

California's 2002 Statewide ENERGY STAR[®] New Home Program Evaluation Results

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ABSTRACT

The California Investor Owned Utilities teamed in 2002 to offer California's first ever statewide residential new construction program, named the California Statewide ENERGY STAR[®] New Homes Program. The Program provides design incentives to single family and multi-family builders for surpassing existing energy efficiency regulations, Title 24, by 15% or more. Unique to the California ENERGY STAR[®] Homes Program is the California Home Energy Efficiency Rating System (CHEERS) registry, a 3rd party database used for storing Title 24 output (building and energy characteristics data) for new single family and multifamily dwellings that participate in the California Energy Commission's Home Energy Rating System (HERS).¹

The Evaluation Measurement and Verification (EM&V) of the 2002 ENERGY STAR[®] New Homes Program was launched in 2003. The evaluation is being conducted in two separate phases. The Phase I EM&V activities were completed in early spring of 2003. EM&V activities covered by the phase I study included a process evaluation and a market characterization of single family and multi-family builders, a rigorous analysis of the CHEERS registry, surveys with key market actors, including Title 24 consultants, 3rd party inspectors, builders, plan check agencies, the CHEERS quality control contractor, and a preliminary assessment of the energy savings produced by the program.

In Phase II, the EM&V of the 2002 ENERGY STAR[®] New Homes Program will apply several methods that will be used in determining the energy savings resulting from the program activities. The Phase II activities will also include on-site verification of the measures installed by builders to reach ENERGY STAR[®] criteria as defined by the program and as documented in the CHEERS registry.

This paper concentrates on the Phase I findings. Specifically, readers will learn about the builder's satisfaction and attitudes toward the program, what role the newly introduced CHEERS registry played in the EM&V activities, perspectives of other key players included in the evaluation, and how the energy savings aspect of the program evaluation activities was addressed.

Introduction

The evaluation of the 2002 California ENERGY STAR[®] New Homes Program is a study mandated by California Public Utility Commission (CPUC) for the purpose of 1.) Reliably

¹ The California Energy Commission is required by Public Resources Code Section 25942 to establish regulations for a Home Energy Rating System (HERS) Program to certify home energy rating services in California. The goal of the program is to provide reliable information to differentiate the energy efficiency levels among California homes and to guide investment in cost-effective home energy efficiency measures.

documenting program effects, and 2.) To improve program designs and operations to be more cost effective at obtaining energy resources. California’s Investor Owned Utilities (PG&E, SCE, SDG&E, and SoCalGas) implemented the program in each of their respective service territories. RLW Analytics (RLW) was the sole evaluation, measurement and verification contractor on this project.

Program Overview

The California ENERGY STAR[®] New Homes Program (Program) provides financial incentives and education to California builders who construct new residences that exceed the state’s mandatory minimum energy efficiency standards. Participating builders that exceed California’s Title 24 residential standards by 15% or more receive cash incentives, in addition to training and marketing support.² Table 1 summarizes, by building type, climate zone (CZ), and compliance margin,³ the dollar amount each builder received for each unit that met ENERGY STAR[®] standards.⁴

Table 1. 2002 Incentive Rates Per Unit by Compliance Margin

Type	15-19.99% Compliance	20% + Compliance
Single Family (CZ 1-7)	\$ 400	\$ 700
Single Family (CZ 8-16)	\$ 500	\$ 900
Multifamily	\$ 150	\$ 250

The following steps provide an overview of the program participation and the connection between the various parties involved with the 2002 California ENERGY STAR[®] program.

- **Step 1:** Once builders have the building designs prepared, they submit the plans to Title 24 consultants who then prepare the required compliance documentation.
- **Step 2:** Builders must submit their building plans, alternative compliance method (ACM) modeling runs, and a short program application to the IOU to demonstrate they have indeed designed energy efficient homes. If the utility approves the application, the ENERGY STAR[®] program reserves incentive funds for the builder based on the projected number of units approved.
- **Step 3:** As part of the utility’s review and approval process, it submits the building plans and ACM runs to a plan check agency that verifies Title 24 and ENERGY STAR[®] compliance. Once approved, the plan check agency uploads the Title 24 output file (called the “transfer file”) to the CHEERS registry.
- **Step 4:** During construction of the homes, builders must hire a trained and certified CHEERS rater to verify the energy efficiency measures specified in the Title 24 file. Verifications are completed via an on-site inspection of the unit. CHEERS is a non-profit organization that has been approved by the California Energy Commission (CEC) to

² Title 24, the Energy Efficiency Standards for Residential and Nonresidential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption.

³ Compliance margin is how much more efficient than Title 24 the participant units are.

⁴ For the 2003 program, the incentive rates changed; single family units (CZ 8-16) with 20% or more compliance margin received \$700 per unit (instead of \$900/unit in 2002) and all other units that exceed 20% compliance receive no additional incentive than the amount from the 15% compliance rate.

provide oversight of HERS raters, who provide testing, verification, and certification of the homes under the California Home Energy Rating System (C-HERS) regulations. All new homes that include rater verified C-HERS measures are contained in the CHEERS Registry. Therefore, the CHEERS registry is a database of building and energy characteristics for homes with one or more C-HERS measures, and ENERGY STAR[®] homes.

Evaluation, Measurement and Verification Overview

The Phase I evaluation, measurement and verification report for the 2002 California ENERGY STAR[®] New Homes Program covers program activities completed in calendar year 2002 and 2003. The Phase I evaluation concentrated on the following tasks:

- Interviews with participant and non-participant builders.
- Interviews with turnkey service providers. (Turnkey service providers fulfill a host of services for participating builders, including Title 24 consultation and documentation, CHEERS analysis, inspections and testing, and program application paperwork.)
- Surveys with CHEERS certified raters.
- Interviews with Program Managers.
- Interviews with the agency responsible for CHEERS quality control and training and certification of new raters.
- Building characteristics and ex-post savings analysis. Utilizing the individual Micropas and EnergyPro Title 24 compliance models, which are the participant builder's best estimate of the building characteristics that will be installed during construction, an analysis of the building characteristics and energy savings was completed.⁵

The Phase II report will be completed mid-year 2004, when the majority of construction and incentive filing by 2002 program participant builders will be complete. The Phase II report will reassess the actual ex post energy savings by including as-built information gathered as part of on-site inspections that will be conducted by the evaluator. Additionally, not only will this report replicate the ex-post savings methodology used for the Phase I study, this study will also execute a billing analysis and use a forthcoming residential new construction baseline study as an additional approach to estimating gas and electric savings. These alternate methods will also be used to quantify program free-ridership occurring within the single family program.

Discussion of Process Evaluation Findings

In the following sections we discuss some of the more important findings as they relate to the process evaluation and market characterization of builders. The market characterization and process evaluation findings are based on the interviews with single family builders, multi-family builders and CHEERS raters.

⁵ MICROPAS and EnergyPro are two CEC approved software applications used to comply residential and non-residential buildings with Title 24.

Single Family Builders

The evaluation of the ENERGY STAR[®] New Homes Program began with a survey of new home builders, including both single family and multifamily builders. Both participant and non-participant builders were surveyed in order to gauge program acceptance, satisfaction and awareness.

It is clear from the surveys conducted with builders that the majority of the program participants are high volume production builders. More than 90% of the respondents built 100 homes or more per year, while 25% built more than 500 homes per year. As a result of the program, nearly 70% of builders say that they now specify energy efficient measures that they did not previous to participating. These findings reveal that the program is changing construction practices to include energy efficiency as an end goal. Evaluations of ENERGY STAR[®] homes programs in Wisconsin and Texas markets reported similar findings (ACEEE 2003; P.A. Govt. Services 2003).

In terms of program participation motivation, respondents clearly indicated that financial incentives were their primary reason for participating. In addition to the incentives, approximately 50% of the builder respondents participated for the direct benefits of marketplace differentiation and advertising partnerships. Furthermore, about 80% of the builders responding believe that the ENERGY STAR[®] label has had a positive impact on the marketability of their homes. These findings are also supported by recent evaluations in Texas. Evaluations of two ENERGY STAR[®] Homes Programs in two Texas markets (Oncor and Centerpoint) showed that builders are more motivated by the ENERGY STAR[®] advertising and promotion partnership than they are by financial incentives (P.A. Govt. Services 2003).

Overall satisfaction with the program was good, with an overall score of 3.62, out of a possible 5 points. Areas of the program scoring the highest were ‘communication with the utility’ (4.07) and ‘required margin of compliance’ (4.02). Scoring the lowest in terms of participant satisfaction was ‘advertising partnership’ (2.71). It was recommended that the utilities make an effort to strengthen and improve this important area of program delivery.

The builder surveys also assessed program barriers. About 48% of builders who participated reported that they did experience some barriers certifying homes as ENERGY STAR[®]. Most commonly, builders reported that the program timeline and funding uncertainty were the cause of the certification barriers. As a result, the evaluation strongly recommended that the CPUC allow for timely program approval, which should resolve both of these issues.

In addition to participant builders, a number of non-participant builders were also surveyed. Nearly all (94%) of the non-participant builders surveyed were aware of the ENERGY STAR[®] homes program. Builders who were aware of the program were asked why they elected not to participate. Inability to work within the program timeline and lack of program funding were the most common responses.

Lastly, the study also found that neither participants nor non-participants reported the required margin of compliance as a barrier. On a scale of 1-5, where “1” is not at all a barrier and “5” is a large barrier, responses for participants and non-participants scored 1.98 and 2.45 respectively. Participants scored their satisfaction level with the ‘amount of incentives’ at 3.08 out of a possible 5 points. These findings suggest that builders do not find the required margin of compliance to be a notable barrier, as they do with other aspects of the program, and the incentive appears to be more than satisfactory.

In 2005-06 the new residential Title 24 standards will take effect, which will make it more difficult for builders to comply with minimum standards. A case could be made (based on the builders' attitude toward the required margin of compliance and incentive levels) that it may be possible for the program to raise the compliance margin without adversely impacting participation rates. The result of such a change would likely better prepare builders for the inevitable code change and increase the amount of energy savings.

Multifamily Builders

In 2002, the ENERGY STAR[®] program certified nearly 9,000 multifamily units (nearly 8,000 in southern California) as ENERGY STAR[®]-compliant. Sixty-one multifamily builders were interviewed to better assess construction practices and attitudes of ENERGY STAR[®] program participants and non-participants.

Both participants and non-participants solely depended on a Title 24 consultant or energy consultant to complete documentation for Title 24 compliance. The vast majority of both groups found it very or somewhat easy to meet Title 24 standards, although program participants seemed to rate the easiness with a higher percentage. In addition, both groups claim to be building better than code. About 94% of program participants and 89% of non-participants stated that they built at least 10% or better than code. The majority of builders were not aware of the planned 2005 energy code changes. Based on these responses, the utilities should consider increasing the Program's qualifying level of efficiency to be greater than 15% better than Title 24; at least until the 2005 energy code changes are implemented.

Participant builders rated the importance of an energy efficient design with an average score of about 4 (of out a high of 5). Non-participants rated the importance with a slightly lower average, but the difference was not statistically different with 95% confidence.

The main motivation that participants listed as their reason for joining the program was the financial incentives. Although the financial incentives help builders incur the additional costs of building with greater energy efficiency, it is also important that some builders recognize other benefits they gain from being ENERGY STAR[®]-compliant, such as reduced bills for tenants and marketing support. Also about half of participants who built affordable multifamily housing stated that it helped them gain credits on tax exempt financing.

Non-participants who were aware of the program were asked about the barriers to participation they experienced. Non-participants mostly disagreed that it is difficult to find qualified contractors who are knowledgeable about energy efficient measures. Non-participants somewhat agreed that the ENERGY STAR[®] program's timeline made it difficult to participate in the 2002 program. The 2002 ENERGY STAR[®] program was not approved until March 2002. The uncertainty around future funding of the program most likely discouraged and disabled some of these builders from participating.

CHEERS Registry, Inspections and Quality Control

The California ENERGY STAR[®] New Homes program relies on the CHEERS organization for several aspects of program delivery. In the course of the evaluation, an assessment of various program delivery mechanisms that utilize CHEERS could not be avoided. At the beginning of 2002 CHEERS was the only CEC approved registry for tracking C-HERS measures. Recently however, the California Energy Commission approved California Certified

Energy Rating & Testing Services (CalCERTS) to oversee HERS raters providing Title 24 field verification and diagnostic testing.⁶

During the Phase I evaluation activities, CHEERS was the organization responsible for training and certifying CHEERS inspectors, and they were also responsible for conducting quality assurance on the data input into the CHEERS registry by the raters. Since all ENERGY STAR[®] homes must be entered into the CHEERS Registry, and because one in every seven ENERGY STAR[®] homes must have a certified CHEERS inspector inspect the home, it is evident that the utilities heavily depend on CHEERS for several areas of program delivery.

One of the most notable findings was that the CHEERS Registry was not a reliable database of information. Early on in the evaluation design stage, the utilities approved a plan that relied heavily on the use of the data in the CHEERS registry. It was quickly determined that the transfer file data stored in the registry were input incorrectly due to CHEERS data management problems. As a result of the problems identified with the CHEERS database it was determined that alternative methods would be required to fulfill the requirements of the evaluation activities.

Also, the inspection data gathered by the raters and input into the Registry was going to be used by the evaluation as a method for determining what building components and equipment were actually installed, as opposed to what was originally planned (transfer file data) by the builders. Unfortunately, the CHEERS Registry data structure did not support this level of analysis. Further compounding this problem was the finding that in many cases raters would not enter any information into the registry if the inspection data were more energy efficient than was originally specified. Raters are trained to identify less efficient, or non-compliant building characteristics, not necessarily more efficient characteristics – since this would have no impact on ENERGY STAR[®] compliance. This is a particular problem for the evaluation since more energy efficient building components would likely show more energy savings for the program.

As a result of these compounding issues the evaluation scope was increased to include on-site inspections of a statistically representative sample of single and multifamily homes. These activities are planned as part of the Phase II evaluation activities.

CHEERS is currently taking corrective steps to improve the quality of their product and the services they provide to the program. With the introduction of CalCERTS, the utilities have the ability to diversify the HERS requirements of the program. (No longer are they forced to “put all their eggs in one basket”.) Therefore the introduction of competition to California’s HERS market is a good thing as it will likely spur a reaction in the marketplace that will lead to improved HERS products.

Discussion of Ex Post Energy Savings

The most telling measurements used to evaluate the impact of the 2002 ENERGY STAR[®] New Homes Program are the overall energy savings produced by constructing more energy efficient homes. Each builder’s Title 24 compliance files that qualified the homes as ENERGY STAR[®] were utilized as a preliminary approach to estimate the energy savings. Again, the final ex post energy savings estimates will be based on the Phase II report’s reassessment of as built data through on-site inspections, in addition to alternative approaches and data sources that will be used to fortify the findings.

⁶ CalCERTS was approved by the CEC on October 8th, 2003.

Each utility submitted estimates of gas and electric savings resulting from the program as part of the Annual Earnings Assessment Proceeding (AEAP) filing in April 2003.⁷ Filings varied based on assumptions made about the baseline gas versus electric fuel type. Since Title 24 compliance software is fuel blind, meaning that all energy is converted into Btu's, it is irrelevant (to Title 24) whether energy savings result from gas or electric measures. Therefore a home can reach ENERGY STAR[®] criteria (15% better than the Title 24 prescriptive baseline) with only gas measures, only electric measures, or a combination of both.⁸

Table 2 presents the overall EM&V savings and the utility filed (AEAP) savings along with the associated realization rates. As the table shows, all utilities exceeded the AEAP estimate of kBtu savings. SoCalGas had the highest realization rate of 240% while PG&E reported savings closest to the EM&V estimate with a realization rate of 101%. The AEAP estimate shown for SCE only includes the fraction of kBtu savings that they projected would result from electric measures (in essence removing gas measure savings). The EM&V estimate of total savings includes both electric and gas savings for SCE while the AEAP filing only includes electric savings, so it is by no means an "apple-to-apple" comparison. For this reason, a total realization rate for SCE is not presented. Interestingly, SoCalGas, an all gas utility, is allowed by the CPUC to claim electric savings. It was not made clear to the evaluators why SCE and SCG have different AEAP filing requirements.

Table 2. Single Family kBtu Savings by Utility

Utility	Total Savings (kBtu)		Realization Rate
	EM&V Estimate	AEAP Estimate	
PG&E	49,410,150	48,826,028	101%
SCE*	60,551,406	42,998,425	
SoCalGas	8,501,121	3,547,142	240%
SDG&E	15,137,253	13,883,593	109%
Overall	133,599,930	109,255,187	

*EM&V Estimate includes both gas and electric savings, while AEAP estimate is electric savings only.

Single Family Energy Savings

While it is straightforward to determine the total kBtu savings (fuel neutral savings), measuring the proportion of the kBtu savings that is gas and electric can be subjective without having detailed construction data.

We present two approaches in this section for determining the fraction of kBtu savings that are gas or electric. The first approach we present (Approach A) is what the utilities selected as part of the original EM&V plan and the second approach (Approach B) is an alternative method that utilizes data from a recent residential new construction study, herein referred to as "Approach A" and "Approach B," respectively.

Approach A evaluation methodology. Approach A is based on Title 24 files that were obtained from each of the four utilities represented in the evaluation. The Title 24 files were all approved by the utilities for participation in the 2002 program, and represent the best approximation of

⁷ For almost a decade, energy efficiency programs administered by investor owned utilities and regulated by the CPUC have been subjected to annual review in the Annual Earnings Assessment Proceedings.

⁸ SCE, an all electric utility, is only allowed to file for electric savings, while the other three utilities are able to file for both gas and electric savings.

how the new homes will actually be built. Energy savings are based on a comparison of the “as specified” home compared to the prescriptive baseline home.⁹

For each single family residential end-use (i.e., heating, cooling and water heating) the difference in energy use was determined in units of kBtu. Depending on the fuel type of the equipment installed in the home, the kBtu savings for each end-use was converted to either gas or electric savings. Each housing plan in the program underwent this analysis before being weighted to the total number of plans represented in the program.

Table 3 shows the results of the Approach A analysis. Using this approach, all utilities claiming gas savings exceeded their AEAP estimate. On the electric side, some exceeded the estimate while others fell short. For example, PG&E had the closest realization rate for both gas and electric (101% and 102%) because they used a methodology similar to the evaluation methodology to compute their filed estimate of savings. The other utilities used different approaches to calculate the amount of gas and electric savings that their programs would produce. Using Approach A, the data shows that both SDG&E and SCE fell short of their electric savings filing. However, SDG&E produced an extremely high gas realization rate (1318%). The stark difference in estimation is due to differing methodologies used between the EM&V Approach A and the utilities’ approach to calculate energy savings. SoCalGas was the only utility that highly exceeded both gas savings and electric savings.

Table 3. Single Family Gas and Electric Energy Savings by Utility using Approach A

Utility	Gas Savings (thm)		Realization Rate	Electric Savings (kWh)		Realization Rate
	AEAP Estimate	EM&V Estimate		AEAP Estimate	EM&V Estimate	
PG&E	403,299	407,443	101%	829,781	846,362	102%
SCE	n/a	395,617	N/A	4,199,475	2,049,974	49%
SoCalGas	6,163	18,851	306%	286,243	646,158	226%
SDG&E	8,988	118,434	1318%	1,268,170	321,698	25%
Overall	418,450	940,345	225%	6,583,669	3,864,192	59%

Approach B evaluation methodology. In this section, the Approach B methodology of calculating energy savings by fuel type in order to account for differing assumptions in the baseline figures is presented. In our previous presentation of gas and electricity savings, Approach A assumed the prescriptive based standards as the baseline.¹⁰ In this methodology we utilize data from a previous study conducted by Itron.¹¹ The Itron study sought to identify a baseline that would more accurately reflect actual construction practice in California.

In California, builders can use either a performance-based method to meet Title 24 standards that “trades-off” savings between end-use categories (cooling, heating, hot water), or a prescriptive method that requires the builder to meet the minimum requirements within each specified category (e.g., wall insulation, ceiling insulation, window area, window U-factor). Builders very seldom use the prescriptive method due to its cost-ineffectiveness.

⁹ “As specified” refers to how the ENERGY STAR home is modeled in Title 24. In most cases this is an accurate representation of the home’s material and equipment characteristics. However, it is possible that the home was ultimately constructed slightly differently, which would be identified by the CHEERS rater at the time of the CHEERS inspection if the difference resulted in a lower efficiency.

¹⁰ The prescriptive standards refer to the specific Title 24 minimum standards in each end-use category (cooling, heating, hot water).

¹¹ Itron prepared a study memo for PG&E, SCE, SDG&E and SCE titled "Differences in Savings Estimates". June 2003.

In order to correct for the difference in prescriptive versus performance based compliance methods, approach B utilized percentages from the Itron study that broadly estimate the actual proportion of savings by fuel-type. The study was based on interviews with Title 24 consultants and builders to gain an understanding of building measures that would be used to comply with baseline and/or ENERGY STAR® standards. Inconsistencies in a comparison, conducted in this report, of the 2002 ENERGY STAR® building characteristics and Title 24 consultant responses in regards to ENERGY STAR® building characteristics leads us to believe that there is added subjectivity to this approach.

Table 4 presents the estimated ratios by utility and by inland homes and coastal homes as determined by Itron. Itron found that there were greater electricity savings in inland regions (Climate zones 8-16) than in coastal regions (Climate zone 1-7). SCE had the greatest variance between regions. In coastal homes, only 42% of the energy savings were in electricity, whereas 87% of the savings in inland homes were in electricity.¹²

Table 4. Fuel-Type Savings Proportions by Itron Study

Utility COASTAL	Gas (Therms)	Electricity (kWh)	Total	Utility INLAND	Gas (Therms)	Electricity (kWh)	Total
SCE	58%	42%	100%	SCE	13%	87%	100%
PG&E	71%	29%	100%	PG&E	58%	42%	100%
SDG&E/SoCalGas	12%	88%	100%	SDG&E/SoCalGas	11%	89%	100%

The percentages shown in Table 4 between fuel-type savings to each utility's evaluated total kBtu savings were used in order to gain an alternate estimate of gas versus electric savings. Note this methodology is used only to account for the difference in gas versus electric savings, and that the combined/total energy savings between the two methodologies remains equal to that in Approach A. Table 5 summarizes the total savings by gas/electric and coastal/inland areas.

The ratios used in Approach B makes evident the favoring of electric savings to gas savings, which is clearly demonstrated in SCE's electric realization rate. SCE's realization rate under this approach is 123%, while under Approach A it was 49%. Under this scenario, PG&E is the only utility with a realization rate of gas or electricity below 100% (73% gas). Note that one can compare the difference in realization rates by fuel-type for each utility, except SCE because they are not allowed to report gas savings in their earnings claims.

Table 5. Gas and Electric Energy Savings by Utility using Approach B Methodology

Utility	Gas Savings (kBtu)		Realization Rate	Electric Savings (kBtu)		Realization Rate
	AEAP Estimate	EM&V Estimate		AEAP Estimate	EM&V Estimate	
PG&E	40,329,900	29,549,712	73%	8,496,128	19,860,438	234%
SCE	-	7,610,670	N/A	42,998,425	52,940,736	123%
SoCalGas	616,300	933,970	152%	2,930,842	7,567,151	258%
SDG&E	898,800	1,778,598	198%	12,984,793	13,358,655	103%
Total	41,845,000	39,872,949	95%	67,410,187	93,726,981	139%

Alternative Indicators of Single Family Program Effectiveness

For this report, the evaluator encourages readers to not only draw on the realization rate as an indicator of program success, but to also utilize other metrics that go further than verifying

¹² The percentages are the amount of kBtu savings for electric as apposed to gas.

claimed savings. Since program implementation budgets and numbers of participants vary by utility, we have included additional indicators of program cost effectiveness that are perhaps equally, if not more, important to assess program success. These metrics provide further insight into the evaluation and use equivalent methodologies of calculation.

Table 6 presents three indicators of program effectiveness: cost per single family unit recruited, cost per 1,000 kBtu saved, and kBtu savings per unit. The data in Table 6 clearly shows SDG&E as having the lowest cost per unit recruited (or per participant unit) and the lowest cost per 1,000 kBtu saved, however they produced the lowest savings per unit. On the other hand, SoCalGas saved the most energy per unit, but also had the fewest projects in the program and highest recruitment cost. SCE had the highest number of single family units in the program. Although PG&E had the highest cost per 1000 kBtu saved, they had the second highest energy savings per unit. On average, it cost \$1,009 per unit recruited, \$83 per 1,000 kBtu saved, and each home saved on average 12,092 kBtu.

Table 6. Alternative Indicators of Program Cost Effectiveness for Single Family Program

Utility	EM&V Total kBtu Reduction	2002 Single-Family Budget	Participating Single-Family Units	Cost Per Unit Recruited	Cost per 1000 kBtu Saved	kBtu Savings Per Unit
PG&E	49,410,150	\$ 4,412,000	3,520	\$ 1,253	\$ 89	14,037
SCE	60,551,406	\$ 4,917,183	5,234	\$ 939	\$ 81	11,569
SoCalGas	8,501,121	\$ 742,000	432	\$ 1,718	\$ 87	19,679
SDG&E	15,137,253	\$ 1,080,066	1,863	\$ 580	\$ 71	8,125
Overall	133,599,930	\$ 11,151,249	11,049	\$ 1,009	\$ 83	12,092

Multifamily Energy Savings

This section presents the preliminary ex post savings for participating multifamily projects. This includes both low-rise and high-rise multifamily dwellings. The key difference between these two types of multifamily housing is that high-rise projects are subject to Title 24's nonresidential and residential building standards (nonresidential for equipment and envelope, and residential for water heating and lighting), while low-rise (3 stories or less) are subject only to Title 24's residential building standards. For comparison purposes, the multifamily program is less than half the size of the single family program in terms of claimed (AEAP) savings.

Table 7 shows the results of the total kBtu savings, comparing the EM&V estimate to the AEAP filed savings. SoCalGas produced the highest realization rate of 120%, while PG&E's and SDG&E's EM&V estimate were slightly below the AEAP Filing with realization rates of 98% and 86%, respectively. This study does not present an overall realization rate for SCE because their AEAP filing does not include gas savings, while the overall EM&V estimate does, therefore, making a comparison not possible.

Table 7. Multifamily Total kBtu Savings by Utility

Utility	Total Savings (kBtu)		Realization
	EM&V Estimate	AEAP Estimate	Rate
PG&E	8,988,113	9,147,454	98%
SCE*	12,852,193	6,846,963	
SoCalGas	16,173,208	13,443,982	120%
SDG&E	17,143,419	19,919,988	86%
Overall	55,156,933	41,314,187	

*EM&V Estimate includes both gas and electric savings, while AEAP estimate is electric savings only.

The approach to estimating gas and electric savings for multifamily housing was the same as Approach A, discussed earlier in the single family energy savings section. Using this approach, a comparison of the as-built energy consumption to the prescriptive baseline, the evaluator calculated total kBtu savings.

Table 8 shows that SCG had the greatest gas realization rate and PG&E had the greatest electric realization rate. While PG&E did not meet their projected savings for gas savings (87%), SDG&E and SCE did not meet their electric savings estimates. Statewide, or overall, gas measures saved 400,201 kBtu, resulting in a realization rate of 187% when compared to the utilities AEAP filing. For electric, nearly 1.5 million kBtu were saved, resulting in a 76% realization rate when compared to the utility AEAP filing.

Table 8. Multifamily Gas and Electric Energy Savings by Utility Using Approach A

Utility	Gas Savings (thm)		Realization Rate	Electric Savings (kWh)		Realization Rate
	AEAP Estimate	EM&V Estimate		AEAP Estimate	EM&V Estimate	
PG&E	88,157	77,039	87%	32,401	125,422	387%
SCE	-	82,997	-	668,714	444,621	66%
SoCalGas	80,442	98,539	122%	527,374	617,184	117%
SDG&E	126,298	141,626	112%	712,002	291,128	41%
Overall	214,455	400,201	187%	1,940,491	1,478,355	76%

Unlike the single family analysis, data to support an Approach B savings analysis is not available for the multifamily market segment. Since the Itron study did not survey multifamily market actors, applicable ratios could not be calculated. Therefore, Approach A was the only method used to determine the amount of gas and electric savings resulting from the program.

Alternative Indicators of Multifamily Program Cost Effectiveness

Similar to single family, this study includes added metrics in order to evaluate program cost effectiveness. These metrics include the cost of recruitment per participant unit, the cost of saving 1,000 kBtu, and the savings per multifamily dwelling unit.

Table 9 shows the results of this analysis for each of the utilities. Like the single family analysis, the SCE EM&V numbers include gas and electric kBtu savings. This consistency allows us to make equivalent comparisons between utilities.

SCE produced the lowest cost per unit recruited, with an average cost of \$248 per unit participating in the program. PG&E's costs were nearly three times higher than SCE, although PG&E projects also saved more energy per unit than any of the other utilities. In terms of cost per energy unit saved, SDG&E had the lowest cost at only \$42 per 1,000 kBtu, SCE and SDG&E were nearly equal at \$58 and \$59 respectively, while PG&E fared the worst at nearly double the

other three. The lowest cost per unit recruited was SCE (\$248) and the highest cost per unit recruited was PG&E (\$734). Despite PG&E's high recruitment cost and cost per energy saved, they did have the highest amount of energy saved for each ENERGY STAR[®] multifamily unit.

Table 9. Alternative Indicators of Program Cost Effectiveness for Multifamily Units

Utility	EM&V Total kBtu Reduction	2002 Multifamily Budget	Multifamily Units	Cost Per Unit Recruited	Cost per 1000 kBtu Saved	kBtu Savings Per Unit
PG&E	8,988,113	\$ 828,837	1,129	\$ 734	\$ 92	7,961
SCE	12,852,193	\$ 742,000	2,030	\$ 248	\$ 58	6,331
SoCalGas	16,173,208	\$ 946,608	2,994	\$ 286	\$ 59	5,402
SDG&E	17,143,419	\$ 728,149	3,313	\$ 359	\$ 42	5,175
Overall	55,156,933	\$ 3,245,594	9,466	\$ 343	\$ 59	5,827

Ex Post Savings Conclusions

This study included two approaches for evaluating gas and electric savings for the single family program. Each of the approaches has its merits, even though they produce considerably different energy-specific results. While calculating overall energy (fuel neutral) savings is equal in both approaches, determining the fraction of savings that is gas and electric is not. The value of having a reliable approach to dividing gas and electric savings cannot be underestimated since these are some of the primary inputs that determine the program's total resource cost (TRC) test (cost effectiveness testing). Because of the importance surrounding this issue, the Phase II EM&V report will utilize alternative methods such as a billing analysis and data sources such as the 2004 Residential New Construction baseline study in order to evaluate gas and electric savings resulting from the program.

Because Itron did not study multifamily market actors, the alternate approach to estimate the gas versus electric split for the multifamily analysis could not be applied. Currently, in Title 24 compliance software, algorithms allow low-rise multifamily projects to comply with the ENERGY STAR[®] program requirements (i.e., 15% better than Title 24) with little, and sometime no measures that are above the prescriptive baseline. As part of the 2005 energy code modifications, these problems will be removed. The result of the code changes will have a significant impact on multifamily builders, no longer will they enjoy the ease of compliance as they currently do. Builders will be required to design much more energy efficient buildings than they currently are simply to meet code, not to mention the added measures they will need to implement in order to reach ENERGY STAR[®] criteria.

Since this market will undergo a mandated transformation (code change) in 2005, RLW recommended continued use of Approach A to evaluate energy savings in the multifamily segment. We believe the cost of conducting an in-depth study in order to identify a baseline that will soon change is an inefficient use of ratepayer funds.

General Conclusions

Demand for, and participation in the 2002 California ENERGY STAR[®] New Homes Program was good, with nearly 11,000 single family and nearly 9,000 multifamily dwellings participating. In 2002 there were approximately 124,000 new single family housing starts in California, and 44,000 new multifamily units started in 2002. (CBIA 2003) These numbers represent a 9% market penetration in the single family market and 20% penetration in the multifamily market.

Longer program implementation periods would mitigate builder uncertainty and would improve participation rates. By extending the program duration, the utilities will have sufficient time to target its key group of builders through various marketing strategies, and the builders will have sufficient time to learn, adopt and gain incentives for energy efficient design practices.

Selected EM&V Recommendations

The utilities should work toward a common approach to estimating energy savings. The four utilities used varying approaches to estimate filed savings. Utilizing a common approach would benefit program administration as well as program evaluation.

The required margin of compliance for low-rise multifamily projects should be no less than 20%. Issues relating to the ease of program compliance for low-rise multifamily projects could be mitigated by a higher compliance margin for low-rise projects. Disallowing negative savings in any of the three end-use categories would also mitigate the ease of compliance issues. Upon implementation of the 2005 standards, the program should then restructure the multifamily program metrics to match single family compliance metrics. Additionally, these changes will better prepare low-rise builders for the imminent code changes.

Improvements and standardization of the utility data tracking systems would greatly improve the efficiency of the evaluation activities. RLW has recommended variables for the utilities to track as part of program implementation activities. Standardizing the tracking systems would be a significant cost savings to the evaluation and would also remove some of subjectivity that has gone into the evaluation.

On-site inspections, or other means of verification would be prudent due to current issues and areas of program design identified by the evaluation. This recommendation was made as a result of several findings, 1.) The transfer files are unencrypted, 2.) CHEERS quality assurance processes were not producing independent verification of rater activities, 3.) Less than adequate “to do lists” resulting from poorly parsed transfer files (particularly an issue relating to multifamily inspections), and 4.) Potential conflict of interest when same agency is responsible for Title 24 documentation, inspections, and plan check.

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