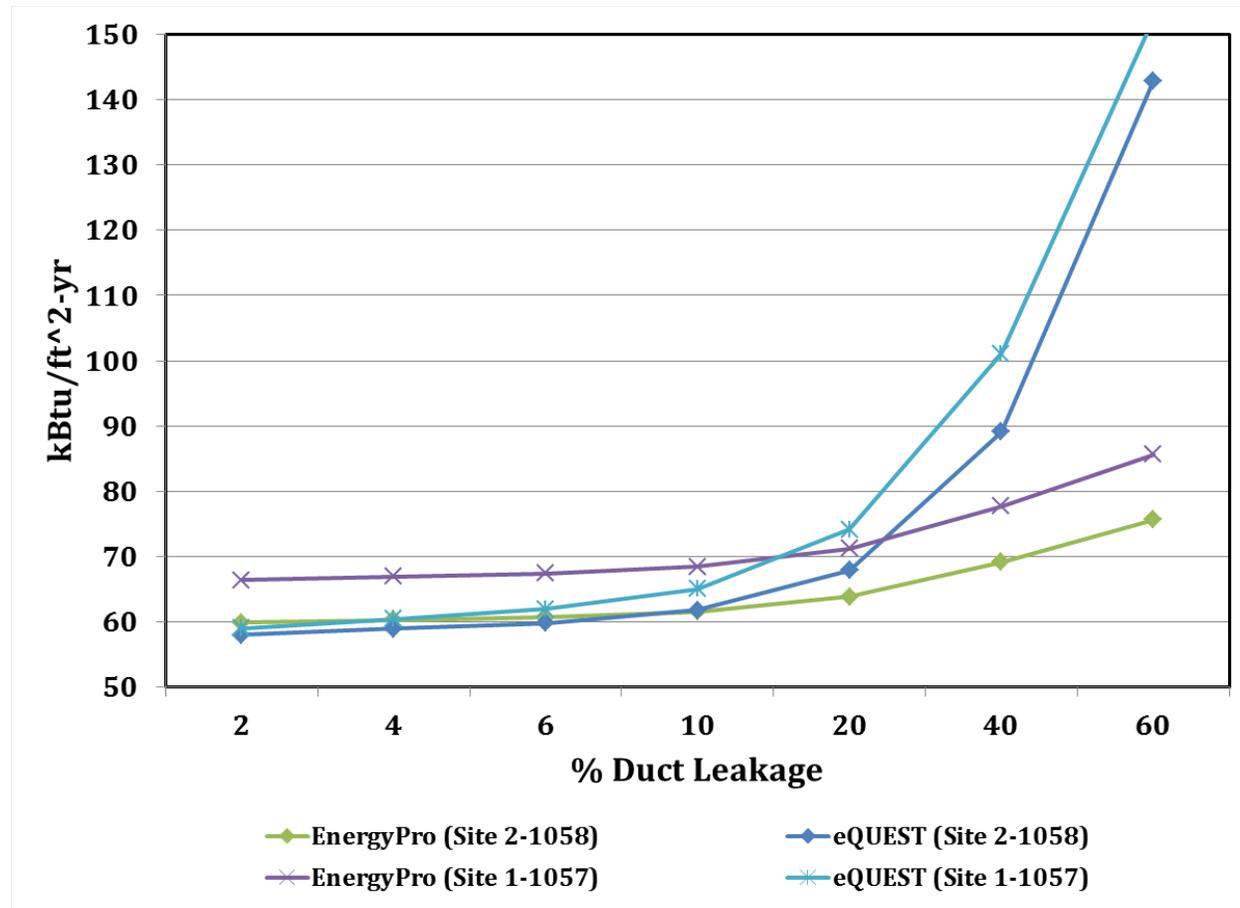


Figure 21: Sensitivity to Changes in Duct Leakage Percentage (Site 1-1057, Site 2-1058)

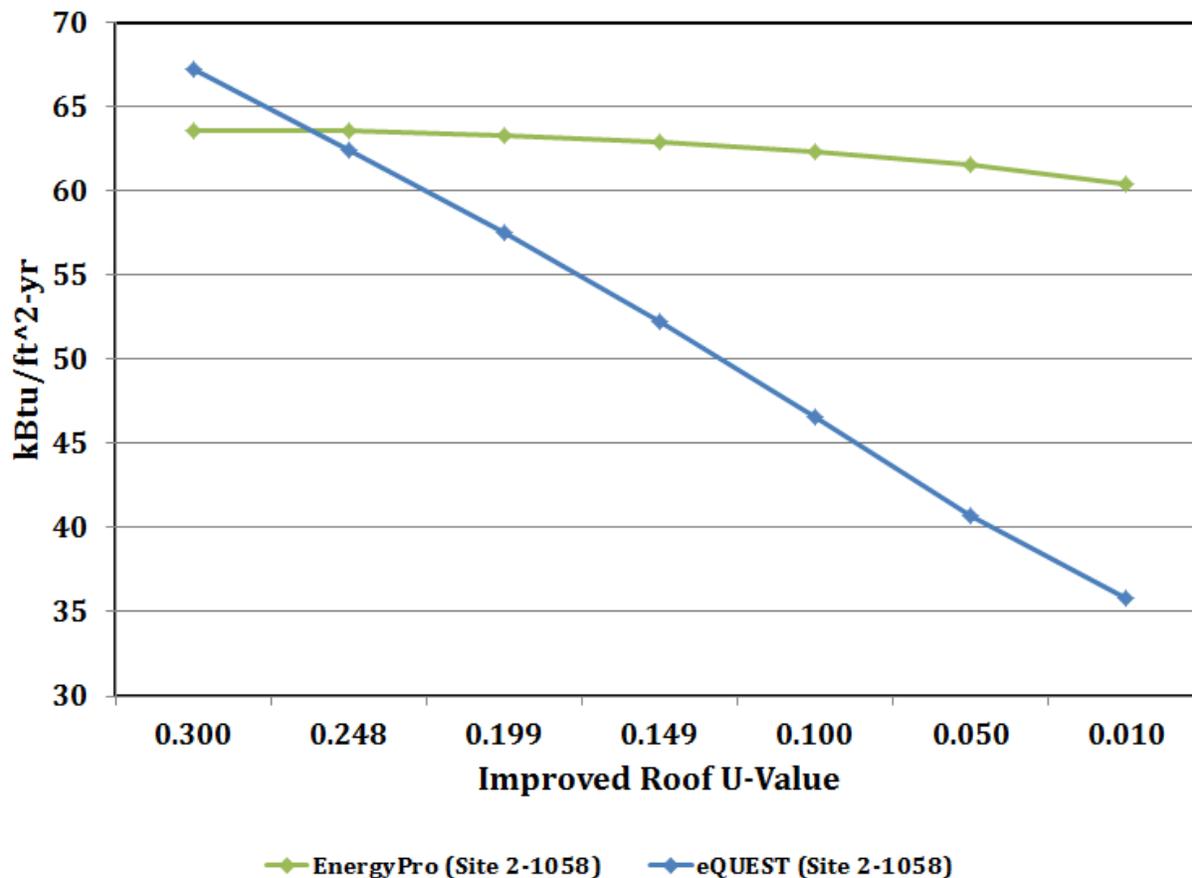


Figure 22: Sensitivity to Changes in Improved Roof U-Value (Site 2-1058)

5.11.4. Model Advantages and Disadvantages

The modeling effort revealed advantages and disadvantages to using EnergyPro and eQUEST, which are listed in Table 67. The comparison is based on the use of models to estimate energy savings in accordance with current procedures of the program, which limit the data available from each home and the time and staff resources typically available to the contractor responsible for the modeling.

Table 67: EnergyPro & eQUEST Software: Advantages & Disadvantages

Observation	Advantage
The EnergyPro interface is much more simplistic than eQUEST, allowing for less customization, but also requiring less expertise to run.	EnergyPro
EnergyPro is designed to take results directly from standard test procedures such as duct leakage testing and blower door testing. Test results must be converted in detailed design mode if running eQUEST. This can be time-consuming and requires an experienced modeler or engineer.	EnergyPro

Observation	Advantage
EnergyPro schedules are easily customizable. eQUEST schedules can be customized easily in the wizard, but once outside the wizard it is very time consuming.	EnergyPro
Many EnergyPro inputs can be changed, but changes are not reflected in the model because hidden defaults override these inputs. An example is fan horsepower (based on square footage regardless of user input). This can be misleading to the modeler and provide erroneous results.	eQUEST
When setting up a model, the wizard is used in both software programs. Once outside the wizard, detailed design mode must then be used. Detailed design mode is much more complex in eQUEST and requires an experienced modeler to understand.	EnergyPro

5.11.5. Key Takeaways

- Both EnergyPro and eQUEST overestimated annual energy use for both test homes.
- The eQUEST model estimated higher savings for both test homes.
- Individual measure savings estimated by eQUEST and EnergyPro were significantly different because eQUEST is more sensitive to measure-related inputs than EnergyPro.

5.12. Evaluability Assessment

Normally, an evaluability assessment addresses three major questions:

- Is there a program theory that accurately describes the logic of the program?
- Are the data required to assess the implementation and impact of the program available?
- Have been any changes in the program since its last evaluation?

For this program and this program cycle, the assessment focuses on the program theory, the logic model, and data adequacy. This is a new program so there have been no prior evaluations.

The overall conclusion of this assessment is that the elements for an effective process and impact evaluation are present in this program. It is a new program, so processes and documents are in flux, but this is to be expected. The theory and strategies are sufficient to test, and most data points are available. The areas that could be improved for future evaluations are access to web-portal participants and documentation of quality-control inspections.

In the following sections, we describe the detailed findings that led to this overall conclusion.

5.12.1. Program Theory and Logic Models

Do the documents allow the reader to understand what the program does and why?

- The expected causal links are shown in the program theory and logic model, and in the Program Implementation Plan (PIP).

Are the connections between activities, outputs, and outcomes logical?

- Yes.

Are program goals well defined and measurable?

- There are specific savings and participation goals in the PIP. However, they have been changing over the course of the evaluation period, and a current set of goals has not been available.

Does the program theory describe clear strategies to achieve goals?

- Both the program theory and PIP documents list barriers that program activities should try to overcome to achieve the stated goals. In addition, strategies were identified to overcome the barriers and increase participation and savings.

Does the program theory and logic model reflect what the managers report is their program logic and strategies?

- For the most part, program managers reported strategies consistent with the PIP. The picture is somewhat mixed, however. These issues are addressed in the contractor findings, the training assessment, and the local entity, as well as the marketing effectiveness sections of this report.

5.12.2. Data Adequacy

For these questions, answers are divided between PG&E and SCE/SoCalGas. While the PIP was a statewide document, the data systems are separate and should be described separately.

Is there a tracking system?

- PG&E: The tracking system is maintained by Build it Green (BIG) in the online Green Compass database. A summary spreadsheet of all Whole-House jobs, as well as individual site files, can be downloaded. Rebate payments are tracked in an Electric & Gas Industry Association (EGIA) database. Reports can be downloaded from an EGIA website.
- SCE/SoCalGas: Yes. It consists of the Milestone Tracking Report, an Excel workbook released more or less weekly, maintained by PSO within SCE. The Tracking Report provides a summary of all Whole-House jobs. Individual site files are maintained at the EUC Online Document Repository, maintained by RHA. However, SCE is rolling out a new system. It will replace the Milestone Tracking spreadsheets and most of the functions of the EUC Online Repository managed by RHA. All EUC files will be contained within the Vision database with the exception of the files that go to Lincus for technical review of jobs with energy savings of 35% or more. Therefore, RHA will only keep Lincus jobs in their repository.

Does the tracking system contain adequate information?

Are all jobs listed, including those that subsequently decide not to continue with the program?

- PG&E: The system starts tracking when the pre-upgrade application is received. Job status is tracked, including jobs that are no longer active and will not be completed. Information about prospective participants is contained in an Energy Upgrade California website, but those data are not accessible to the IOUs.
- SCE/SoCalGas: Same.

Are application forms present in all cases?

- PG&E: Yes, they were provided for all sampled cases.
- SCE/SoCalGas: Same.

Is it clear what was installed, when, and in what household?

- PG&E: Yes.
- SCE/SoCalGas: Yes.

Is there contact information for all participants?

- PG&E: Yes.
- SCE/SoCalGas: The Milestone Tracking Report does not contain contact information; the EUC Online repository contains this information.

Is the contractor associated with each job listed?

- PG&E: Yes.
- SCE/SoCalGas: Yes.

Is there contact information for the contractors?

- PG&E: Yes.
- SCE/SoCalGas: Yes.

Are there records of contractor report cards?

- PG&E: The number of jobs performed in any period by a contractor can be derived from the tracking database, along with the duration between major milestones for each job. QC/QA review for each job is buried in notes in the Green Compass system and is not recorded consistently. We are not aware of any per-contractor summary files. The small number of on-site inspections by PG&E means that QC of contractor work consists mostly of desk review.
- SCE/SoCalGas: The number of jobs performed in any period by a contractor can be derived from the tracking database, along with the duration between major milestones for each job. Detailed results of QC/QA reviews are recorded in the EUC Online repository. We are not aware of any per-contractor summary files.

For the Advanced Upgrade jobs, are the test-in, test-out, and combustion-test results recorded?

- PG&E: Yes.
- SCE/SoCalGas: Yes.

For the Advanced Upgrade jobs, is there documentation of the test process and results?

- PG&E: Yes.
- SCE/SoCalGas: Yes.

For the Advanced Upgrade jobs, is there documentation of quality-control inspections and testing?

- PG&E: No, but this may not be necessary. The results are likely sufficient for evaluation.
- SCE/SoCalGas: Yes.

For the Advanced Upgrade jobs, are there records of contractor qualifications, including classes attended and mentoring processes completed?

- PG&E: Records show whether the contractors have been approved for use, but they do not show what specific classes they took.
- SCE/SoCalGas: Same.

Is there information about contact with other federal, state, or local programs?

Are there contact names, agencies, titles, and roles?

- Not in the tracking system, but they were available from other sources

Is there contact information on each?

- Not in the tracking system, but they were available from other sources

Is there a record of conversations with each?

- No. It would be helpful to have a log of these conversations as one measure of engagement and collaboration with these agencies. However, the evaluation team was able to ascertain that collaboration was strong through interviews with the agencies and IOU program managers.

6. RECOMMENDATIONS AND SUPPORTING FINDINGS

In this section, we present our recommendations for how to sustain and improve the Whole-House Program. The recommendations fall into four categories:

- Marketing
- Implementation
- Program Design
- Additional Research

Each recommendation is associated with the relevant supporting findings drawn from **5. Findings**.

Table 68 is a prioritized listing of the recommendations within each category and shows whom, within PG&E and SCE, the recommendation is relevant to.

Table 68: Recommendations

Category	Recommendation	Priority
Marketing	Sustain and Enhance IOU Marketing Strategies	High
	Move Control of the EUC Website to the IOUs	High
	Support Contractor Marketing Efforts	High
	Improve the EUC Website	Low
Implementation	Reduce Application Processing Times and QA/QC Requirements	High
	Focus Training and Mentoring on the Top Performing Contractors	High
	Adopt Common Statewide Job Reporting	High
	Identify Financing Options for Customers	High
	Improve SCE Contractor Training Classes and Mentoring	Low
	Provide Additional Program Tracking Data	Low
	Conduct Ongoing Safety Training	Low
	Conduct Further Studies of Energy Models	Low
	Close SCE Contractor Performance Gaps	Low
	Address Additional Training Topics	Low
	Address Gaps in Who Gets Trained	Low
	Establish SCE Inspector-Trainer Role	Low
	Open Communications Between QA/QC and Mentors	Low
Program Design	Improve Customer Service to Contractors and Customers	High
	Modify or Drop the Basic Upgrade Package	High
	Increase Customer Incentives	Low
	Offer Contractor Incentives	Low

Category	Recommendation	Priority
	Subsidize the Assessment Cost	Low
	Allow Early Installation of HVAC Appliances	Low
	Improve Whole House Energy Modeling	Low
Additional Research	Referral Drop-Out Surveys	High
	Tracking Change	Low
	Understanding Market Differences that Drive Participation	Low
	Side-by-Side Program Comparison	Low

6.1. Marketing

6.1.1. Sustain and Enhance IOU Marketing Strategies

6.1.1.1. Recommendations

- **Foster peer-to-peer marketing.** Incorporate the excellent participant feedback that the program has received into marketing efforts in a way that fosters peer-to-peer marketing. Tactics may include customer testimonials, social media channels, and email.
- **Continue promoting main program benefits.** Continue promoting the main program benefits that participants have valued in their program experience. These benefits include increased comfort in the home, financial incentives, lower energy bills, and the educational and decision-making benefits of getting a comprehensive home assessment.
- **Build the future target market based on participant characteristics thus far.** Use the participant’s characteristics to help define the target market for the program. For example, many participants did a whole-house retrofit when they first purchased a new home. The program may consider some ways to best identify and market to new home buyers. Because this program is not appropriate for the general residential market, efforts to build program awareness should be targeted.
- **Continue with events and workshops.** Continue using local events to build program awareness and direct potential participants to other informational and educational resources such as the program website and upcoming workshops. Continue the educational workshops because they have been effective in driving program participation.
- **Ensure that program information is simple and accurate.** Develop brief, step-by-step explanations of how the program works to include in program materials, especially the website. SCE’s three short video clips on its program website are a good example.
- **Convene quarterly with statewide implementers.** The IOUs should consider convening quarterly with all entities implementing the program statewide. Many entities are implementing and marketing this program statewide and all can benefit from frequent discussions on best practices in marketing strategies so that they can learn from each other.

6.1.1.2. Supporting Findings

- Many marketing efforts have been effective in driving awareness of the program. Awareness of EUC is high in PG&E’s territory among the targeted population (29%). A significant percentage recall hearing radio ads (24%), internet (12%) and newspaper (12%) ads. Participants are primarily hearing about the program from their contractor, family and friends, and utility letters. In PG&E territory, a significant percentage of participants heard about the program through their mortgage lender.
- Program staff, local entities, and contractors agree that a major marketing challenge is the complex nature of the program, which makes it difficult to explain in short media channels. Past studies have also found this to be a major hurdle to marketing whole-house programs.
- Email, local events, and direct mail are the most effective channels for getting customers to attend workshops in PG&E territory. Marketing has also generated a fair amount of word of mouth regarding the program, and drove much of the workshop awareness.
- PG&E workshops were effective in educating customers about the program and motivating them to participate.
- Half of the participants have visited the program website, and most gave it high ratings overall. SCE/SoCalGas customers rated it low for “accurately reflecting what they experienced in the program,” indicating that it may not do a good job of explaining the steps involved in participating.
- Evaluation results indicate that different messages resonate with different customers. The most effective message to motivate customers in PG&E’s territory to participate is lower utility bills, followed by the financial incentives. Contractors ranked comfort as the most effective message, followed by incentives and lower energy bills. However, contractors argue that effective messaging varies by climate zone and the availability of premium incentives from local entities. Also, contractors noted that customers often do not realize what home comfort is until after the job is done. Participants rate multiple factors as being important in their decision to participate in the Whole-House Program, indicating that it takes many factors to motivate homeowners to do a whole-house job. Also, local entities found that many potential participants do not have high energy bills, so messages related to comfort and conservation are often more effective than cost savings. The exceptions are places like Fresno where energy bills are high but available capital is low. In this market, financing is much more attractive than rebates.
- Most participants appeared to be motivated, to some degree, by helping the environment, but more so by comfort, which is the message that is most often presented by the program and contractors. Fifty-eight percent agreed to a statement that connected participation to concern about the environment, and 53% said they would feel guilty about harming the environment if they didn’t do what they could to increase energy efficiency. On the other hand, 87% agreed that they addressed comfort issues with the upgrade, although it is possible that comfort became salient after they actually experienced it.

- Most participants did a whole-house job as a stand-alone job, not as an extension of a remodel, and many did it when they were purchasing a new home or when they needed to replace an HVAC system.
- Participants are very satisfied with the contractors and are very likely to recommend them. Participants are also very satisfied with the home-energy assessments.

6.1.2. Improve the EUC Website

6.1.2.1. Recommendations

- **Enhance website content and user experience.** Because the website can be a useful education tool for the program, consider modifications that help to accurately explain the program, and enhance the user experience. Consider the user-experience recommendations derived from a focus group study in Los Angeles County,²³ and the recommendation stated in the previous section to provide a step-by-step synopsis of the participation process.

6.1.2.2. Supporting Findings

- Program staff and contractors agree that a major marketing challenge is the complex nature of the program, which makes it difficult to explain in short media channels. Thus, the website is very useful educational tool for potential participants.
- Los Angeles County focus groups²⁴ suggested that the website itself can be a barrier to participation. The study participants had difficulty navigating the site and formed inaccurate assumptions about the program eligibility requirements and the steps involved. Thus, the program may be misinforming residents and turning them away from a program that may be conducive to them. Program staff and local entities mentioned the same issues with the website.

6.1.3. Support Contractor Marketing Efforts

6.1.3.1. Recommendations

- **Continue to support contractor marketing.** Provide contractors with easily distributable marketing materials such as door hangers, brochures, and fact sheets, to enable them to co-market the program. For example, door hangers could be designed to include slots where contractors can insert their business cards. The program should also continue to support any presentations that contractors want to give to homeowners by providing marketing

²³ Fairbank, Maslin, Maullin, Metz & Associates, *Energy Upgrade California Los Angeles County Focus Groups Report of Findings*, (November 2011).

²⁴ Ibid

materials (e.g., PowerPoint slides that help explain the program) and attending presentations where possible.

6.1.3.2. Supporting Findings

- The EUC website is effective at generating leads for some low-volume contractors. Large-volume contractors, which drive most of the program participation, have their own marketing resources and find that a mix of methods is working for them. Those methods include door hangers, neighborhood canvassing, one-on-one conversations with potential customers, and presentations to homeowners. Contractors want any marketing support they can get from the program.

6.1.4. Move Control of the EUC Website to the IOUs

6.1.4.1. Recommendations

- **Move control of the EUC website to the IOUs.** Keep one centralized EUC program website, but authorize the utilities to collectively change the content and user interface. Also give them access to customer data so that IOUs can do follow-up marketing with interested customers.

6.1.4.2. Supporting Findings

- Program staff has found CEC ownership of the EUC website to be challenging from a marketing perspective and hopes that control of the website will eventually transfer to the IOUs. Because confidentiality clauses prevent the CEC from giving the IOUs access to customers who visit the site, the IOUs cannot do follow-up marketing with customers who express interest in the program while visiting the website. The lack of access to this information also affects the evaluability of the program because evaluators cannot access these non-participants to fully explore program-participation barriers.

6.2. Implementation

6.2.1. Identify Financing Options for Customers

6.2.1.1. Recommendations

- **Identify and promote financing options for customers.** Identify and leverage other financing options that complement the program. The financing options available to customers should be listed on the EUC website and in contractors' marketing materials so they can easily communicate these options to customers.

6.2.1.2. Supporting Findings

- Many program managers mentioned that the program’s success would be enhanced by making financing easier for customers to obtain, and by helping market financing options to customers. Contractors agreed that financing plays a key role in their ability to sell whole-house jobs. A major challenge of marketing the program is that it requires a substantial investment by customers during difficult economic times. Program managers believe that offering financing to customers will help the program reach its goals. Currently, there is no central financing resource. Previous financing programs such as PACE and Home Star were available in SCE/SoCalGas territory during the program’s planning process but are no longer available. Beyond banks, the financing currently available to customers is through smaller third parties, which only cover a small portion of the utilities’ service area and have varying requirements and rates. In PG&E territory, funding for existing customer financing through the California Home Buyers Fund might end in March. If that is the case, Build It Green (BIG) would like to see PG&E allow EGIA to continue offering customer financing using some reallocated incentive funds that might otherwise go unused.
- Los Angeles County focus groups²⁵ suggested that customers’ interest in the program increased after learning that below-market (2%) financing might be available. Several focus-group participants said they would look into the program after learning about that financing.
- Among program participants, 45% used financing to pay for their Whole-House upgrades.
- The most common barrier to program participation among workshop attendees was the anticipated cost of the job. Four in ten did not take all of the recommendations for home improvements that came out of the home-energy assessments; the number one reason cited was insufficient money to fund all recommended improvements.
- Participants rated contractors low for their knowledge of available financing options.

6.2.2. Reduce Application Processing Times and QA/QC Requirements

6.2.2.1. Recommendations

- **Reduce application processing time.** Reducing application processing time will require multiple efforts, including better educating contractors about how to meet program requirements, rewarding contractors that meet the requirements, revisiting QA/QC protocols, and looking at how the program might loosen the program requirements that contractors have difficulty fulfilling. Many of the program’s challenges with processing applications are similar to what SCE and PG&E experienced when processing applications

²⁵ Ibid

for the California Solar Initiative (CSI) Program. EUC program staff might consider speaking with the CSI teams to brainstorm solutions.

- **SCE should continue reducing QA/QC requirements for all participants.** Application processing delays for SCE is partly due to its protocol of performing a pre- and post-upgrade inspection of every job. So SCE is reducing the percentage of jobs that receive the inspections, which should help reduce application and rebate-processing time. Program changes currently being considered call for inspecting only a sample of jobs. For high-volume contractors, the number of inspections may drop to 10% or less if they have proven their ability to abide by program guidelines in previous jobs.
- **PG&E should continue reducing application process time:** PG&E has started a mentoring program for high-volume contractors to help them meet program requirements, and hopes this will reduce application errors that cause delays. Also, delays in delivering incentive payments are partly due to the combustion-appliance-safety inspection that is required for every participant. PG&E is finalizing safety protocols that allow for inspecting a sample, instead of every site.

6.2.2.2. Supporting Findings

- Nearly every contractor interviewed said that the paperwork required and constant back-and-forth with the program administrators to complete an application delays the beginning of their work and the rebate disbursement. Paperwork requirements and slow rebate-processing times were the most common barriers cited by contractors who have not submitted many jobs.
- Contractors mentioned that if the paperwork can be reduced and streamlined, they would likely promote the program more often. Some contractors also recognized that this issue is inherent to a new and complicated program design and will likely improve over time.
- Many contractors are not pleased with the inspections performed by SCE's QC contractors. Delays in verifying energy modeling can cause completed jobs to be rejected if the revised estimated savings is inadequate. This can cause time-consuming appeals and discontent among contractors and customers. Contractors also believe that the four data-collection visits (test-in and test-out functions performed by both the contractor and the QA/QC third party) causes customers to balk at participating, because they must take at least four days off of work to participate. Smaller contractors, and those that have been around for a long time, are not happy about being introduced to the whole-house concept for the first time, and then being monitored closely and asked to produce a lot more information than usual. This will likely prevent contractors from becoming home-performance advocates.
- Participant satisfaction with the program is high overall. Most are saying positive things about the program to others. Among the few customers who were somewhat dissatisfied with the program, one of the most common sources of dissatisfaction was rebate-processing time.

6.2.3. Focus Training and Mentoring on the Top Performing Contractors

6.2.3.1. Recommendations

- **Train and mentor the top performing contractors.** Continue to focus on helping the top contractors expand their customer base and not on getting more contractors into the program. Once these contractors are successful and the participation processes are streamlined, work on broadening the pool of contractors.

6.2.3.2. Supporting Findings

- A small number of contractors are completing (or selling) most jobs. The most productive contractors are those that began as home–performance contractors. They are more likely to stick with the program because it already aligns with their business model. For contractors, this program requires a lot of contractor training, mentoring, and experience ushering a few jobs through the program before they know what they need to do to meet program guidelines.
- The program is stimulating business development among large contractors. The program has successfully incentivized large and mid-sized contractors to build up a trained BPI-certified and whole-house-oriented workforce.
- Program administrators are still struggling to streamline application process, protocols, and procedures. Until they addresses these issues, it will be difficult to get more contractors on board, and they may end up turning many contractors away . As noted above, the paperwork, going back and forth to correct applications, and slow rebate processing are barriers to contractor participation, so much so that some contractors are selling against the program (i.e., telling the customer they can do the job for less if they bypass the program). Processing rebates can take months. This discourages customers from participating (especially if their HVAC is broken and they want a quick replacement).

6.2.4. Adopt Common Statewide Job Reporting

6.2.4.1. Recommendations

- Adopt common statewide pre- and post-upgrade application files based on the Job Reporting Template (JRT) used by SCE. A common format would facilitate operation and evaluation of the program. The SCE format has these advantages:
 - A single file effectively defines a job.
 - Home model parameters can be input to the EnergyPro software from the pre-application.
 - Measures installed, energy usage, and savings and can be uploaded automatically from the post-upgrade application for use in tracking and evaluating the program.

- To the pre-application, add a lookup of N-factor, based on climate zone (which could be derived from the home’s address), which is needed in calculating house leakage rate (ACH) from the blower-door tests.
- Add the following to the post-upgrade application to help evaluate the program:
 - The name of the local entity (if any) providing additional incentives, and the amount of the incentive
 - An indication of whether mechanical ventilation was actually installed, and its make, model, and capacity
- Track revisions to each site’s application file as a way to facilitate QC review. Values entered in revisions of the application can be automatically uploaded and tracked to see what kinds of changes are being made in the QC process.

6.2.4.2. Supporting Findings

- The SCE JRT format facilitates tracking jobs and evaluating the program. Almost all information about the job is contained in the JRT, including modeling inputs. These values can be automatically uploaded to a database to enable tracking of program parameters.
- IOUs are not recording whether mechanical ventilation is actually installed, or the capacity of the ventilation.

6.2.5. Provide Additional Program-Tracking Data

6.2.5.1. Recommendations

- Provide additional tracking data:
 - SCE and PG&E: Contractor ID, in addition to contractor company name
 - PG&E: Date that incentive check was sent
 - PG&E: Energy savings percentage
 - PG&E: Electric and gas utility

6.2.5.2. Supporting Findings

- In PG&E tracking data, 14% of post-pilot records listed no electric utility, and 5% listed no gas utility.
- In tracking data, modeled energy use was not reported in most cases by PG&E, and not reported in any cases by SCE.
- Percent energy savings was not correctly reported by PG&E.
- Though names were used, contractor IDs were not systematically used by either utility.

- The date that the incentive check was sent to the homeowner was not reported in PG&E tracking data.

6.2.6. Conduct Ongoing Safety Training

6.2.6.1. Recommendations

- Provide ongoing safety training to contractors. Issues to emphasize include possible asbestos in ducts, combustion-appliance-zone (CAZ) testing, and correct installation of insulation.

6.2.6.2. Supporting Findings

- For both SCE/SoCalGas and PG&E, contractors and QC found significant numbers of safety issues. The QC review also found many instances of possible asbestos in ducts and CAZ failures that were not found by the contractors.
- On-site inspections at four PG&E Advanced Upgrade job sites, after the contractor submitted final applications, found significant problems in modeling, submitted savings, and safety:
 - Gas leaks not identified by the contractor were found at two sites.
 - At one site, floor insulation was installed with exposed paper that is intended to be covered with sheetrock, creating a fire and mold hazard.

6.2.7. Conduct Further Studies of Energy Models

6.2.7.1. Recommendation

- Conduct a study to measure the actual effects of individual measures on energy use. Model pre- and post-upgrade energy use using both eQUEST and EnergyPro, and any other software that might be used in the program, or is currently used by multiple contractors, such as Recurve or Wrightsoft. Compare the model results to pre- and post-upgrade utility bills to determine the accuracy of each software program relative to the particular measure, and what steps would be necessary to calibrate the models to the actual use.

6.2.7.2. Supporting Findings

- Contractors' opinions of EnergyPro are mixed. Some contractors think it is great if you know how to use it, and others characterize it as "garbage-in-garbage-out." Some contractors (especially very experienced contractors) doubt its usefulness. They believe it is flexible, but overvalues wall insulation and undervalues attic insulation. Many also believe that it does not allow for pool pump changes, and does not handle multiple HVAC systems well. Most agree that the reports it provides are not useful for selling jobs to customers. Also, contractors who are BPI-certified but have not participated in the program yet, cited their

need for EnergyPro training as a barrier to enrolling in the program. Whole-House Program managers recognizes that EnergyPro may not be the most useful tool for contractors, and hope to find a better alternative.

- A comparison of modeled pre-retrofit annual energy use with billing data for 13 SCE/SoCalGas and 17 PG&E Advanced Upgrade jobs showed:
 - ▣ The mean modeled total annual use was 40% greater than billed use for both SCE/SoCalGas and PG&E.
 - ▣ The mean modeled annual kWh use was 68% greater than billed use for SCE/SoCalGas, and 56% greater for PG&E.
 - ▣ The mean modeled annual gas use was 39% greater than billed use for SCE/SoCalGas, and 43% greater for PG&E.
- Our staff compared EnergyPro and eQUEST for two homes. We observed significant differences in the model estimates of total savings and savings for each measure. Both models significantly overestimated the energy use of each home, as compared to the gas and electric bills, but for different reasons.

6.2.8. Improve SCE Contractor Training Classes and Mentoring

6.2.8.1. Recommendation

- **SCE participation workshop.** The participation workshop should include more details about mandatory training, and more exposure to the Job Reporting Template (JRT), EnergyPro, and QA/QC requirements.
- **Basic Upgrade training.** Improve by:
 - ▣ Adding worksheets
 - ▣ Adding more hands-on practice
 - ▣ Requiring participants to demonstrate proficiency
 - ▣ Stating formal training objectives
 - ▣ Applying adult-learning principles
- **Advanced Upgrade training.** Improve by adding the following to the 12-day CBCA course:
 - ▣ Descriptive text for photos
 - ▣ Formal training objectives
 - ▣ Adult learning principles

In addition, this training should be supplemented by:

- ▣ More hands-on practice and mentoring with field testing procedures and protocols
- ▣ Sessions with opportunities to practice program-specific desk work (forms and energy modeling)

- ❑ Supplementary training as needed for all tasks required for EUC measures
- **Online Learning Center.** Improve by:
 - ❑ Adding the ability to record exam scores for multiple employees per contractor
 - ❑ Expanding topics to include:
 - reviewing field inspections,
 - identifying asbestos,
 - identifying and installing insulation,
 - weatherization, and
 - reviewing BPI standards that all program work must meet.
- **Mandatory mentoring.** Improve by:
 - ❑ Developing standardized mentoring design and evaluation protocols
 - ❑ Allowing the QA/QC firm to provide input to develop the mentoring design
 - ❑ Providing, in addition to one-on-one evaluation mentoring, mentoring as training sessions adapted to individual contractor needs
 - ❑ Adding remote desktop mentoring for EnergyPro and JRT

6.2.8.2. Supporting Findings

- SCE’s Participation Workshop is a 2-hour session delivered as a webinar or classroom training. This workshop nicely pitches the program to contractors, but provides little information on enrollment requirements, and the reporting, modeling and QA/QC standards.
- SCE’s Basic Upgrade training addresses program measures well, but lacks formal objectives and adult-learning principles.
- The California Building Performance Contractor’s Association (CBPCA) 12-day course supports BPI certification and provides a solid foundation for Advanced Upgrade work, with a strong combustion-safety curriculum. It also provides hands-on practice with diagnostic tools. However, it does not provide an adequate EUC skill set and lacks formal training objectives and adult-learning principles.
- The Online Learning Center delivers on-demand training via four program-specific modules: JRT administration, Energy Modeling, Job Processing (application, reservation), and Combustion-Safety Testing. Participation is mandatory for at least one person from each contractor; built-in final exams require a passing score. The learning center provides well designed training that addresses performance gaps and incorporates adult-learning features. However, the learning center needs to be expanded to cover additional topics.

- Mandatory mentoring is required of one person from each contractor firm, for both program levels. Three topics are covered: Field Work, JRT/Job Processing, EnergyPro. Mentors provide ad hoc observation, evaluation, and feedback.

6.2.9. Close SCE Contractor Performance Gaps

6.2.9.1. Recommendations

Assessment Gaps

- **Characterizing Insulation**

The methods for judging coverage and measuring depth of blown insulation should be clearly described within existing training, during field inspection mentoring, and through a new Online Learning Center module. The training should provide practice identifying types of insulation (Fiberglass, cellulose, etc.), and coverage (poor, fair, good). More photographs of examples of types will help.

With blown insulation, determining coverage can be very subjective, and there probably won't be 100% clarity on this. For example, if there is blown insulation in an attic, contractors will do a measured average. Contractors will pick three or four locations to do the depth sampling, and even if they mark the locations for RHA and the QC contractors, there is no guarantee that the QC contractor will replicate the measurements in those areas.

With the batt insulation, if the R-value is not stamped on the product, the contractors can measure and determine fairly accurately the actual R-value of the insulation. What is a challenge for contractors is to determine a coverage rating—whether it is fair, good, or poor.

Insulation measurement requirements for walls, buried ducts, and floors should be more extensively reviewed within existing training, during field inspection mentoring, and through an Online Learning Center module. Also, establish standard procedures for measuring hard-to-reach insulation such as in the walls, if not already in place.

- **Recognizing Asbestos**

Contractors should receive remedial training on how to identify the various forms of asbestos-containing materials that might be found in a residence. This can be done as supplemental training as well as through a module in the online learning center.

Contractors should be encouraged to be thorough in their search for asbestos, and to continue their education on identifying asbestos. Training sessions should provide protocols for obtaining a certificate of abatement. During field mentoring, explore typical locations of duct boots and wrapping.

There have been continuous issues with properly identifying asbestos, but it has improved somewhat—ICF has been able to educate the contractors more about what asbestos looks like and how to identify it. Some photographs exist of typical types and situations to help

with visual recognition. Trainers and mentors should produce and use more photographs. We also recommend addressing asbestos identification in a “Field Inspection Review” module in the online contractor-learning center. In addition, QA/QC personnel should communicate with the mentors and contractors the reasons for rejecting contractor findings related to asbestos.

■ **Identifying Air Leaks**

Address more thoroughly the methods for detecting air leaks and requirements for minimum air sealing in existing training or in an Online Learning Center module.

Mentoring sessions should extensively review how to detect and properly seal air leaks as well as proper setup for blower door testing. Requiring contractors to adhere to BPI Envelope Professional standards or RHA's weatherization installation standards would lead to more consistent air sealing.

■ **Mismeasuring Building Envelope and Floor Area**

The training and mentoring sessions should emphasize the importance of taking and recording measurements accurately. In Mentoring, contractor can practice and demonstrate taking and recording precise measurements of walls and window areas.

■ **Recognizing Inadequate Ventilation for Combustion Appliances**

The necessary NGAT standards should be addressed by adding an Online Learning Center module or in classroom training content. In field mentoring, contractors should practice evaluating levels of CAV for combustion appliances.

■ **Determining Efficiency or Capacity of Water Heater or HVAC Systems**

In mentoring sessions, reinforce the need for careful reading and documentation of nameplate data in the field, and reinforce careful entry on the JRT.

Implementation Gaps

■ **Oversealing Buildings**

Training should be provided that reviews the appropriate levels of ventilation, including the need for mechanical ventilation based on the BPI protocols and ASHRAE Building Airflow Standards. This training can be provided through updating existing training or within a new Online Learning Center module.

One issue is that diverse content from various testing procedures is used to train contractors. These materials should be consolidated, simplified, and standardized for the contractors. AGA (American Gas Association) and NGAT (Natural Gas Appliance Testing) standards can be integrated with BPI standards into a single program-specific set. After a set of procedures and standards is finalized, this should be released to the contractors. Then the contractors and QA/QC should review them together to address any questions or unclear concepts.

■ **Substandard Combustion Safety Testing**

In the training, contractors should be offered opportunities to further review the BPI procedures and should be provided examples of various combustion testing scenarios including photographs and descriptions of actual cases. In the mentoring sessions, contractors should have the opportunity for extensive practice with combustion safety testing. The Online Learning Center should create a module that is dedicated to covering BPI procedures for combustion safety testing.

Although combustion safety testing is covered in the Basic and Advanced (BPI) training, the contractors need more practice and more mentoring with combustion safety testing. Because complex and unique situations can arise, contractors should have available supplementary or remedial training that covers the background concepts for proper testing, plus detailed training for specific situations. In addition, to improve the understanding of contractors, channels of communication should be opened between QA/QC and program mentors.

As mentioned earlier, diverse content from various testing procedures is used to train contractors. These materials should be consolidated, simplified, and standardized for the contractors. AGA (American Gas Association) and NGAT (Natural Gas Appliance Testing) standards can be integrated with BPI standards into a single program-specific set. After a set of procedures and standards is finalized, this should be released to the contractors. Then the contractors and QA/QC should review them together to address any questions or unclear concepts.

■ **Acting on Combustion-Safety Risks**

Contractors should attend remedial training on this topic. They should review the BPI protocols, and the training should include examples of various improperly installed combustion appliances including photographs. In the mentoring sessions, contractors should practice and demonstrate proper methods for gas leak testing. Also, develop an Online Learning Center module dedicated to covering BPI procedures for combustion safety testing.

Procedural Gaps

■ **Omitting Basic Upgrade measures in Advanced Upgrade Jobs**

As new program requirements are implemented, they should be covered in detail within existing training and mentoring. This type of review also could be integrated into an Online Learning Center module.

■ **Entering Data Program Forms**

Require that any contractor staff responsible for entering data in the JRT and other forms complete the relevant Online Learning Center content. In the JRT and Job Processing mentoring sessions, review and explain commonly found mistakes and make suggestions for ways to improve accuracy.

Reducing the number of required fields would allow for more focused and effective JRT training and less headaches for contractors. Contractors also would benefit from a “user

guide” with instructions for filling out the JRT and from increased JRT mentoring opportunities.

In the EnergyPro and in JRT/Job Processing mentoring sessions and corresponding Online Learning Center modules, stress the importance of the information being consistent throughout.

6.2.9.2. Supporting Findings

- Contractors often inaccurately measure attic area, the quality of insulation coverage, or the R-value of insulation.
- In some cases, contractors have not properly identified potential asbestos-containing materials.
- Contractors fail to meet air-sealing requirements in the houses they are upgrading.
- Contractors commonly provide measurements for walls, windows, floor area, and total conditioned space that cannot be verified in the QC inspection.
- Many contractors are unfamiliar with the appropriate amount of combustion air volume (CAV) required to safely operate appliances.
- Contractors occasionally incorrectly document the efficiency of domestic hot water (DHW) heaters, the SEER of HVAC units, or the BTU ratings for furnaces.
- A less common finding is contractors are sealing some homes tighter than is permitted by the ASHRAE Building Airflow Standards.
- Some of the contractors are having difficulty properly testing gas combustion safety.
- Contractors occasionally fail to recognize or act on combustion appliances with gas leaks, that are in disrepair, or that otherwise risk the safety of residents.
- Contractors commonly neglect to implement one or more of the Basic Upgrade measures, such as low-flow showerhead or pipe insulation, in Advanced Upgrade jobs.
- When entering data into the JRT, Application, or Reservation forms, contractors commonly format the data incorrectly, commit typographical errors, enter incomplete data, or omit pieces of data entirely.

6.2.10. Address Additional Training Topics

6.2.10.1. Recommendations

- **Establish comprehensive envelope and weatherization standards.** Consider incorporating BPI’s Envelope Professional standards or RHA’s Weatherization Installation Standards (WIS) into the program standards to improve installation quality and increase energy savings. Also, consider supplementing the BPI training with HERS-II training. That training focuses more strongly on energy savings, and some contractors consider HERS to be a more responsive organization.

- **Develop typical combustion-safety scenarios.** Develop a set of program-specific standards to replace or supplement the current BPI BA Technical Standards. These could be based on other applicable standards such as those of the American Gas Association (AGA) and Natural Gas Appliance Testing (NGAT). This would provide more consistency for training and mentoring.
- **Provide instructions for combustion testing.** Provide targeted mentoring sessions that review combustion testing for any contractors that have misconceptions about combustion-safety testing. Consult with the program QA/QC team (RHA) regarding common areas of need.

6.2.10.2. Supporting Findings

- BPI Building Analyst certification focuses primarily on combustion-safety testing, and lacks sufficient standards related to effective home weatherization.
- The BPI training materials cover most safety and testing protocols well, but not all that might be found in homes.
- Some versions of the BPI training have erroneously instructed contractors to ignore combustion appliances “outside of the building envelope,” have provided improper Combustion Appliance Zone (CAZ) testing methods, or have shown improper locations for taking measurements.

6.2.11. Address Gaps in Who Gets Trained

6.2.11.1. Recommendations

- **Add “embedded–mentoring” content to certification training.** The program should create and provide a half-day “Advanced Upgrade” orientation session to provide the “embedded mentoring” content as well as program-specific performance requirements for contractors who did not attend the official 12-day BPI training sponsored by SCE. This would be mandatory for new contractors that received third-party BPI training, and optional for those who were trained through the program.
- **Develop and offer more training modules.** Developing additional modules for the Online Learning Center would significantly enhance the ability of contractors to perform upgrade work in the program. Not all modules need the full 25 randomized question exams; for many modules, short quizzes would suffice. But the critical topics, such as combustion testing, will require a full exam.

6.2.11.2. Supporting Findings

- Within the program-sponsored BPI training conducted by CBPCA, ICF injects “embedded mentoring” content. Because many of the contractors receive BPI training elsewhere, they do not benefit from this content.

- The contractor survey indicates that contractors need much additional training.

6.2.12. Establish SCE Inspector-Trainer Role

6.2.12.1. Recommendation

The proposed plan for internal inspector-trainers should be implemented. This would put a knowledgeable and responsive individual in the position to answer questions, offer guidance, assign online learning modules, and review work as needs arise.

At least one employee should attend all required training sessions, and use that knowledge to ensure the quality of work. This individual should also be responsible for verifying all work performed by the company, and for relaying program information to the appropriate staff.

Training for the internal contractor inspector-trainers would benefit from input from program QA/QC (RHA). This approach will require a customized training plan to prepare these individuals for their role; that training will provide a detailed understanding of QA/QC inspection practices. The success of this idea will rely on the involvement of program QA/QC. In the past, contractors were often invited by RHA to observe a QC inspection. This practice should be resumed for the benefit of the contractor inspector-trainers.

ICF (training) and RHA (QA/QC) should collaborate to develop the new training for the proposed contractor inspector-trainers. This should provide these individuals the full benefit of the accumulated program knowledge from both companies. The inspector-trainers also would benefit from ride-along and “mentor the mentor” sessions.

6.2.12.2. Supporting Findings

To date, the EUC program does not require that a single employee at the contractor’s business be responsible for attending all required training sessions, for educating and training company employees who are performing the work, and to be responsible for verifying and signing off on all the work done by other employees at EUC jobs.

6.2.13. Open Communications Between QA/QC and Mentors

6.2.13.1. Recommendation

Open communications between QA/QC (RHA) and program mentors to discuss and clarify key aspects of procedures and testing. Areas of specific concern include combustion-safety testing procedures, reasons for rejecting contractor findings regarding asbestos identification, program expectations for blower-door tests, and identifying insulation quantities.

Initiate a way for QA/QC to develop and deliver training to the mentors. These “train-the-mentor” sessions will provide the mentors with the knowledge and information they need in the contractor mentoring sessions they will lead. In addition, QA/QC should be involved in reviewing contractor training materials and the protocols used for program measures.

6.2.13.2. Supporting Findings

There are few lines of communication between the program mentors and the QA/QC personnel. This has caused misunderstandings of certain program issues.

6.3. Program Design

6.3.1. Improve Customer Service to Contractors and Customers

6.3.1.1. Recommendations

- **Establish a single point of contact.** Each IOU should establish a single point of contact for customer and contractor inquiries. This contact needs to be well-versed in all program requirements and guidelines and needs access to the program database to be able to communicate application and rebate status. This customer-service resource should be responsive, answer promptly, and be well-informed.
- **Automate some program-status and customer communication.** Implement an automated process (by email, phone, or a website) that notifies contractors and customers of status updates for major job milestones (e.g., application received, job approved for rebate, inspection pending, etc.). The IOUs should consult SMUD while creating this tool since they have already developed a website that provides customers with rebate-process updates. Implementing this recommendation may require that the IOUs use the same program-tracking database or that each of their databases communicate the same data to a third system. This would require that the IOUs use the same job-reporting system and the same QC/QC checkpoints, so that the same information could be reported to all customers.

6.3.1.2. Supporting Findings

- Contractors who try to get answers about the Whole-House Program, in both PG&E and SCE/SoCalGas territory, say it takes a significant amount of time to find a person who can answer their questions. In the case of Job-Reporting-Template revisions, they often deal with multiple people who seem to have different understandings of the detail required for the JRT. Customers who have called the PG&E customer-service line find that the representatives do not know about and cannot give them any answers about rebates or about the QA/QC inspections. Customers then call the contractors for answers, who often cannot answer their questions.
- Participants are highly satisfied with the program overall. Most talk about the program to others and say positive things. However, several participants expressed dissatisfaction with the customer service from program staff and suggested that the program have fewer points of contact to allow for better program communication.

6.3.2. Offer Contractor Incentives

6.3.2.1. Recommendations

- **Offer contractor incentives.** Support and encourage contractors by awarding them funding that partially covers their cost of participation, such as the cost of diagnostic tools, training sessions, administrative resources, and time spent marketing the program. Look at the NYSERDA model for some ideas on how incentives can be structured to help with contractor participation.

6.3.2.2. Supporting Findings

- Some contractors are discouraged by the paperwork and time that this program adds to their current business operations. Some are so discouraged by the added amount of time that they would prefer to cut their cost for a job or discourage the whole-house approach entirely instead of encouraging program participation. Therefore, many contractors do not think the promise of additional customers or more lucrative jobs is enough to keep them engaged in the program. This is especially true for small contractors who may only have a few employees. Contractors with large administrative and sales staffs find it easier to meet the program requirements. Findings from prior studies and similar programs (see **4.1 Prior Studies and Similar Programs**) indicate that this problem is common for these types of programs and that programs must often provide contractors with incentives to keep them engaged.
- Many high-volume contractors indicated that smaller HVAC and insulation contractors are selling against the program (i.e., telling the customer they can do the job for less if they bypass the program). These contractors are listed as EUC-approved which helps them generate leads. However, when working with customers who need new HVAC equipment, they tell them that the program is too much of a hassle to work with. They can underbid the other EUC contractors that the customer may have contacted for bids by not using the whole-house approach and assuring the customer that this option is quicker and better. This behavior began partly as a reaction to the high administrative and time costs associated with participation.
- The program raises the overhead for contractors. One contractor said the program may cost them an additional \$700 in administrative time to give someone a \$2000 rebate. This investment also causes mid-sized and smaller contractors, who do not have a robust administrative staff, to spend less time in the field completing jobs. Many contractors said that they spend a significant amount of time managing customer expectations and customer frustration with rebate delays and program complexity.
- Two-thirds of contractors (non-participating, inactive, and low-volume contractors) said they had jobs in 2011 that would have qualified for the Whole-House Program but chose not to send them through the program (average of 14 jobs per contractor completed outside of program in 2011) due to the added overhead costs.

- The NYSERDA program offers contractors reimbursement for BPI certification, tuition reimbursement for non-BPI certification classes and exam fees, a 50% reimbursement for fees associated with new and renewing company BPI accreditations, a 20% reimbursement for the cost of diagnostic equipment up to \$4,000, cooperative marketing incentives to help pay for advertising and marketing efforts, a \$250 reimbursement for assessments, and a general contractor/referral incentive. When assessments lead to retrofits, the contractor that modeled the home gets 5% of the value of eligible measures installed up to \$500.

6.3.3. Modify or Drop the Basic Upgrade Package

6.3.3.1. Recommendation

- **Reconsider the Basic Upgrade Package option.** The program staff understands the issues with the Basic Upgrade Package and has some interesting ideas for modifying it that should be considered. For example, one SCE staff member suggested that, instead of offering customers the option of doing 5 measures, the program could give customers the choice of up to 15 measures and allow them to pick a minimum of 2 core measures and 3 others. This would allow the Basic Upgrade path to progress as a fixed-measure path, giving more flexibility to the contractor and homeowner, and possibly streamlining the internal application processing for Basic Upgrades.

6.3.3.2. Supporting Findings

- The Basic Upgrade Package has not gained much traction. A large majority of the jobs submitted are Advanced Upgrade jobs. Contractors do not support the Basic Upgrade path; they prefer to promote Advanced Upgrade jobs, which are more lucrative. Also, the Basic Upgrade path has requirements that are not suitable for many homes in California (e.g., the Basic Upgrade package requires attic insulation, but many home do not have attics).

6.3.4. Increase Customer Incentives

6.3.4.1. Recommendations

- **Increase customer incentive amounts:** Consider increasing the incentive cap to match some of the premium incentives that have been offered through ARRA funding. Program administrators are concerned that this will affect rates. So this recommendation needs to be considered with expectations for program cost-effectiveness in mind.

6.3.4.2. Supporting Findings

- The ARRA funding has helped the program by adding additional incentives to customers in some regions. This has helped strengthen the program in marketplace. The ARRA funds doubled and even tripled the incentive amounts in some regions. SCE and PG&E offered up to \$4,000. In many cities and counties, the incentives were up to \$8,000, and in one city, the incentives were up to \$12,000. Contractors in these areas believe that if these local

incentives go away, business will significantly decrease. The premium incentives offered by cities and counties were very popular; 63% of participants received them. On average, premium incentives amounted to 68% of the incentives paid by the IOUs.

6.3.5. Subsidize the Assessment Cost

6.3.5.1. Recommendations

- **Subsidize the cost of the home assessments.** Consider subsidizing the cost of the home assessments. To avoid “tire kickers” and to reinforce the value of the service, home assessments should not be *entirely* subsidized. The IOUs will have to consider whether they can offer this additional incentive and still meet expectations for program cost effectiveness.

6.3.5.2. Supporting Findings

- ARRA funding allowed local government to offer incentives that helped subsidize assessment costs. In most places, the assessment incentive was \$100, however some of them subsidized the entire cost for participants. Contractors in areas where the local program incentives have offered subsidies for assessments, have said that their business significantly increased. However, in areas where assessments were free, contractors spent a significant amount of time dealing with “tire kickers”—customers who were not serious about undertaking a whole-house upgrade.

6.3.6. Allow Early Installation of HVAC Appliances

6.3.6.1. Recommendations

Let contractors install new HVAC systems and water heaters before the preliminary application in cases where the existing system has failed. This would expand program participation to customers who need to replace equipment immediately. Contractors may be forced to oversize the new equipment because they will not know what efficiency measures might be installed, but this will happen anyway if the replacement is an emergency.

6.3.6.2. Supporting Findings

- For PG&E, 65% of sites installed a new HVAC system, compared with 38% at SCE/SoCalGas sites.
- For PG&E, 29% of sites installed a new water heater, compared with 19% of SCE/SoCalGas sites.
- SCE QC review imposes time gaps of one month or more between pre-application and work authorization. Gaps due to processing by PG&E were significantly shorter and more consistent with allowing for emergency replacement of HVAC systems

6.3.7. Improve Whole-House Energy Modeling

6.3.7.1. Recommendations

- If contractors continue to perform energy modeling at current training and budget levels, EnergyPro would be a better choice than eQUEST due to its simplicity. If energy-modeling specialists perform the energy modeling, eQUEST would be a better choice due to its high level of customizability and transparency. Regardless of which modeling software is used, expanded site-visit and modeling procedures increase the accuracy of the models. Focus on areas in which data are easy to acquire and enter into the model. Thermostat, internal plug-load, and lighting schedules, which are currently set in EnergyPro to CEC defaults, can be obtained by interviewing residents. One option is to request a change in EnergyPro to allow high/medium/low selections for plug and lighting loads, and to make the thermostat, internal plug-load, and lighting schedules a normal part of model input. These options would be especially useful at sites where the modeled energy use deviates significantly from billed usage data.

6.3.7.2. Supporting Findings

- Many default values were used in the EnergyPro models, and those values affected the accuracy of the models relative to utility bills. This includes all schedules (lighting, appliances, occupancy, etc.). A more accurate model would require obtaining more information on-site and applying this to the model.
- The modeling effort revealed advantages and disadvantages to using EnergyPro and eQUEST. The comparison is based on the use of modeling to simulate residential improvement measures with data from site visits and current test procedures, and under current budget constraints and current level of staff training.
- The EnergyPro residential module does not provide outputs with the same level of detail as eQUEST. Less detail means that the effects that specific inputs have on the model cannot be fully understood. This also affects confidence in the model results.

6.4. Additional Research

We have identified three areas where we think additional research is warranted.

6.4.1. Referral Drop-Out Surveys

A study should be conducted to investigate the customer-referral process and determine why some customers, who initially contact the program, fail to complete a job. The EUC website records contact information for customers who express interest in the program. The sample for this study should be drawn from these customers. This may become possible if the recommendation to move control of this website to the IOUs is implemented. The survey should:

- determine how customers learned of the program;
- determine what motivates customers to participate;
- assess current levels of awareness, knowledge, and attitudes (AKA) of the customers;
- incorporate the most important portions of the statewide AKA-B measurement protocol, while still allowing for critical questions related specifically to the reasons for dropping out;
- address the impact on customer actions and attitudes from specific marketing and promotional strategies;
- investigate whether customers that chose not to participate in the program still proceed with energy efficiency upgrades.

The survey data should be used to assess barriers to program participation and identify strategies for overcoming these barriers.

6.4.2. Tracking Change

This evaluation report should be viewed as a baseline for this relatively new program in the marketplace to which future evaluations can be compared to gauge program improvement. We recommend that the program continue with some of the data-collection tasks and analyses included in this evaluation to monitor implementation over time. Specifically, we recommend that the program conduct similar participant surveys, contractor surveys, and studies of the effectiveness of marketing on the target population. The data presented in this report can be a baseline measurement for the beginning of this program, and be tracked over time to measure progress and change. This evaluation provided some baseline measurements of marketing effectiveness in PG&E territory. We suggest that this be conducted again for PG&E and that SCE/SoCalGas territory be included as well. We also recommend that future evaluations include follow-up staff interviews to best understand how the program responded to the findings and recommendations provided in this study.

6.4.3. Understanding Market Differences that Drive Participation

PG&E has had more participation in this program than SCE. Several hypotheses contribute to this, including differences in demographics, climate zones, population size and characteristics, marketing tactics, economics, attitudes, implementation contractors, participating contractors, and contractor training approaches. We recommend that the program consider a study that fully explores the static and variable differences between the territories to better forecast the level of participation that can be expected in each territory. This study should categorize the differences into those that the program has influence over and those that the program does not. It is possible that SCE will never have the level of participation that PG&E can due to territory characteristics that are beyond the control of the program. These differences may also need to be considered as justification for some necessary program design and implementation

differences between the two territories so that the IOUs can cater the program to barriers that may be unique to each territory.

6.4.4. Side-by-Side Program Comparison

This evaluation called for a light review of prior studies and similar programs to illicit some best practices that would help the CA program with future decision making and help set program-performance expectations. Toward that end, we recommend collecting more data and devoting more analysis time to comparing the CA program to other similar programs across the country. We suggest that the evaluation team create some key metrics for comparison such as program duration, total cost, incentive levels, modeling tools, measures covered, number of participants, number of participating contractors, target market size, average cost per participant, and average savings per participant. This would require reviewing program websites, reviewing publicly available program evaluation reports, and may require interviewing several program managers if information is not publicly available. This would allow side-by-side comparison of the program with similar programs, and will likely be most informative as the CA is compared to a more mature whole-house program such as NYSERDA's.