Evaluation of the 2004-2005 Statewide Multifamily Rebate Program – Volume I

FINAL REPORT

Program 1118-04

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Table of Contents

Table of Contents

Table of Contents

Table of Contents

Tables

Table of Contents

Table of Contents

Table of Contents

Figures

Table of Contents

Table of Contents

1. Executive Summary

This document is the executive summary of the 2004-2005 California Statewide Multifamily Rebate Program Evaluation, Measurement and Verification (EM&V) Study. The California Public Utilities Commission's Energy Division (CPUC or Commission) is the primary guidance organization for this evaluation effort, with the state's investor-owned utilities (IOUs) [San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and Southern California Gas (SCG)] providing valuable feedback. This report follows an interim report that was submitted on September 15, 2005, which is included as an appendix to this report.

1.1 Program Overview

The 2004-2005 California Statewide Multifamily Rebate Program was launched in 2002 to address the unique needs of the multifamily sector. This market was served prior to 2002 by the Residential Contractor Program, which included both single and multi-family homes. Thus, the 2002 program was innovative in having its design tailored to the unique barriers faced by the multifamily sector, primarily the split-incentive barrier. The program theory, as described in the program plans, is that financial incentives, along with program marketing and education, will be used to help multifamily property owners and managers overcome the split-incentive barrier. Although these owners and managers are responsible for facility improvements, they usually do not pay energy bills for the tenant spaces and therefore have little incentive to install more expensive energy-efficient measures in these spaces. The rebates help reduce—and in some cases totally eliminate—these higher first costs for energy-efficient equipment. The program also helps to encourage the participation of multifamily property owners and managers by offering rebates for energy-efficient measures installed in common areas. The program hopes that "program momentum and market penetration will likely increase at a faster rate" as multifamily property owners become more familiar and comfortable with energy-efficient measures and learn the long-term benefits of energy efficiency.

The 2004–2005 program is offered statewide in the service territories of PG&E, SCE, SDG&E and SCG. The program promotes energy savings in apartment dwelling units and in the common areas of apartment and condominium complexes and mobile home parks. Property owners (and property managers, as authorized agents for property owners) of existing residential multifamily complexes with five or more dwelling units may qualify for rebates for installing a variety of energy efficiency measures. These include:

- Apartment improvement measures (e.g., interior and exterior hardwired fixtures, ceiling fans, compact fluorescent lights (CFLs), clothes washers, and dishwashers)
- Common-area improvement measures (e.g., exit signs, occupancy sensors, photocells, high-performance dual-paned windows)
- Mechanical improvement measures
- High-efficiency heating and cooling equipment.

The electric measures, such as lamps, fixtures and appliances, have made up most of the savings attributed to the program. Gas measures have been much more challenging to sell to both contractors and property managers.

1.2 Evaluation Objectives and Approach

This study assessed the performance of the 2004–2005 California Statewide Multifamily Rebate Program in terms of accomplished program goals and effectiveness of program processes. Key EM&V objectives included:

- Measurement and verification of energy and peak demand savings through development of ex-post savings and verification of measure installations
- Process evaluation to assess overall levels of performance and success of the program processes
- Market assessment of response to program interventions.

The following summarizes key elements of our EM&V approach.

1.2.1 Process Evaluation and Market Assessment

The objectives of the process evaluation were to address the effectiveness of changes in program implementation from prior years and to identify areas for continued improvement.

The main objectives of the market assessment were to characterize multifamily property managers/owners, the installation contractors that serve them, and installation contractors that could potentially serve them. This part of the evaluation looked at characteristics of the multifamily market such as property size, prevalence of centralized energy equipment, billing arrangements, metering characteristics, property ownership, and company size. It also looked at this sector's awareness of energy efficiency, involvement in California energy efficiency programs, and installation of energy-efficient equipment. Finally it looked at the potential for additional energy efficiency in the multifamily sector. This included finding out plans for future energy efficiency projects by multifamily property managers/owners. It also included asking installation contractors which energy efficient technologies they thought had the greatest market potential.

A total of five telephone surveys were used to inform both the process evaluation and the market assessment. Table 1-1 below provides a summary of the surveys.

Table 1-1
Summary of Program/Market Participant Surveys
Used for Market Assessment and Process Evaluation

Survey Target Group	Time Period of Survey	Number of Completed Surveys	Survey Format
2004 participating property managers/ owners	August 2005	106	Computer-Assisted Telephone Interview (CATI)
Nonparticipating property managers/owners	July 2005	40	Computer-Assisted Telephone Interview (CATI)
2005 participating property managers/ owners	June 2006	150	Computer-Assisted Telephone Interview (CATI)
Participating contractors	May - July 2005	28	In-depth expert survey
Nonparticipating contractors	May - June 2006	17	In-depth expert survey

To further inform this market assessment as well as the process evaluation, we reviewed past studies of the California multifamily market such as the 2000 Statewide Survey of the Multifamily Market by ADM Associates and TecMRKT Works. Since we recently completed evaluations of two other California multifamily programs—the Efficient Affordable Housing (EAH) program and the Partnership for Energy Affordability in Multifamily Housing (Energy Action)—we also leveraged knowledge from these evaluations.

1.2.2 Impact Evaluation

The objectives of the impact evaluation were to verify the energy savings claimed by the program. The impact evaluation:

- Assessed which savings parameters for each measure were most crucial for developing reliable energy and demand savings estimates
- Implemented data collection and analysis to update these parameters (as necessary)
- Implemented data collection and analysis to verify measure installations
- Calculated net and gross savings attributable to the program.

The impact evaluation relied on two phases of on-site surveys with program participants from 2004 and 2005 to estimate gross savings for all measures but boiler controls. A total of 216 participating sites were visited (111 - 2004 sites and 105 - 2005 sites) – with 4,000 CFLs and 1,100 programmable thermostats inspected in addition to a small number of other measures. For CFLs, inspections were used to verify installation (and determine disposition of any CFLs that were not found), record room type and determine prior bulb wattage (based on tenant or property manager self-report). Hours of use and peak usage were determined based on a look-up table by room type from the California CFL Metering Study (KEMA 2005). For programmable thermostats, inspections were used to verify installation (and determine disposition of any units not found) and to determine whether the tenant(s) made any behavioral changes associated with the installation of the new programmable thermostat. For other measures (which accounted for a small fraction of the program's total energy savings), inspections were used primarily for verification purposes[1].

A stand-alone billing analysis was conducted to estimate gross savings for boiler controls (see Appendix D). Participant surveys that were conducted as part of the market assessment were used to estimate net to gross ratios for all measures.

1.3 Process Evaluation and Market Assessment Results

1.3.1 Program Target Market

The program is marketed in a variety of ways – but the vast majority of property managers/owners learn about the program via contractors. The program engages with a pool of contractors that solicits properties to participate in the program (typically through canvassing), and contractors procure and install program-qualifying equipment. For the most commonly installed measures, program rebates cover the installation and equipment cost. Many of the contractors that market this program rely on the program's rebates for most of their business.

The interim report noted that the program was most successful in reaching medium sized properties. Contractors tend to avoid smaller properties, and have difficulties engaging with large properties, which typically have in-house maintenance staff and existing relationships with contractors. The program is also more successful in reaching properties that both own and manage their buildings, where there are fewer people involved in decision-making.

In 2005, the program had more success in reaching smaller properties. The program made a concerted effort in 2004 to expand its reach to smaller sites and these efforts likely led to an increase in smaller property participation. The program continues to struggle with engaging the larger properties.

While the program is predominantly delivered via contractors, program managers also use other marketing methods to reach property managers/owners directly. These methods include direct mail, bill inserts, program websites, email, advertisements and articles in trade journals and presentations to apartment associations. The program has recently expanded its efforts to engage multifamily trade associations. Program managers prefer to engage directly with properties because they believe that these so-called self-initiating properties may eventually install a greater variety of energy efficiency measures.

[1] In Phase 2, lighting fixture and T8 inspections were broadened to mirror CFL inspections in order to allow for analysis of per unit savings.

Typically, contractors that market the program focus on one or two categories of measures and do not attempt to treat the site comprehensively. In contrast, a self-initiator might be more likely to continue working with program managers to identify further energy efficient opportunities.

We found evidence that indeed, self-initiating property managers/owners were more likely to have plans for comprehensive energy efficiency upgrades in the future. However, within a given program year they do not install a wider variety of measures than properties that have been engaged by contractors.

The program's marketing strategies (a combination of engaging directly with property managers/owners and relying on a dedicated pool of contractors) have been highly successful in leading to installations of low cost retrofit measures such as energy efficient lighting measures and programmable thermostats, where the rebates cover most or all of the equipment and labor cost. However, it has had less success with replace on burnout measures. The program has had more success with high-efficiency measures that provide other benefits besides energy savings. For example, lighting fixtures, programmable thermostats and high-efficiency windows provide additional benefits and are easier to sell to properties.

In 2006-2008, the program has removed programmable thermostats from its measure mix[2] and is aiming to expand its sales of gas measure rebates. As a result, program managers have ramped up their marketing efforts to specifically target contractors who install gas measures (such as using targeted direct mail campaigns). However, contractors who deal with these measures confirm program managers' perception that it is very difficult to convince property managers/owners to replace equipment unless it is in need of major repair or is not working at all. As such, these marketing efforts will likely take time to come to fruition.

The program has not extensively mined its tracking data to identify additional energy efficiency opportunities among prior participants. The program has typically met its energy savings goals and has not had to rely on such data mining. But going forward program managers might want to explore marketing to prior participants and encouraging them to install other energy efficiency measures. These efforts may not lead to short-term impacts but could be an important part of longer-term efforts to identify replace on burnout opportunities.

1.3.2 Program Theory

As mentioned in the interim report, the program lacks a formal program theory. Such a formal program theory would use a logic model to help explain the purpose of key program activities, help identify appropriate strategies for mitigating market barriers, and help measure program progress and success through metrics that are based on desired program outcomes. However, program managers – at least collectively – are aware of the key market barriers to energy efficiency implementation in the multifamily sector, including high first costs, hassle costs, lack of awareness or knowledge of energy efficiency and its benefits, the split incentive barrier and lack of maintenance staff. Moreover, the evaluation results show that the program's implementation strategies are appropriately aligned to mitigate most of the key barriers.

The program has been extremely successful in reaching buildings that are individually metered. This result suggests that either the hypothesis that property managers will not pay for energy efficiency improvements unless they directly benefit from the savings is untrue (the split incentive barrier) – or that

[2] DEER no longer recognizes savings potential for this product, based on prior evaluation results.

the program is successfully reducing this barrier. It is probably a little bit of both. Evidence from property managers suggests that if energy efficiency tenant unit improvements are valuable in and of themselves (e.g., lighting fixtures and programmable thermostats) – aside from their energy efficient savings opportunities – property managers are more likely to invest in them. Other evidence suggests that most property managers have already outfitted their common areas with CFLs – but potential remains still in tenant units. As such, the split incentive barrier still exists for individually metered units – but program rebates are effectively designed to overcome it.

1.3.3 Program Design

This section includes various findings of interest related to program marketing, measure mix, program processes, quality assurance and satisfaction.

1.3.3.1 Marketing

Property managers/owners are most likely to learn about the program from contractors. However, 2005 program participants learned about the program through a wider variety of sources than 2004 participants. This may reflect ramped up program marketing efforts such as engaging apartment associations in attracting self-initiators. Property managers/owners and contractors – both participating and nonparticipating – tend to favor direct mail for receiving program information. 2005 participants are more likely to prefer utility websites than 2004 participants, suggesting either a trend towards increased use of the Internet by property managers/owners in general or that self-initiating properties are more likely to use the Internet than those that are engaged by contractors.

Participating contractors pitch the program by emphasizing energy savings and program rebate levels. Few contractors varied their sales pitch based on the type of measure they were promoting, the type of property or to whom they were making their pitch (e.g., owner versus manager versus maintenance staff.) Contractors who actively market the program are not highly satisfied with program marketing – saying that most sites they visit have not heard of the program. However, they did not have clear recommendations for improving program marketing. In fact, some feared that if the program expanded its marketing efforts, property managers/owners would install their equipment themselves. Others felt that contractors are the best to market the program directly to property managers/owners.

Contractors' suggestions for improving program marketing included utility bill inserts, print ads, wider availability of program brochures, educational seminars for property managers/owners with contractors as guest speakers, allowing contractors to use utility letterhead, and the circulation of lists of qualified local contractors to property managers/owners.

Nonparticipating boiler/plumbing contractors said simply getting more information about the program to the contractors would be the most effective recruitment strategy. In addition to direct mail, they mentioned telephone calls, emails, and advertisements at home improvement and hardware stores as ways to do this.

1.3.3.2 Measure Mix

There is a high degree of interest in energy-efficient water heaters and controllers among nonparticipating property managers/owners. They are also interested in energy efficient lighting fixtures, CFLs, central ACs, heat pumps and clothes washers. Likewise, there is interest among participating property

managers/owners in high efficiency windows, dishwashers, furnaces and CFLs. They are most likely to have already installed CFLs and energy efficient lighting and high-performance windows.

Contractors believe the greatest potential exists in the multifamily market for T5/T8 lamps and CFLs in tenant units. CFLs in common areas were rated lower in terms of relative market potential – likely because contractors believe that these measures are already installed. Some contractors were less enthusiastic about CFLs in tenant units due to difficulty getting access to tenant units, theft of lamps, limitations on the number of fixtures that may use CFLs, limited availability of program rebates and increasing CFL saturation. A few contractors mentioned that while T5/T8 lamps offer great potential, they take longer to install, require a higher degree of skill and limitations on tenant unit applications (versus CFLs.) Some contractors felt that programmable thermostats offered potential – while others felt that the market was becoming saturated due to the program and that new buildings already have them installed.

The general consensus of the participating contractors was that the program was offering rebates for all the important energy efficiency measures. Over half of the participating contractors cited at least one measure that they believed to have insufficient rebates. The most-cited measures were exterior lighting and T5s/T8s.

1.3.3.3 Program Processes

Participating contractors said that checking websites, receiving utility emails, and calling the utility were their most common means of monitoring program developments. Only one participating contractor said that it was difficult to find out which energy-efficient measures qualify for the program's rebates.

Half of the participating contractors said that the program had rejected at least some of their applications. Reasons for rejected applications included rebate monies running out, property managers/owners not allowing utilities to perform inspections, property managers/owners exceeding rebate eligibility limits, installing CFLs too soon after previous installation of CFLs, lighting measures no longer qualifying for ENERGY STAR, and applications with incorrect information. However, as discussed below, satisfaction ratings regarding rebate applications are high.

All but one of the contractors said that they would be more active in the program than currently if rebates incentives were available all year round.

1.3.3.4 Quality Assurance

The interim report noted concerns among participants regarding quality assurance. In response, program managers increased their efforts, particularly by requiring contractors to provide warranty information and increasing inspections. These measures resulted in an increase in participant satisfaction with measures and their contractors from 2004 to 2005. Satisfaction with the quality of installation and equipment for both programmable thermostats and CFLs increased significantly from 2004 to 2005.

1.3.3.5 Satisfaction

Satisfaction with the overall program, program staff and the rebate process among participating property managers/owners increased from 2004 to 2005 and levels of satisfaction are high. Average satisfaction ratings were higher for projects that were mainly the participating property manager/owner's ideas (self-initiators) as opposed to those that were mainly contractor-driven. Nearly all 2005 participants said they would recommend the program to another property manager/owner.

Forty-two percent of 2005 participating property managers/owners provided open-ended recommendations for program improvement. Those who had suggestions for program improvement provided a very wide range of recommendations. Doing more marketing and education about the program was the only recommendation cited by more than 10 percent of respondents.

1.4 Impact Evaluation Results

1.4.1 Program Goals and Claimed Savings

The program's net savings goals were 55 MWh, 10 MW and 4.4 million therms. The majority of the electricity savings goals were associated with CFLs (unit goal: 350,000) and programmable thermostats (unit goal: 50,000) while the majority of the gas savings goals were associated with boiler controllers (unit goal: 2,000) and programmable thermostats.

As shown in Table 1-2 below, the program nearly met its gas savings goals and nearly doubled its electricity savings goals – with claimed savings of 104 MWh, 18 MW and 4.2 million therms. CFLs and programmable thermostats dominated the program's savings claims even more than anticipated.

Table 1-2
Savings Goals and Reported Accomplishments

	Savings Goals	Reported Accomplishments	% of Goals
Gross kWh	61,748,644	117,254,277	190%
Gross kW	10,747	19,712	183%
Gross therms	4,919,568	4,761,229	97%
Net kWh	54,954,453	104,347,387	190%
Net kW	9,565	17,535	183%
Net therms	4,377,233	4,235,207	97%

1.4.2 Evaluation Results

Table 1-3 shows the program's gross verified savings based on the evaluation verification results only (i.e., not incorporating evaluation measurement results). Over 90 percent of the measures claimed by the program were found to be program-qualifying and installed at eligible participating sites, representing over 100 percent of the program's goals.

Table 1-3
Gross Verified Savings

	Gross Verified Savings	% of Goals	% of Reported Accomplishments
kWh	108,442,053	176%	92%
kW	18,555	173%	94%
Therms	4,687,757	95%	98%

Table 1-4 below shows the program's measured savings based on evaluation results. These results include adjustments for lower than expected lighting hours of use, programmable thermostat savings and boiler control savings. As shown, the program met over half of its gross and net electricity (energy and demand) savings goals and less than 20 percent of its gas savings goals.

Table 1-4
Measured Savings

	Measured Savings	% of Goals	% of Reported Accomplishments
Gross kWh	41,198,839	67%	35%
Gross kW	6,513	61%	33%
Gross therms	721,396	15%	15%
Net kWh	32,972,788	60%	32%
Net kW	5,390	56%	31%
Net therms	627,125	15%	15%

The primary reasons for lower than expected savings are:

- Lighting hours of operation – subsequent to the program's filing of energy savings claims, a California CFL Metering Study was conducted, which estimated much lower operating hours for CFLs than was previously assumed (e.g., the program assumed 3.5 hours per day versus 2.3 hours based on the metering study.)
- Programmable thermostats – the evaluation found that few households use programmable thermostats in a manner that might be associated with energy savings. Essentially, multifamily tenants are not consistently using the programmable features or if they are, use of the features is not leading to changes in behavior that would result in a reduction in energy use. The program's savings claims were based on prior measure savings studies, which assumed high levels of savings under theoretical conditions (i.e., very high baseline use and major changes in setpoints) that are not observed at least under the conditions of the program (e.g., a statewide mass market multifamily program.)

- Boiler controls – the program claimed savings of 15 percent of baseline gas usage for master metered tenant units. The baseline gas usage was found to be overstated by at least 10 percent. The savings percentage estimate of 15 was found to be overstated by a factor of 5. There are numerous explanations for finding lower savings than expected, including an assumption of central gas water heating and space heating when typically boilers are only supplying water heating; controls installed that replaced existing controls; and controls not functioning as intended (e.g., they are removed, the boiler malfunctions and the control does not operate as intended, controller settings are overridden by maintenance staff, etc.) The evaluation team believes that this measure has savings potential perhaps up to the ex ante assumption of 15 percent of baseline usage, but under the current program design this potential is not being realized.

Other impact evaluation findings of note:

- The evaluation estimates of net-to-gross ratios are close to program assumptions – with boiler controls estimated at 80%, CFLs at 76% and programmable thermostats at 88%.
- Verification rates are fairly high for the program – averaging around 95% across all measures. CFL installation rates were impacted by various factors:
  - CFLs installed in exterior fixtures had higher installation rates
  - CFL fixtures were associated with higher installation rates and per unit energy savings than bulbs
  - Master metered sites had higher CFL installation rates – but this may be due to the fact that installations were more likely to be in exterior fixtures.

1.5 Conclusions and Recommendations

The program's reliance on a dedicated pool of contractors is a cost-effective method of achieving energy savings. However, the measure mix will be dominated by lower cost retrofit measures such as lighting and boiler controls. This phenomenon is not unique to this program. The program managers have ramped up their marketing efforts to reach a wider pool of contractors that deal with replace on burnout measures. These efforts will take time to lead to impacts, but should be continued and possibly expanded in order to create gas impacts. Program goals should be set accordingly – since it will be difficult to rely on large quantities of replace on burnout measure installations.

The program should mine its tracking data in order to identify energy efficiency opportunities among prior participants (both retrofit and replace on burnout). The program might also consider introducing incentives that are designed to reward measure comprehensiveness to expand the diversity of measures installed in participating properties. This would help the IOUs meet their unit savings goals. However, this could reduce the program's cost-effectiveness since most properties install the most cost-effective measures first.

The program's preference towards self-initiating property managers/owners is logical and marketing efforts to directly engage properties should be continued and perhaps increased. Evaluation results showed that the fraction of smaller properties and self-initiators increased from 2004 to 2005 suggesting that ramped up efforts in 2005 were realized.

Large properties are underrepresented in the mix of participants, but that may not be a problem. Given the unique characteristics of larger properties, they may already be installing energy efficient equipment without incentives.

Program managers have demonstrated an understanding of their target market and its barriers and have designed a program that includes strategies to address the most important barriers. However, there may be some benefits to be gained from developing an explicit program theory including a formal logic model. As the program faces new challenges ahead – namely market saturation for lighting measures and meeting gas goals, it may benefit from a more formal approach to program design. For example, program managers might consider developing metrics associated with new program strategies to help gauge success and to inform future fine-tuning of new strategies.

The program's increasing emphasis on energy efficient fixtures (as opposed to bulbs) may make sense from both an impact and a process perspective. Per unit impacts are higher[3] and property managers favor fixtures over bulbs since they lead to an improvement of the tenant unit.

The program might consider adjusting incentive levels for light bulbs versus fixtures in order to increase cost-effectiveness. For example, convincing property managers/owners to install CFLs in tenant units may only require incentives that cover the labor cost. Fixture incentives may need to be increased to reflect the greater degree of skill and time required for their installation (versus bulbs).

The program's emphasis on quality assurance seems to have resulted in higher satisfaction in 2005 versus 2004. These efforts should be continued and reevaluated in conjunction with future evaluation results. If participating property managers/owners continue to have quality issues with CFLs, the program might consider requiring contractors to procure CFLs that have been successfully PEARL tested[4].

The program realized less than half of its savings claims because when the program was designed savings assumptions (based on the latest available research) for CFLs and programmable thermostats were too high. The program has removed programmable thermostats from its measure mix in 2006 and has incorporated the latest lighting hours of operation data into its savings claims.

The program realized less than 20 percent of its boiler control savings goals due to a variety of issues. Baseline usage is being overstated, and needs to be updated. Likewise, 15 percent savings of baseline usage is probably the highest potential savings from this measure – and these savings are not being realized under the Statewide program model. In some cases, controls are being installed where existing controls are in place. In other cases, maintenance staff override controls or boilers malfunction and controls are not functioning as intended. Further research should be conducted in order to more accurately identify this measure's true savings potential[5]; the circumstances under which this potential may be met;

[3] Our evaluation did not assess the relative cost-effectiveness of bulbs versus fixtures, so this recommendation concerns only impacts.

[4] Currently, very few products are tested by PEARL but in the near-term there are plans to significantly expand the number of products that are tested.

[5] For example, on-site data may be collected on a real-time basis as sites are identified and measures are installed in order to accurately capture site-specific data from maintenance staff, vendors and property managers. This study was conducted long after 2004-2005 measures were installed, preventing the evaluation team from collecting accurate timeline information to inform the billing analysis.

the appropriate program design under which promising sites may be identified, tracked and savings realized; and whether and how this measure can be cost-effectively included in a program.

The program has a very low incidence of free-ridership, reinforcing the finding that the program managers are knowledgeable of the program's target market, its barriers, and how to address those barriers. Program influence should be monitored in the future since both market conditions and program measures and strategies are changing.

This evaluation has shown that there exist market barriers to the installation of energy efficient measures in the multi-family sector. Moreover, the evidence shows that the 2004-2005 program was effectively designed to reduce some of those barriers and achieve energy and demand impacts cost-effectively. To the extent that these barriers exist today and that the 2006-2008 program continues to cost-effectively address those barriers, it should be continued. However, program managers need to shift their approach to serving this market in response to the removal of programmable thermostats from the program and as the target market becomes saturated with CFLs. Their reliance on a dedicated pool of unskilled contractors to deliver cost-effective energy savings will likely diminish over time as a result. Increased marketing to skilled contractors and property managers and mining of existing program tracking data are some recommendations for adapting to these changes.

2. Introduction

This report describes the results of the 2004-2005 California Statewide Multifamily Rebate Program Evaluation, Measurement and Verification (EM&V) Study. The California Public Utilities Commission's Energy Division (CPUC or Commission) is the primary guidance organization for this evaluation effort, with the state's investor-owned utilities (IOUs) [San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and Southern California Gas (SCG)] providing valuable feedback. This report follows an interim report that was submitted on September 15, 2005, which is included as an appendix to this report. An addendum to this report will include results on boiler control impacts.

2.1 Program Overview

The 2004-2005 California Statewide Multifamily Rebate Program was launched in 2002 to address the unique needs of the multifamily sector. This market was served prior to 2002 by the Residential Contractor Program, which typically focused on single-family homes. Thus, the 2002 program was innovative in having its design tailored to the unique barriers faced by the multifamily sector, primarily the split-incentive barrier. The program theory, as described in the program plans, is that financial incentives, along with program marketing and education, will be used to help multifamily property owners and managers overcome the split-incentive barrier. Although these owners and managers are responsible for facility improvements, they usually do not pay energy bills for the tenant spaces and therefore have little incentive to install more expensive energy-efficient measures in these spaces. The rebates help reduce—and in some cases totally eliminate—these higher first costs for energy-efficient equipment. The program also helps to encourage the participation of multifamily property owners and managers by offering rebates for energy-efficient measures installed in common areas. The program hopes that "program momentum and market penetration will likely increase at a faster rate" as multifamily property owners become more familiar and comfortable with energy-efficient measures and learn the long-term benefits of energy efficiency.

The 2004–2005 program is offered statewide in the service territories of PG&E, SCE, SDG&E and SCG. The program promotes energy savings in apartment dwelling units and in the common areas of apartment and condominium complexes and mobile home parks. Property owners (and property managers, as authorized agents for property owners) of existing residential multifamily complexes with five or more dwelling units may qualify for rebates for installing a variety of energy efficiency measures. These include:

- Apartment improvement measures (e.g., interior and exterior hardwired fixtures, ceiling fans, compact fluorescent lights (CFLs), clothes washers, and dishwashers)
- Common-area improvement measures (e.g., exit signs, occupancy sensors, photocells, high-performance dual-paned windows)
- Mechanical improvement measures
- High-efficiency heating and cooling equipment.

The electric measures, such as lamps, fixtures and appliances, have made up most of the savings attributed to the program. Gas measures have been much more challenging to sell to both contractors and property managers.

2.2 Program Goals and Accomplishments

Through providing rebates to qualifying properties, the program intended to achieve 54,954 MWh, 9,565 kW, and 4,377,233 therms in savings associated with the installed measures' first year of operation. Table 2-1 shows the program's net savings goals by measure category, along with each measure category's expected contribution to total net savings for the first year of installed measure operation.

Table 2-1
Net Energy Savings Goals Associated with First Year of Installed Measure Operation, by Measure Category

	Program Net Goals				Percentage of Total Program Net Goals		
Measure Category	**Units**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
Air Conditioners	1,850	89	352,634	19,669	0.9%	0.6%	0.4%
Boiler Controllers	2,006	-	-	1,703,203	-	-	38.9%
Boilers	518	-	-	599,593	-	-	13.7%
CFLs	347,703	3,164	26,979,830	-	33.1%	49.1%	-
Clothes Washers	1,702	29	149,425	98,912	0.3%	0.3%	2.3%
Dishwashers	192	1	4,165	2,799	0.0%	0.0%	0.1%
Faucet Aerators	2,200	4	17,328	4,993	0.0%	0.0%	0.1%
Furnaces	3,643	-	-	40,698	-	-	0.9%
Heat Pumps	10	16	8,909	-	0.2%	0.0%	-
High Performance Windows (square feet)	437,500	1,374	891,195	102,036	14.4%	1.6%	2.3%
Insulation (square feet)	702,000	856	593,864	68,504	8.9%	1.1%	1.6%
LED Exit Signs	2,930	100	821,462	-	1.0%	1.5%	-
Lighting Controls	360	5	31,664	-	0.1%	0.1%	-
Low-Flow Showerheads	12,012	51	236,878	73,360	0.5%	0.4%	1.7%
Programmable Thermostats	51,074	2,569	15,931,095	1,416,439	26.9%	29.0%	32.4%
T8s	94,131	1,303	8,905,265	-	13.6%	16.2%	-
Water Heaters	1,133	4	30,741	247,027	0.0%	0.1%	5.6%
Total	**1,660,964**	**9,565**	**54,954,453**	**4,377,233**	**100.0%**	**100.0%**	**100.0%**

The program ultimately claimed net energy savings of approximately 104,347,000 kWh, 17,500 kW and 4,235,000 therms associated with the installed measures' first year of operation. Table 2-2 shows the program's reported accomplishments by measure category, along with each measure category's reported contribution of energy savings. As shown, lighting measures and programmable thermostats ultimately accounted for most of the program's electricity (both peak and energy) savings. Boiler controls and programmable thermostats contributed the most to the program's gas savings.

Table 2-2
Program Reported Net Accomplishments Associated with First Year of Installed Measure Operation, by Measure Category

Measure Category	Program Reported Net Accomplishments				Percentage of Program Reported Accomplishments		
	Units	kW	kWh	Therms	kW	kWh	Therms
Evaporative Coolers	50	76	48,840	-	0.4%	0.0%	-
Air Conditioners	677	235	211,240	-	1.3%	0.2%	-
Boiler Controls	1,550	-	-	1,441,702	-	-	34.0%
Boilers	268	-	-	213,689	-	-	5.0%
Ceiling Fans with CFL	80	1	2,314	-	0.0%	0.0%	-
CFLs	877,638	7,717	64,376,472	-	44.0%	61.7%	-
Clothes Washers	373	2	28,334	18,443	0.0%	0.0%	0.4%
Dishwashers	995	5	30,777	14,142	0.0%	0.0%	0.3%
Duct Improvements	7,381	657	994,261	-	3.7%	1.0%	-
Faucet Aerators	3,881	5	30,599	8,781	0.0%	0.0%	0.2%
Furnaces	392	-	0	16,208	-	0.0%	0.4%
Heat Pumps	331	197	282,239	-	1.1%	0.3%	-
High Performance Windows (square feet)	328,092	868	605,268	54,143	5.0%	0.6%	1.3%
Insulation (square feet)	675,679	220	148,143	38,706	1.3%	0.1%	0.9%
LED Exit Signs	1,331	44	373,392	-	0.3%	0.4%	-
Lighting Controls	105	2	8,925	-	0.0%	0.0%	-
Low Flow Showerheads	2,504	7	49,500	15,339	0.0%	0.0%	0.4%
Pool Pumps	6	4	7,567	-	0.0%	0.0%	-
Programmable Thermostats	99,584	6,478	27,195,251	2,335,369	36.9%	26.1%	55.1%
T8s	90,622	1,018	7,931,260	-	5.8%	7.6%	-
Torchieres	8,208	-	2,016,213	-	-	1.9%	-
Water Heaters	947	-	6,792	78,686	-	0.0%	1.9%
Total	**2,100,694**	**17,535**	**104,347,387**	**4,235,207**	**100.0%**	**100.0%**	**100.0%**

The program's reported net energy savings accomplishments represent 190 percent of its energy savings goals (kWh), 183 percent of its peak demand savings goals (kW), and 97 percent of its gas savings goals (therms). Table 2-3 shows reported accomplishments as a percentage of goals by measure category. The program greatly exceeded its goals for heat pumps, dishwashers, and CFLs. The program also exceeded its goals for programmable thermostats and faucet aerators.

Table 2-3
Program Reported Net Accomplishments Associated with First Year of Installed Measure Operation as a Percentage of Net Savings Goals, by Measure Category

Measure Category	Program Reported Net Accomplishments as Percentage of Program Net Goals			
	Units	kW	kWh	Therms
Air Conditioners	36.6%	265.3%	59.9%	-
Boiler Controllers	77.3%	-	-	84.6%
Boilers	51.7%	-	-	35.6%
CFLs	252.4%	243.9%	238.6%	-
Clothes Washer	21.9%	5.3%	19.0%	18.6%
Dishwashers	518.2%	737.5%	738.9%	505.2%
Faucet Aerators	176.4%	125.0%	176.6%	175.9%
Furnace	10.8%	-	-	39.8%
Heat Pumps	3310.0%	1210.7%	3168.1%	-
High Performance Windows (square feet)	75.0%	63.2%	67.9%	53.1%
Insulation (square feet)	96.3%	25.8%	24.9%	56.5%
LED Exit Sign	45.4%	44.0%	45.5%	-
Lighting Controllers	29.2%	36.5%	28.2%	-
Low-Flow Showerhead	20.8%	14.0%	20.9%	20.9%
Programmable Thermostat	195.0%	252.1%	170.7%	164.9%
T8s	96.3%	78.1%	89.1%	-
Water Heaters	83.6%	-	22.1%	31.9%
Ceiling Fans with CFL*	-	-	-	-
Duct Improvements*	-	-	-	-
Evaporative Coolers*	-	-	-	-
Pool Pumps*	-	-	-	-
Touchieres*	-	-	-	-
Total	**126.5%**	**183.3%**	**189.9%**	**96.8%**

*The program did not have goals associated with these measures.

2.3 Evaluation Objectives and Approach

This study assessed the performance of the 2004–2005 California Statewide Multifamily Rebate Program in terms of accomplished program goals and effectiveness of program processes. Key EM&V objectives included:

- Measurement and verification of energy and peak demand savings through development of ex-post savings and verification of measure installations
- Process evaluation to assess overall levels of performance and success of the program processes
- Market assessment of response to program interventions.

The following summarizes key elements of our EM&V approach.

2.3.1 Impact Evaluation

The objectives of the impact evaluation were to verify the energy savings claimed by the program. The impact evaluation:

- Assessed which savings parameters for each measure were most crucial for developing reliable energy and demand savings estimates
- Implemented data collection and analysis to update these parameters (as necessary)
- Implemented data collection and analysis to verify measure installations
- Calculated net and gross savings attributable to the program.

2.3.2 Process Evaluation

The objectives of the process evaluation were to address the effectiveness of changes in program implementation from prior years and to identify areas for continued improvement. Particular emphasis was placed on:

- *Determining barriers for a variety of multifamily market actors* and seeing whether the program was addressing the proper barriers and targeting the right participants. We collected information on market and program participation barriers from participating and nonparticipating property managers/owners and participating and nonparticipating installation contractors. We examined whether program incentives and delivery strategies were properly structured to overcome these barriers. We also examined whether the program strategies of recruiting self-initiating participants and larger property management firms were justified.
- *Measuring program attribution.* KEMA administered a series of questions to program participants to determine the degree to which energy savings claimed by the program could be attributed to the program.
- *Examining the effectiveness of program marketing efforts.* This evaluation looked at levels of program awareness and preferred sources of program information for both participating and nonparticipating property managers/owners. It also got feedback from participating contractors on the effectiveness of program marketing efforts. The evaluation also measured levels of program awareness among nonparticipating contractors and discussed ways to recruit them into the program. Finally it determined whether the program had attained its goals for serving hard-to-reach customers.
- *Assessing program efforts to improve quality control.* Evaluations of the 2002 and 2003 programs found problems with poor quality equipment and installation. This evaluation looked at program strategies for addressing these problems, measured the degree that these quality control procedures were being implemented, and assessed participant satisfaction levels with the rebated equipment and its installation.
- *Measuring participant satisfaction with program processes and collecting recommendations for program improvement.* KEMA examined participant satisfaction with rebate application forms, rebate payment amounts, the timeliness of rebate payment, program staff, and the program as a whole. It also collected recommendations on

program improvements from both participating property managers/owners as well as participating contractors.

2.3.3 Market Assessment

The main objectives of this task were to characterize multifamily property managers/owners, the installation contractors that serve them, and installation contractors that could potentially serve them. This part of the evaluation looked at characteristics of the multifamily market such as property size, prevalence of centralized energy equipment, billing arrangements, metering characteristics, property ownership, and company size. It also looked at this sector's awareness of energy efficiency, involvement in California energy efficiency programs, and installation of energy-efficient equipment. Finally it looked at the potential for additional energy efficiency in the multifamily sector. This included finding out plans for future energy efficiency projects by multifamily property managers/owners. It also included asking installation contractors which energy efficient technologies they thought had the greatest market potential.

To further inform this market assessment as well as the process evaluation, we reviewed past studies of the California multifamily market such as the 2000 Statewide Survey of the Multifamily Market by ADM Associates and TecMRKT Works. Since we recently completed evaluations of two other California multifamily programs—the Efficient Affordable Housing (EAH) program and the Partnership for Energy Affordability in Multifamily Housing (Energy Action)—we also leveraged knowledge from these evaluations.

2.4 CPUC Policy Manual Requirements

The evaluation addresses the California Public Utilities Commission (CPUC) Policy Manual evaluation requirement, as demonstrated in Table 2-4.

2.5 Organization of Report

The remaining sections of this report are as follows:

- Section 3: Multifamily Market Characterization
- Section 4: Market Barriers, Program Theory and Program Attribution
- Section 5: Program Processes and Satisfaction
- Section 6: Impact Evaluation
- Appendix A: Study Methodology
- Appendix B: Survey Instruments
- Appendix C: Interim Report Executive Summary
- Appendix D: Boiler Control Analysis Results

Table 2-4
CPUC Policy Manual Evaluation Requirements and Study Components and Approach to Meeting Requirements

CPUC Policy Manual Evaluation Requirement	Study Component	Study Approach	Study Result
1. Measuring level of energy and peak demand savings achieved	Impact evaluation	• The impact evaluation included both a verification study and a measurement study, which together yielded estimates of the program's energy and peak demand savings.	• Sections 1.5 and 6
2. Measuring cost-effectiveness	Cost-effectiveness assessment	• KEMA updated the program's cost-effectiveness calculations using the measurement and verification results from the impact evaluation. We will recalculated the program's cost-effectiveness using the updated formulas and included the results in the study's draft and final reports.	• Sections 1.5 and 6.7
3. Providing up-front market assessments and baseline analysis	Market Assessment	• The market assessment included a review of existing multifamily market baseline studies, the results of which were used to inform our process and market assessment and were incorporated into our market assessment results.	• Sections 1.4, 3 and 4
4. Providing ongoing feedback and guidance	Impact, Process and Market Assessments	• The evaluation consisted of two phases of research, with interim process, impact and market assessment results provided mid-year 2005.	• Sections 1.4.3 and 5
5. Measuring indicators of effectiveness, including testing of the assumptions that underlie the program theory and approach	Process and Market Assessment	• Interviews with property managers/owners and were used to test the assumptions underlying the program theory.	• Sections 1.4, 3, 4 and 5
6. Assessing the overall levels of performance and success of programs	Impact, Process and Market Assessments	• The verification study assessed the overall levels of program performance. The process and market assessments determined the effectiveness of the program in meeting its goals.	• Verification: Sections 1.5 and 6.3 • Process/market: Sections 1.4, 3, 4 and 5
7. Informing decisions regarding compensation and final payments	Impact evaluation	• A verification study was performed, which generated verification ratios for each measure installed under the program. These ratios were applied to the program's claimed accomplishments to provide counts of program-level verified measure installations.	• Sections 1.5 and 6.3

CPUC Policy Manual Evaluation Requirement	Study Component	Study Approach	Study Result
8. Helping to assess whether there is a continuing need for the program	Process, Cost-effectiveness and Market Assessments	The final evaluation report includes a statement concerning the continuing need for program. This statement was based on consideration of the following pieces of evidence: ▪ The degree to which the program is addressing the barriers to implementation identified by program participants; ▪ To what degree the program may be mitigating these barriers in any sustainable way; and ▪ Quantitative assessments of the relative cost-effectiveness of the program.	• Statement: Section 1.6 • Barriers: Sections 1.4 and 4 • Cost-effectiveness: Sections 1.5 and 6.7

3. Multifamily Market Characterization

This section summarizes findings from our evaluation research that help to characterize the current California multifamily market. Sources for these findings include the participating property manager/owner survey, the nonparticipating property manager/owner survey, the participating and nonparticipating contractor surveys, interviews with program managers, and a review of past multifamily evaluation reports and market baseline studies. This section is organized as follows.

Multifamily property manager/owner characterization. This subsection characterizes the property managers/owners who participated in the program in 2004 and 2005 as well as recent nonparticipants. It includes findings concerning property size and management structure, company size, energy-efficiency awareness and decision-making, and energy- efficiency activities.

Contractor characterization. This subsection includes findings concerning company size and target markets, energy-efficient measures installed, activity in the program and other energy efficiency programs, and sales practices.

Multifamily market potential. This subsection looks at the potential for energy efficiency in the California multifamily marketplace from a number of different perspectives including participating property managers/owners, nonparticipating property managers/owners, and participating and nonparticipating contractors.

Multifamily market drivers. This subsection discusses some of the multifamily market characteristics and trends that are driving the current market for energy-efficiency improvements and will continue to do so in the future.

Summary of multifamily market characterization findings – This subsection presents the findings from the whole section in a more concise format.

3.1 Summary of Information Sources

Most of the information in this chapter, and subsequent chapters, was collected from a number of surveys that KEMA conducted with property managers/owners and installation contractors who participated in the program as well as with property manager/owners and installation contractors who did not participate in the program. Table 3-1 summarizes the key characteristics of these surveys. Copies of the survey instruments appear in Appendix B.

Table 3-1
Summary of Program/Market Participant Surveys
Used for Market Assessment and Process Evaluation

Survey Target Group	Time Period of Survey	Number of Completed Surveys	Survey Format
2004 participating property managers/ owners	August 2005	106	Computer-Assisted Telephone Interview (CATI)
Nonparticipating property managers/owners	July 2005	40	Computer-Assisted Telephone Interview (CATI)
2005 participating property managers/ owners	June 2006	150	Computer-Assisted Telephone Interview (CATI)
Participating contractors	May - July 2005	28	In-depth expert survey
Nonparticipating contractors	May - June 2006	17	In-depth expert survey

In addition to gathering information from these five surveys, the evaluation team also:

- Conducted a group interview with most of the Multifamily Rebate Program managers;
- Conducted additional interviews with the program managers and staff of each of the investor-owned utilities participating in the program;
- Reviewed the program documents provided by the utilities including program plans, application forms, tracking databases, and monthly reports;
- Reviewed the past two evaluations of the Multifamily Rebate Program (for program years 2002 and 2003), as well as the 2000 California Market Baseline Report[6]; and
- Leveraged multifamily market knowledge and insights gained from two other California multifamily programs – the Efficient Affordable Housing (EAH) program and the Partnership for Energy Affordability in Multi-Family Housing (Energy Action) – that KEMA is also evaluating.

[6] 2002 California Statewide Multifamily Program Evaluation, Prepared for San Diego Gas & Electric, Prepared By: Wirtshafter Associates, Inc., February 27, 2004; 2003 California Statewide Multifamily Program Evaluation, Prepared For: San Diego Gas & Electric, Prepared By: Wirtshafter Associates, Inc., March 18, 2005; Best Practices Benchmark for Energy Efficiency Programs, "Residential Multi-Family Comprehensive Report," Quantum Consulting, Inc. Final Report; Statewide Survey of Multi-family Common Area Building Owners Market, Volume I: Apartment Complexes, prepared by: ADM Associates, Inc. TecMRKT Works LLC. June 2000.

3.2 Multifamily Property and Manager/Owner Characterization

One purpose of this evaluation is to better understand the types of multifamily properties and managers/owners that participated in the 2004-2005 program. This understanding is enhanced by comparing these 2005 participants to 2004 program participants, a group of nonparticipants surveyed in 2005, and, in a few cases, to a statewide multifamily baseline study conducted in 2000. This information is useful in helping to understand how participation may have changed over time, whether program targeting of underserved sectors is working, and what barriers to participation might be.

3.2.1 Property Size

KEMA asked both participating and nonparticipating multifamily property managers/owners about the size of their properties. Table 3-2 compares the property sizes of 2005 participants, 2004 participants, nonparticipants surveyed in 2005, as well as a sample from the 2000 California Multifamily Market Baseline report.[7] The table shows that larger multifamily properties (250+ units) continue to be underrepresented in the program. One explanation for this is that larger properties often have their own maintenance crews and are therefore less likely to rely on the outside contractors that drive the program.

The table also shows that while smaller properties were underrepresented among the 2004 participants, they were overrepresented among the 2005 participants. In the Interim Report it was noted that the under-representation of smaller properties among 2004 participants may have been due to the following factors: 1) some participating contractors purposely avoiding smaller buildings because they do not contain enough tenant units to offset costs for marketing, administration, and travel; 2) multifamily properties with fewer than five units not being eligible for the program during 2004-2005; and 3) larger buildings having their own maintenance crews and less need of contractor services. The overrepresentation of smaller properties among the 2005 participants is more difficult to explain. One possibility is that in 2005 there were fewer project opportunities in medium and large buildings and therefore the installation contractors had to shift their focus to the smaller buildings. program managers have also said that some of their marketing strategies – such as making presentations at apartment association meetings – are designed, in part, to recruit more of these smaller properties. So some of these efforts may be paying off.

[7] Final Report, Statewide Survey of Multi-family Common Area Building Owners Market, Volume I: Apartment Complexes, prepared by: ADM Associates, Inc. TecMRKT Works LLC. June 2000.

Table 3-2
Size Distribution of Multifamily Properties
2004-2005 Participants, Nonparticipants, Baseline

Units per Apartment Building	Multifamily Properties Participating in 2004 Program (n = 106)[1]	Multifamily Properties Participating in 2005 Program (n = 150)[2]	Nonparticipating Multifamily Properties (n = 40)[3]	Market Baseline Multifamily Properties (n = 540)[4]
100 or fewer	46%	68%	61%	57%
101 to 250	43%	23%	15%	25%
Over 250	9%	7%	18%	18%
Don't Know	1%	1%	8%	0%
Total	**100%**	**100%**	**100%**	**100%**

Note: Total may not exactly equal 100% due to rounding. [1] KEMA survey conducted in August 2005. [2] KEMA survey conducted in June 2006. [3] KEMA survey conducted in July 2005.[4] ADM survey conducted in January 2000.

3.2.2 Centralized Energy Equipment, Billing Arrangements, and Metering Characteristics

The survey of 2005 participants contained new questions concerning the prevalence of centralized energy systems. Table 3-3 shows that a little more than half of these participants have heating systems that supply all tenant units and less than half have cooling systems that do so. However, the large majority of the participating properties have central water heating systems. These data were similar for all the utilities except for the prevalence of central cooling systems. Central cooling systems were significantly more frequent in the SCE service territory (56 percent) than they were in the PG&E (31 percent) and SDG&E (31 percent) service territories.

Table 3-3
Use of Centralized Energy Systems
Among 2005 Participants

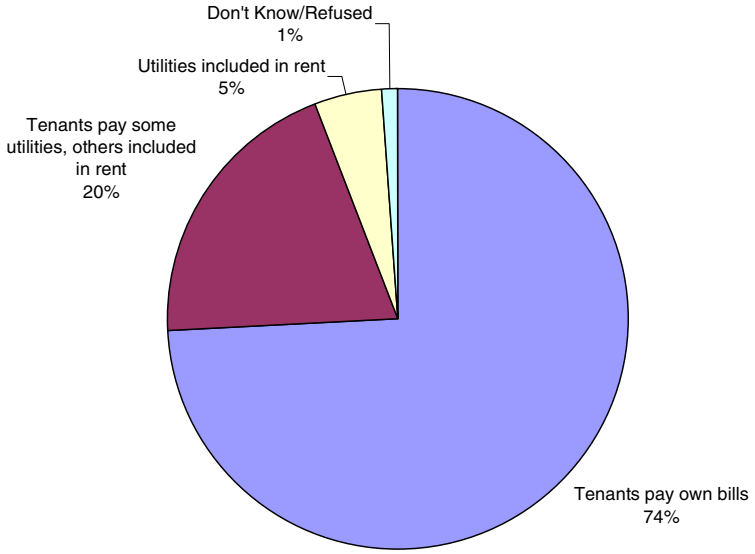
Energy Systems in Property	Multifamily Properties Participating in 2005 Program (n = 150)[1]
Heating system that supplies all tenant units	53%
Cooling system that supplies all tenant units	41%
Water heating system that supplies all tenant units	81%

Note: [1] KEMA survey conducted in June 2006.

The survey of 2005 participants also added new questions concerning how tenants are billed for energy and the prevalence of master-metered properties.

Figure 3-1 shows that the large majority of participating multifamily properties have tenants pay their own energy bills. Figure 3-2 shows that only a small minority of 2005 participating properties has master meters and most of these are for natural gas. PG&E has the highest percentage of properties with master-metered electricity – 13 percent -- compared to 3 percent for SCE and SDG&E. The larger multifamily properties (250+ units) are three times as likely to have master meters as the smaller ones (< 100 units). Multifamily properties in which tenants pay their own energy bills face the so-called "split incentive barrier" to greater energy efficiency. This is because the property owner who purchases the equipment that provides heating, cooling, and lighting to the tenant units has no direct economic incentive to purchase more expensive higher efficiency equipment.[8] The fact that nearly-quarters of the 2005 program pay their own bills is shows that the program is reaching properties that do face split incentive barriers.

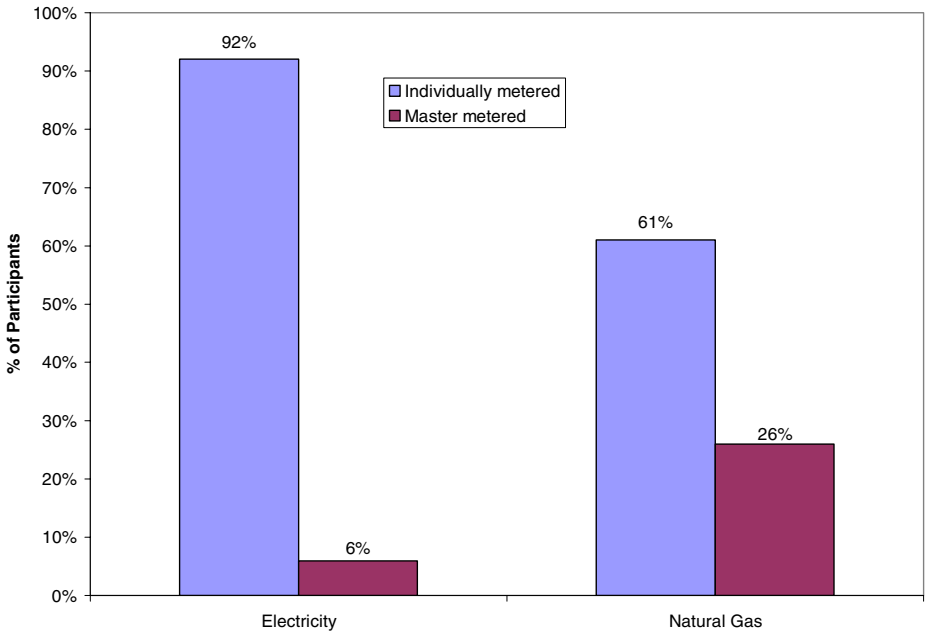
Figure 3-1
Tenant Energy Billing Arrangements
for 2005 Participants



Note: Source is KEMA survey conducted in June 2006.

[8] Some argue that property owners have an indirect incentive to invest in energy-efficient equipment because the less that their tenants pay in utility costs, the less likely they are to default on their rent payments.

Figure 3-2
Metering Characteristics
for 2005 Participating Properties



Note: N = 150. Not shown are 2 percent don't know/refused responses for electricity, 9 percent don't know/refused responses for natural gas, and 4 percent of respondents who had no natural gas. Source is KEMA survey conducted in June 2006.

3.2.3 Property Ownership

Program participants are much more likely to own their properties than program nonparticipants. Table 3-4 shows that 55 percent of the 2004 participants and 52 percent of the 2005 participants own their properties. This compares to only 38 percent of the nonparticipants owning their properties. There are two likely explanations for this. First companies that own their properties are likely to have more autonomy to decide whether to allow contractors into their buildings. Second in cases where property ownership and management is divided, large property management companies often manage the properties. As discussed in the next subsection, many participating contractors have found it difficult to win business from these large property management firms.

Table 3-4
Property Management Structure
2004-2005 Participants, Nonparticipants

Property Management Structure	Multifamily Properties Participating in 2004 Program (n = 106)[1]	Multifamily Properties Participating in 2005 Program (n = 150)[2]	Nonparticipating Multifamily Properties (n = 40)[3]
Own it only	9%	17%	5%
Manage it only	41%	47%	55%
Both Manage and Own It	46%	35%	33%
Don't Know/ Refused	4%	1%	8%
Total	**100%**	**100%**	**100%**

Note: Total may not exactly equal 100% due to rounding. [1] KEMA survey conducted in August 2005. [2] KEMA survey conducted in June 2006. [3] KEMA survey conducted in July 2005.

3.2.4 Company Size

In interviews with KEMA, program managers expressed concerns that participating contractors have more difficulty finding energy efficiency work with large property management companies. They noted that contractors often have difficulty finding the key decision makers with these larger firms. They also pointed out that these larger firms have more substantial internal maintenance resources and are often reluctant to use outside contractors that they are not familiar with. KEMA's interviews with participating contractors in 2005 confirmed these difficulties. Our survey of 2004 participating property managers/owners also found that these large property management firms were underrepresented in the program when compared to a 2005 sample of nonparticipating multifamily properties as well as to a 2000 California market baseline.

It was due to these concerns that some program managers initiated additional outreach efforts in 2005 to try to recruit more of these large property management firms. These larger firms have been targeted not only because they are underrepresented in the program and because they own a lot of apartment units but also because they are often acquiring new properties and retrofitting them, as discussed in a later subsection. The latest survey evidence suggests that these efforts may be producing results. KEMA's survey of 2005 participating property managers/owners found increased representation by these large property management firms. This level of representation is now closer to levels measured in the nonparticipant and market baseline samples, as Table 3-5 shows.

Table 3-5
Company Size
Participants, Nonparticipants, Market Baselines

Company Size	2004 Participating Multifamily Companies (n = 106)	2005 Participating Multifamily Companies (n = 150)	2005 Nonparticipating Multifamily Companies (n = 40)	California Multifamily Companies* (2000 CA Multifamily Market Baseline Report, n = 541)
Small (1-4 properties)	24%	28%	61%	33%
Medium (5 - 49 properties)	44%	33%	15%	45%
Large (50+ properties)	9%	16%	18%	23%
Don't Know/ Refused	23%	23%	8%	0%
Total	**100%**	**100%**	**100%**	**100%**

Note: Total may not exactly equal 100% due to rounding. * Represents % of properties owned nationally by companies surveyed for California baseline study. On average, 91% of the units owned by these firms were located in California.

3.2.5 Energy-Efficiency Awareness and Decision-making

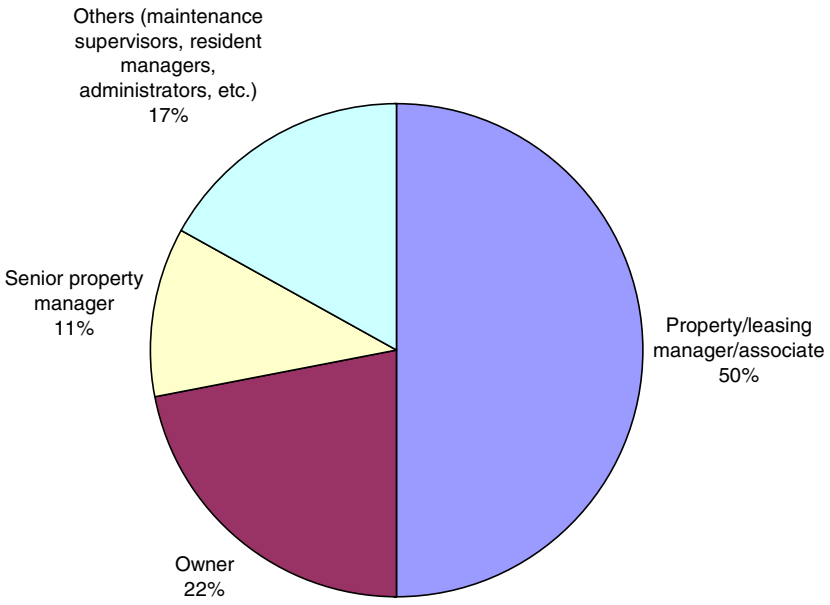
This section discusses what types of multifamily market actors are involved in making decisions about energy-efficiency related projects. It also explores how aware both participating and nonparticipating property managers/owners are of the program and how active they are in other California energy efficiency programs. Finally it examines where these property managers owners get information to help their decision-making when purchasing or replacing energy-using equipment.

3.2.5.1 Project Decision-Makers

3.2.5.1.1 Participants

The utility tracking databases for the program had contact names for the vast majority of multifamily projects. KEMA instructed surveyors to ask for these contacts first before trying to find alternative decision makers. Figure 3-3 shows that about half the time the 2005 program participant was a property/leasing manager or associate.

Figure 3-3
Job Positions of 2005 Participant Survey Respondents



Note: N = 150. Source is KEMA survey conducted in June 2006.

As described in the Interim Report, KEMA also asked participating contractors who they are typically addressing their sales pitch to at the multifamily properties. Over two thirds of them (68 percent) said that they are typically meeting with "managers" – often described as property managers or onsite managers. Only 29 percent said that they meet with owners and 21 percent said that they are meeting with maintenance managers/supervisors. Other figures in the property management hierarchy – such as facility directors, chief purchasing agents, and presidents – were only cited by a single contractor.

3.2.5.1.2 Nonparticipant Decision-makers

The property/leasing manager/associate was also the most-cited (50 percent) job position of the nonparticipant respondents. The next-most-cited job positions of nonparticipant respondents included owner (20 percent) and senior property manager (10 percent). KEMA asked the nonparticipant respondents who beside themselves were involved in choosing equipment when energy-using equipment had to be purchased or replaced.[9] One third of them said "nobody else." Other responses included owners (30 percent), maintenance supervisors (10 percent), and corporate/main offices (10 percent).

[9] In initiating the survey, the surveyors were instructed first to ask for the contact name listed in the Dun & Bradstreet listing. If that person was not available, they were instructed to ask for the "the person involved in, or responsible for, making decisions regarding property improvements."

3.2.5.2 Program Awareness

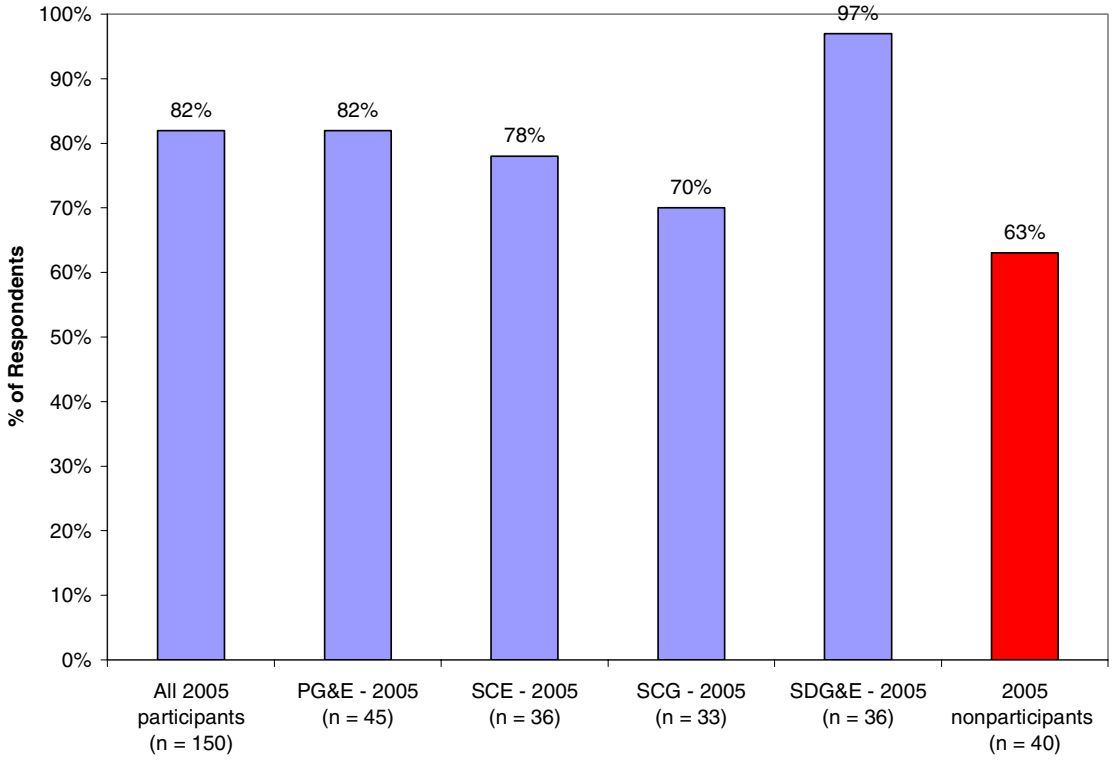
KEMA asked the 2005 program participants both about their awareness of utility rebates for multifamily housing and about their awareness of the fact that their property participated in the program.[10] Participants were asked these awareness questions because there was a possibility that they would not be aware of the program – especially if their contractor filled out the paperwork and received the rebates.[11] While contractors offering "turnkey" energy efficiency project can be a great convenience for property managers and owners, it can also make them less involved in the projects. In addition, some respondents might not have been aware of the rebates or participation in the program because they were a new hire who had replaced the project-aware manager.

Figure3-4 shows that 82 percent of the 2005 participants were aware of the rebates. SDG&E participants were significantly more aware of these rebates than participants from the other utilities. Participant rebate awareness levels were higher than nonparticipant awareness levels, although the differences were not as high as expected.

[10] The "rebate awareness" question asked whether they were aware that their utility offered rebates for making energy efficiency improvements in apartment complexes such as their own. The "participation awareness" question asked whether they were aware that in 2005 the program paid rebates to either them or their contractors to help reduce the costs of CFLs, boiler controls, or programmable thermostats at their address. This second question was only asked of those who were aware of the rebates.

[11] Only 35 percent of the 2005 participating property managers/owners said that they received a rebate check from the program. Of these rebate recipients, 87 percent said that they filled out rebate application forms.

Figure 3-4
Rebate Awareness 2005—Participants vs. Nonparticipants

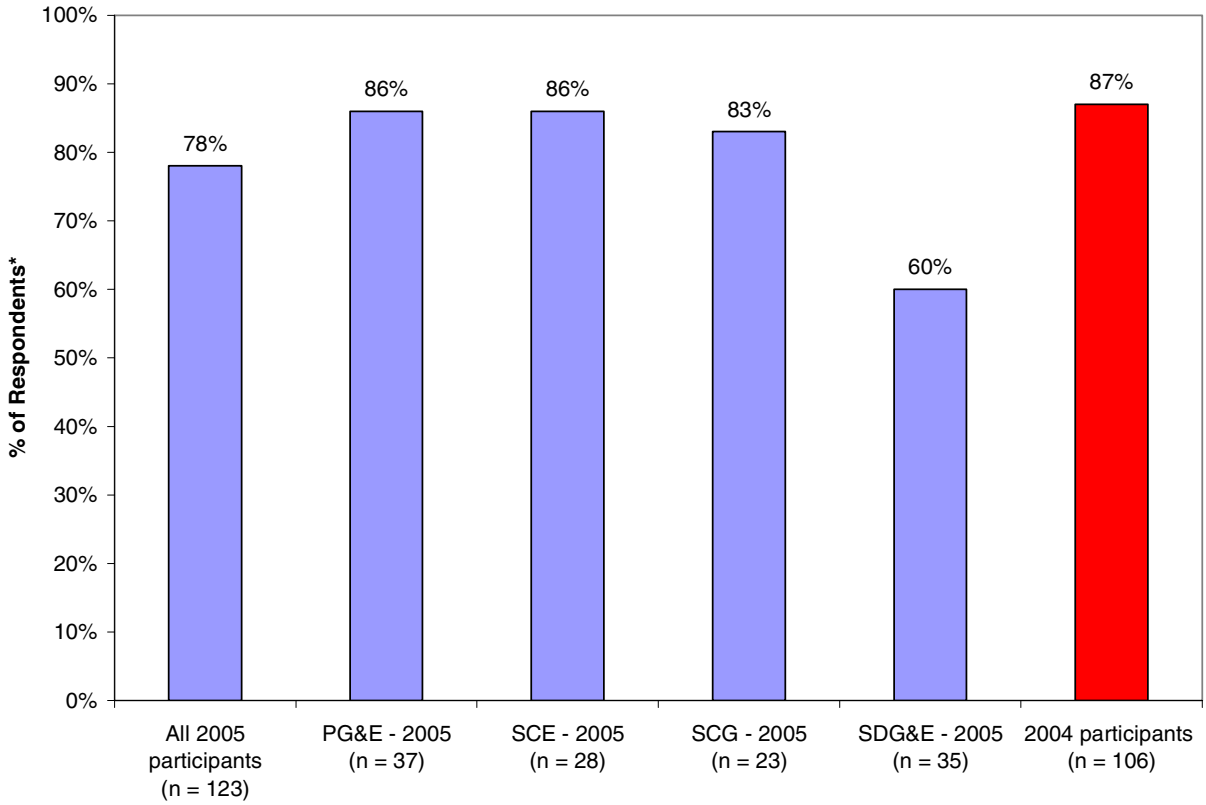


Note: Sources of information are: participants -- June 2006 KEMA survey, nonparticipants -- July 2005 KEMA survey.

Figure3-5 compares 2005 participants with 200 4 participants as to their awareness of participation in the program. It shows that participation awareness declined from the 2004 program.[12] It also shows that once again there was significant variation in awareness levels among the utilities. This time SDG&E has the lowest rather than the highest awareness levels.

[12] This difference is statistically significant at the 95% confidence level.

Figure 3-5
Participation Awareness—2005 vs. 2004 Participants

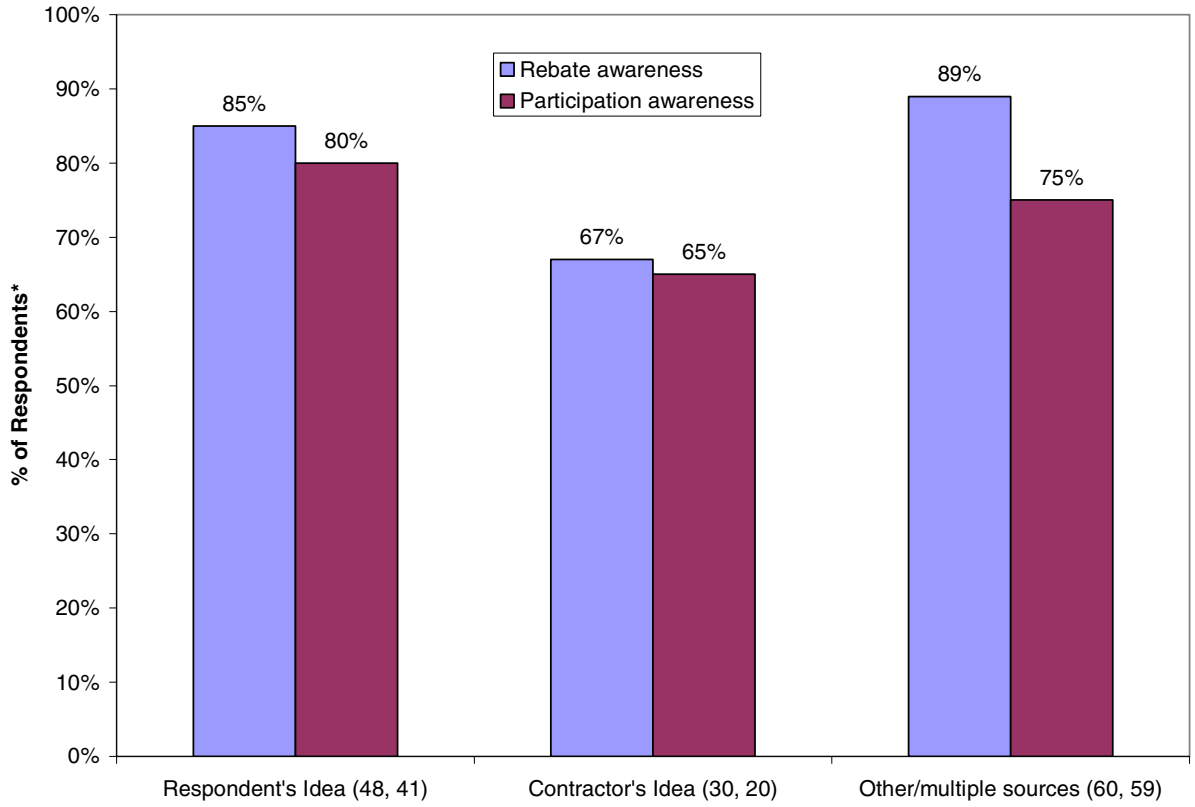


Note: *This participation awareness question was asked of all 2004 participants but only of 2005 participants who had previously indicated awareness that their utility had multifamily rebates.: Sources of information are: 2005 participants -- June 2006 KEMA survey, 2004 participants -- August 2005 KEMA survey.

What factors besides utility service territory affected 2005 participant awareness of multifamily rebates and their participation in the program? Neither the type of equipment installed nor the size of the building made much difference as to these awareness levels. The biggest factor was who came up with the idea for the project.

As Figure3-6 shows, participants whose projects were contractor-inspired not surprisingly were much less likely to be aware of both the rebates and their participation in the program. This makes the decline in participation awareness among the 2005 participants puzzling since other data indicate that the so-called "self initiator" participants were better represented in the 2005 program than in the 2004 program. While lower awareness of participation could be due to staff turnover – e.g., the survey respondent is a new hire who had replaced the project-aware property manager – it is not clear why this staff turnover would be higher among 2005 participants than it was among 2004 participants.

Figure 3-6
2005 Participants—Rebate, Participation Awareness
by Who Had Main Idea for the Project



*The rebate awareness question was asked of all 2005 participants, but the participation awareness questions was only asked of 2005 participants who had indicated awareness of the rebates. The numbers in parentheses are sample sizes for the rebate awareness and participation awareness questions respectively. Source is KEMA survey conducted in June 2006.

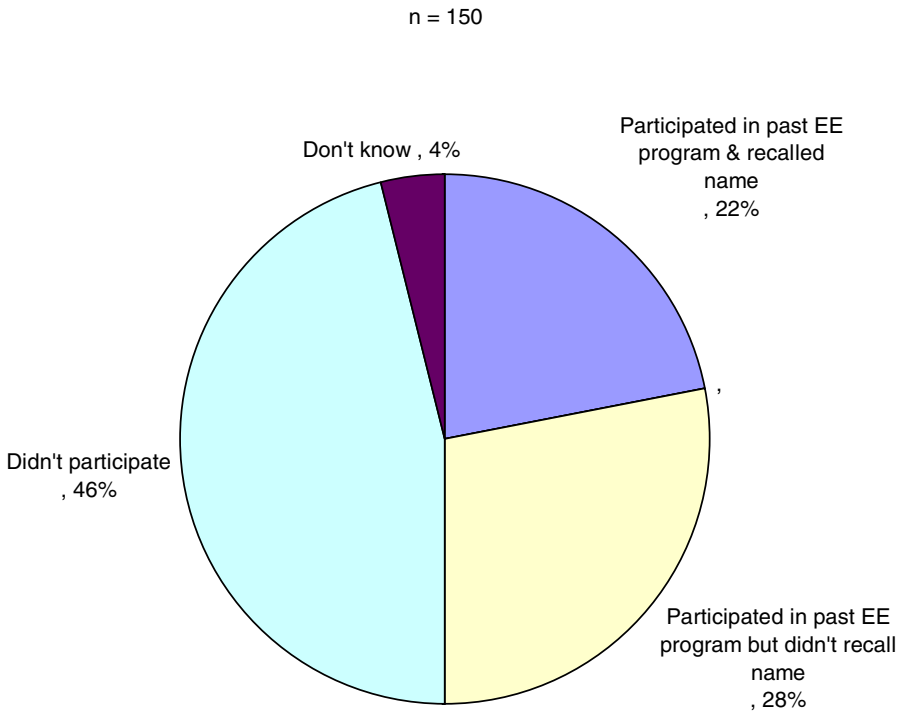
3.2.5.3 Involvement in Other California Energy Efficiency Programs

The 2005 participants were asked whether they had participated in any California energy efficiency programs and if so, which ones. As Figure 3-7 shows, half of the participants said that they did, but only 22 percent could recall the program name. Only nine percent of the 2005 participants were able to name a program that they had participated in that was something other than the program. About half of these named the Low-Income Energy Efficiency Program. Other programs named included the Single-Family Rebate, Designed for Comfort, Energy Partners, and Standard Performance Contract programs.

The level of participation in California energy efficiency programs did not vary to any significant degree among the participants based on their utility service territory, property size, project location (common area vs. tenant units), source of project idea, or metering type. There was some variation based on measure type, with CFL participants less likely (40 percent likelihood) to have participated in California

energy efficiency programs than those participating with a measure that was not a boiler control, programmable thermostat or CFL (61 percent likelihood). This is probably due to the fact that since CFLs are the less expensive energy-efficiency measures to install, CFL participants are most likely to be new initiates into energy efficiency.

Figure 3-7
2005 Participants
Participation in and Recall of Other California EE Programs



Note: Source is KEMA survey conducted in June 2006.

3.2.5.4 Information Sources for Energy-Using Equipment Replacement

KEMA asked both participating and nonparticipating property managers/owners what sources of information they use to help their decision-making when purchasing or replacing energy-using equipment. Participating multifamily property managers/owners were much more likely than nonparticipants to rely on information from internal maintenance staff as well as outside contractors. Nonparticipating property managers/owners were more likely than participants to rely on information from equipment dealers and distributors (Table 3-6). The survey of 2005 participants found decreased reliance on internal maintenance staff for information and increased use of the Internet. Some of this may have been due to the fact that the 2005 participants were generally smaller properties (see discussion above) and therefore fewer of them may have had internal maintenance staffs to rely on.

Table 3-6
Information Sources for Energy-Using Equipment Replacement
2004-2005 Participants, Nonparticipants

Sources of information used when purchasing or replacing energy-using equipment in common areas or tenant units	2004 Participating Multifamily Properties (n = 106)[1]	2005 Participating Multifamily Properties (n = 150)[2]	Nonparticipating Multifamily Properties (n = 40)[3]
Internal maintenance staff	47%	31%	23%
Regular installation contractor	20%	19%	28%
Outside installation contractor	17%	11%	5%
Equipment dealers/retailers	13%	7%	28%
Equipment manufacturers	12%	9%	3%
Own Internet research	10%	19%	8%
Utility representatives	8%	8%	8%
Equipment distributors/wholesalers	8%	5%	15%
Other (Calling around - getting bids, apartment associations, utility websites, own info. resources, colleagues, etc.)	21%	5%	21%
Don't know/Refused	4%	21%	13%

Note: Totals exceed 100% because multiple responses were allowed. [1] KEMA survey conducted in August 2005. [2] KEMA survey conducted in June 2006. [3] KEMA survey conducted in July 2005.

3.2.6 The Energy-Efficiency Activities of Participating Property Managers/Owners

This section discusses the types of measures being installed through the program and their locations in the multifamily properties.

3.2.6.1 Types of Energy-Efficient Measures Installed

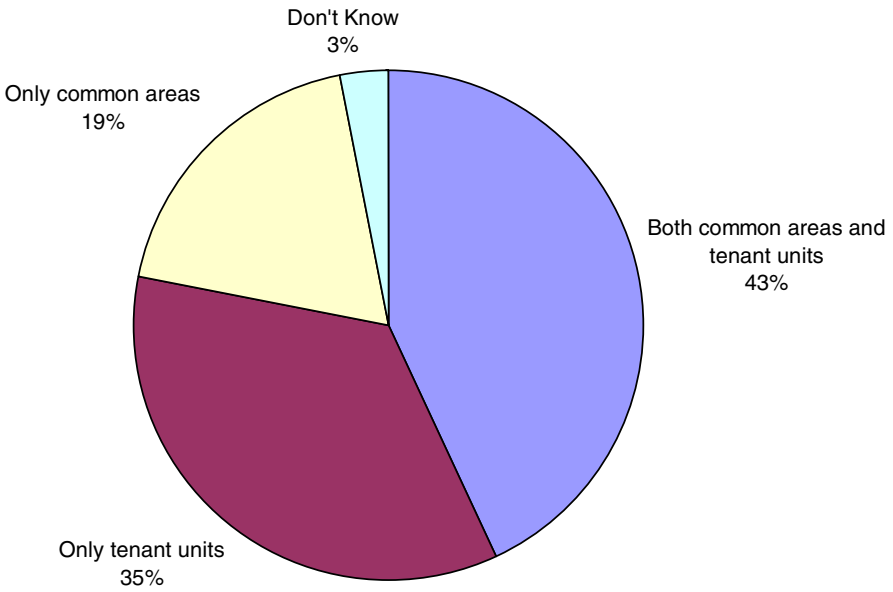
The most common measures installed through the program were CFLs, high performance windows, insulation, programmable thermostats, and T8 fluorescent fixtures. As shown previously in Table 2-2, CFLs and programmable thermostats alone accounted for 88 percent of the kWh savings claimed by the program for 2004-2005. Boiler controls and programmable thermostats alone accounted for 87 percent of the 2004-2005 claimed therm savings.

3.2.6.2 Location of Energy-Efficient Measures

In the Interim Report, KEMA cited interviews with program managers that indicated that tenant units rather than common areas were the more popular targets for energy-efficiency installations. They noted that some participating contractors were only doing installations in tenant units. “The market is in the tenant dwelling units,” one program manager remarked. This was somewhat counterintuitive since most property managers/owners would not directly benefit from reducing their tenant energy bills. Yet the survey of 2004 participants proved the program managers correct. Only 11 percent of the property manager’s owners said that their energy efficiency projects were only in the common areas of their buildings. The 2005 participants told a similar story. As Figure 3-8 shows, they reported that only 19 percent of their installations were in the common area only.

This focus by participating property/managers on improving the tenant units could be due to a number of reasons. First it could be evidence that the program rebates are making the split incentive barriers less relevant. Second, as discussed elsewhere in this report, there is evidence that the desire to make property improvements, due to competitive pressures, is an important driver of energy efficiency improvements. Third it simply could be a result of the fact that many property managers/owners have already take care of most of the common area improvements, and the remaining opportunities are in the tenants units. As noted below, participating contractors pointed to tenant units as being part of the multifamily sector market that has great future potential.

Figure 3-8
Location of Energy-Efficiency Measures
In Properties of Participating Property Managers/Owners



Note: Source is KEMA survey conducted in June 2006.

3.2.7 The Energy-Efficiency Activities of Nonparticipating Property Managers/Owners

KEMA asked nonparticipating multifamily property managers/owners whether they had recently purchased and installed energy-efficient equipment such as high-efficiency lighting, programmable thermostats, high-efficiency heating or cooling equipment, or high performance windows at any of their properties. Because the respondents might have different definitions of energy-efficient equipment, however, we first asked them to select which of a list of definitions of energy-efficient equipment best matched their own definition. Table 3-7 shows that over half of the nonparticipants defined energy-efficient equipment as equipment with an ENERGY STAR label.

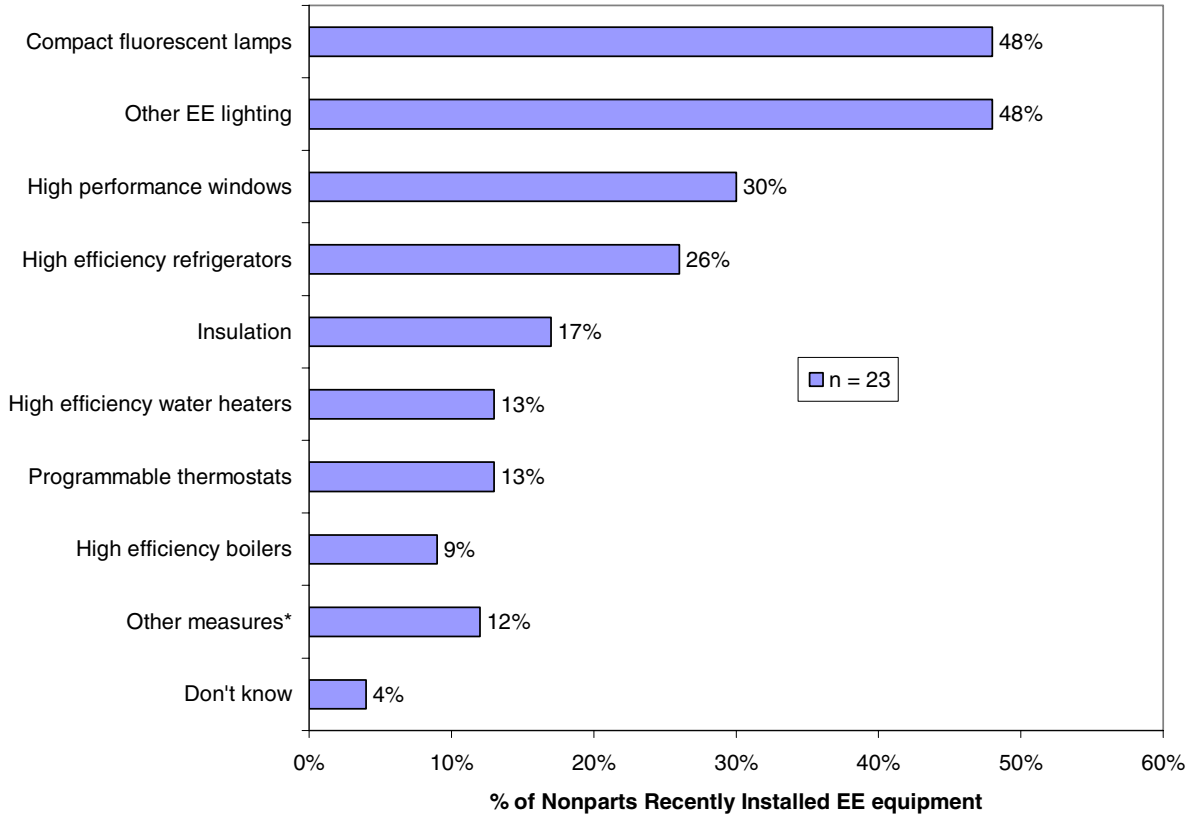
Table 3-7
Definitions of Energy Efficiency
for Nonparticipating Property Managers/Owners

Definition of Energy-Efficient Equipment	% of Nonparticipants (n = 40)
Equipment with an Energy Star label	53%
Equipment that is more energy efficient than the most common equipment available	15%
Equipment with the highest energy efficiency available in the market place	10%
Equipment for which an electric or gas utility offers a rebate	10%
Equipment which is more energy efficient than what we have in place now	5%
None of these statements	3%
Don't Know	5%

Note: Total may not exactly equal 100% due to rounding. Source is KEMA survey conducted in July 2005.

Fifty-eight percent of the nonparticipants said that they had recently installed energy-efficient equipment at one of their properties. Figure 3-9 shows the types of equipment they installed.

Figure 3-9
Energy-Efficient Equipment
Recently Installed by Nonparticipating Property Managers/Owners



Note: Source is KEMA survey conducted in July 2005.

3.2.8 Central Boiler/Water Heater Replacements

Since the program is trying to increase the amount of energy savings it gets from energy-efficient central boilers and water heaters, KEMA asked the nonparticipating boiler/plumbing contractors some questions about the replacement of these measures. First it asked these contractors whether they agreed with the statement "that most building managers only replace central boilers or water heaters when they have broken down or are not performing satisfactorily?" Ninety-four percent of the contractors agreed with this statement. This confirms concerns from program managers that use of rebates for energy-efficient central boilers and water heaters is inherently hampered by the reluctance of most property managers/owners to do early replacement of these systems.

KEMA then asked these nonparticipating boiler/plumber contractors whether, when replacing a central boiler or water heater, there would be any factors that would discourage them from recommending a high efficiency model. Table 3-8 shows that price/cost considerations would be the most important factors, although a quarter of the contractors did not see any barriers to recommending the high efficiency models.

Table 3-8
Factors That Would Discourage
Recommending High EE Central Boiler or Water Heater

Factors that would discourage recommending EE central boiler or water heater	% of Nonparticipating Boiler/ Plumbing Contractors (n = 16)
Price/cost considerations	50%
No reasons for not recommending EE	25%
Follows Title 24 or engineer's recommendation	6%
Nonavailability, which is rare	6%
Contractor doesn't do replacements	13%

Note: Source is KEMA survey conducted in May-June 2006.

KEMA also asked these contractors what factors would encourage them to recommend high efficiency central boilers or water heaters in replacement situations. Being able to know and sell the potential energy savings as well as the existence of rebates were the most-cited factors, as Table 3-9 shows.

Table 3-9
Factors That Would Encourage
Recommending High EE Central Boiler or Water Heater

Factors that would encourage recommending EE central boiler or water heater	% of Nonparticipating Boiler/ Plumbing Contractors (n = 16)
Being able to know & sell energy savings	25%
Manufacturer/other rebates	25%
No factors	13%
Being able to sell features of higher EE system	6%
If they own the building	6%
Only sell high EE models	6%
Contractor doesn't do replacements	13%
Don't know	6%

Note: Source is KEMA survey conducted in May-June 2006.

3.3 Contractor Characterization

Since the program is primarily contractor-driven, a better understanding of both participating and nonparticipating contractors is important for gauging both the strengths and weaknesses of this program delivery approach. This section mainly describes the types of installation contractors that are participating in the program. However, there is also a short characterization of nonparticipating boiler and plumbing contractors, who KEMA surveyed in 2006. Other sections of the report will summarize additional

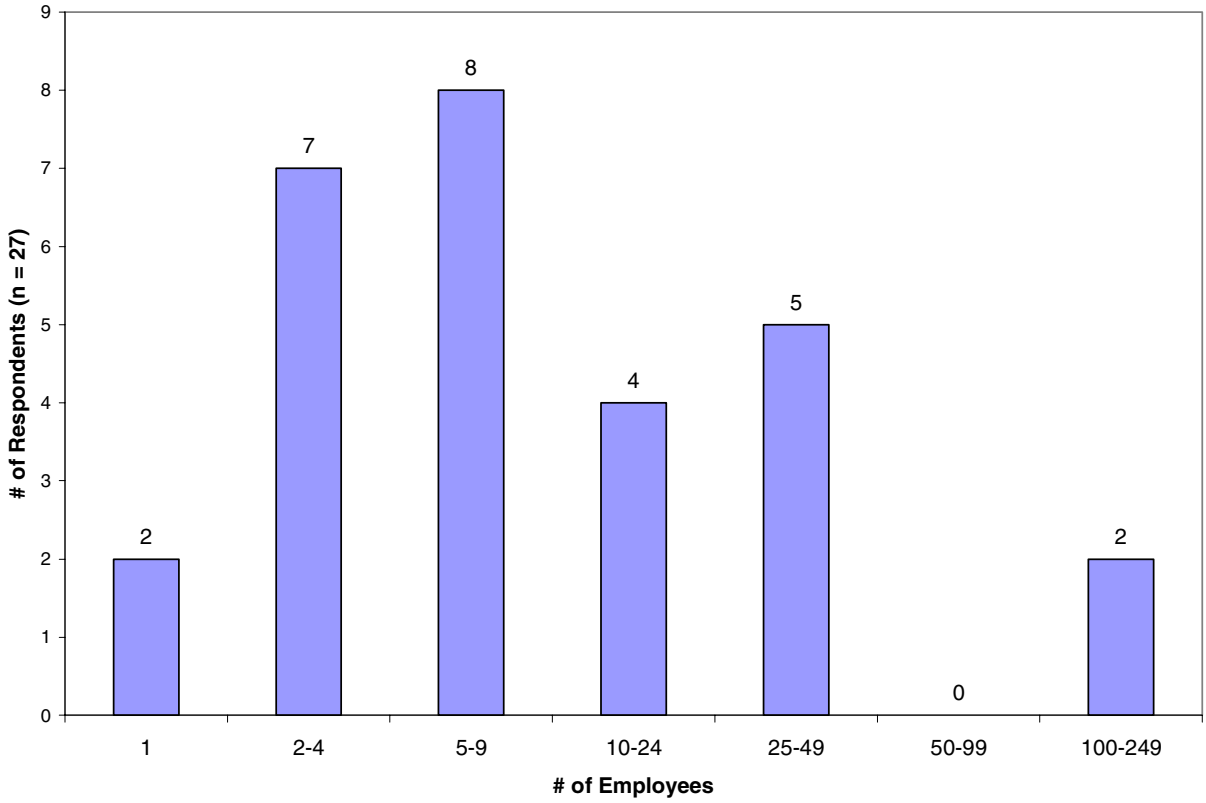
findings from these contractor surveys including an assessment of the market potential for selected energy-efficiency measures, program participation drivers and barriers, quality control procedures, satisfaction with program processes, and recommendations for program improvements.

3.3.1 Characterizing Participating Contractors

3.3.1.1 Company Size and Target Markets

Most contractors participating in the program are small- to medium-sized companies. Only two of the 28 participating contractors had more than 50 employees and the majority of contractors had fewer than 10 employees (Figure 3-10). The mean number of employees for the participating contractors was 23 but the median was only six. There is inherently some uncertainty in these employee numbers since the survey did not ask contractors to distinguish between full-time and part-time employees. Many of the contractors do hire installers on a part-time basis depending on the season and the availability of rebates. There was a similar disparity between the mean and the median for the reported number of energy efficient installation projects in multifamily buildings in a typical year. The mean number of annual projects was 128 but the median was only 36. The number of annual projects ranged from 5 to 1,000.

Figure 3-10
Size of Participating Contractors
by # of Employees



Note: Source is KEMA survey conducted in May-July 2005.

KEMA asked the contractors which electric and gas utilities served most of their customers. Table 3-11 shows that most contractors were active in multiple service territories. Some of the contractors have offices in both northern and southern California. The fact that some contractors only install electric measures explains the smaller percentage of gas utilities cited.

Table 3-10
Primary Electric and Gas Utilities
for Customers Served by Participating Contractors

Fuel Supplied	PG&E (% of respondents)	SCE (% of respondents)	SCG (% of respondents)	SDG&E (% of respondents)
Electric	46%	82%	0%	29%
Gas	25%	0%	43%	11%

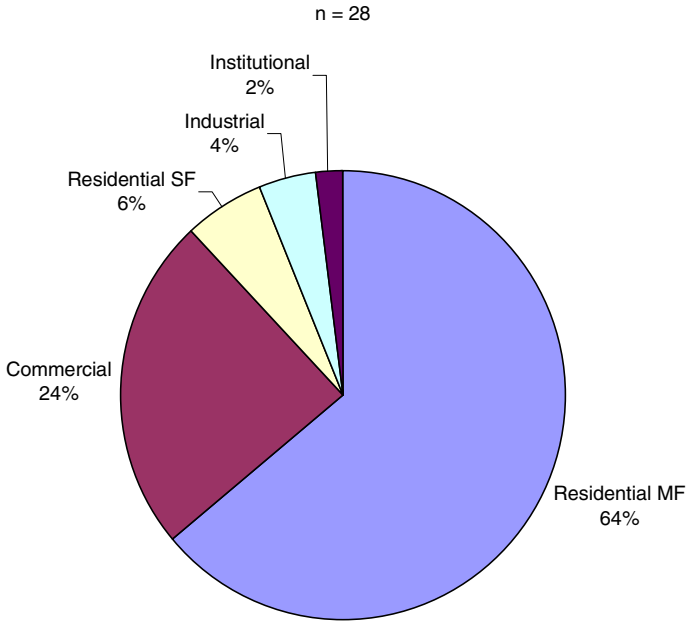
Note: Multiple responses allowed, n = 28. Source is KEMA survey conducted in May-July 2005.

Most of the contractors participating in the program get the majority of their installation business from the multifamily sector (Figure 3-11). Sixteen of the 28 participating contractors get at least 70 percent of their business from this sector. Only eight contractors receive less than 45 percent of their business from the multifamily sector. On average, the commercial sector is the second largest source of installation business. The residential single-family, institutional, and industrial markets contribute little to the revenue streams of participating contractors.

Participating contractors estimated how their installations of energy-efficient equipment were distributed by multifamily building size. Figure 3-12 shows the average percentage of total installations represented by each building size category. Table 3-11 compares these contractor estimates with estimates of the distribution of multifamily building sizes from the 2000 California Multifamily Market Baseline study.[13] It shows that the distribution of multifamily building sizes that participating contractors are reaching is fairly representative of the population as a whole.

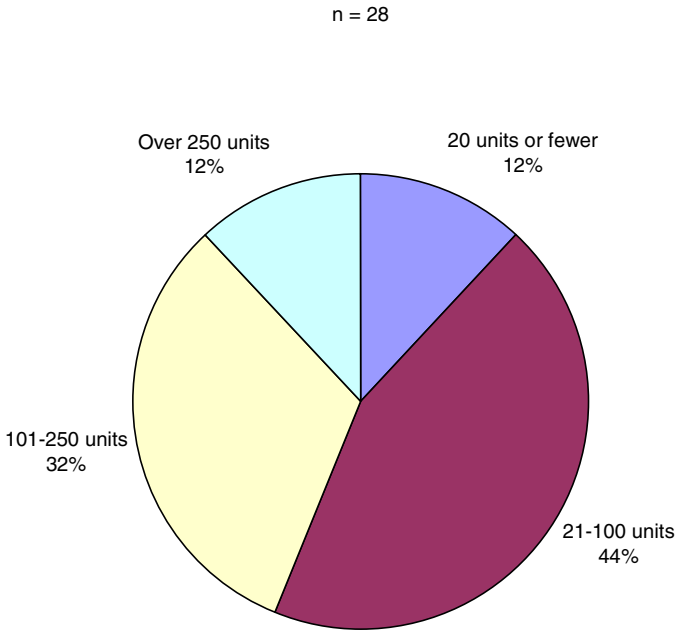
[13] Final Report, Statewide Survey of Multi-family Common Area Building Owners Market, Volume I: Apartment Complexes, prepared by: ADM Associates, Inc., TecMRKT Works LLC. June 2000. p. 2-3. The building size distributions are for the combined PG&E, SCE, and SDG&E service territories. The baseline study developed its building size estimates from data collected through interviews with multifamily property managers and owners as well as from secondary data sources.

Figure 3-11
Participating Contractor EE Installations
by Market Sector



Note: Source is KEMA survey conducted in May-July 2005.

Figure 3-12
Participating Contractor EE Installations by Multifamily Building Size



Note: Source is KEMA survey conducted in May-July 2005.

Table 3-11
Participating Contractor EE Installations by Multifamily Building Size
Compared with Building Size Distributions
from 2000 CA Multifamily Market Baseline Study

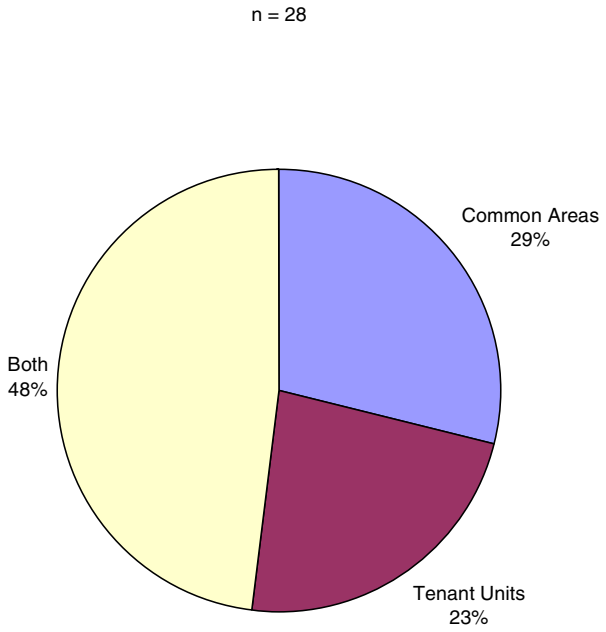
Units per Apartment Building	Size Distribution of Apartment Buildings (2000 CA Multifamily Market Baseline Report, n = 541)	% of EE Installations Reported by Participating Contractors (2005 KEMA Evaluation, n = 28)
100 or fewer	57%	56%
101 to 250	25%	32%
Over 250	18%	12%
Total	**100%**	**100%**

Note: Sources are ADM survey conducted in January 2000 and KEMA survey conducted in May-July 2005.

KEMA also asked the contractors to estimate what percentage of their projects for installing energy-efficient equipment in multifamily buildings were for common areas only, for tenant units only, or for both tenant units and common areas. Figure 3-13 shows that, on average, the contractors estimated that almost half of the their energy-efficient installations were for projects that involved both the building common areas and the tenant units. This proportion was similar to self-reports from participating property managers/owners. Contractors reported a higher percentage of common-area-only installations (29 percent) compared to the 2005 participating property managers/owners (19 percent).[14]. However, the fact that common-area-only projects were still a small part of the contractors' installations is further evidence of the strength of the tenant unit market, as discussed above.

[14] These percentages are straight averages of the contractor self reports and are not weighted according to the size and activity of the contractor. For this reason, the property manager self-reports are probably more reliable for estimating the locations of energy-efficient measures.

Figure 3-13
Participating Contractor EE Installations
by Multifamily Building Location



Note: Source is KEMA survey conducted in May-July 2005.

3.3.1.2 Energy-Efficient Measures Installed

Participating contractors were asked what energy-efficient measures they installed in multifamily housing. Table 3-12 shows that energy-efficient lighting and programmable thermostats are the measures that most contractors offer. For those installing lighting measures, compact fluorescent lamps accounted for the majority of lighting measures, with T5s/T8s accounting for about one quarter of installations and lighting controls only accounting for five percent. This high incidence of CFL and programmable thermostat installations mirrors what is happening in the program (**Error! Reference source not found.**) and suggests that contractors are installing similar measures outside the program. Participating contractors said that, on average, over 70 percent of their lighting products come directly from manufacturers. The quality control implications of this reliance on manufacturer products are discussed in Chapter 5.

Table 3-12
Participating Contractor EE Installations
by Measure Type

EE Measures Offered	% of Contractors Installing Measure (n = 28)
Lighting	82%
Programmable thermostats	68%
Boiler controls	21%
Showerheads/ aerators	18%
Boilers	14%
Central air conditioners	14%
Heat pumps	14%
Duct sealing	14%
Water heaters	11%
Windows	7%
Insulation	7%
Clothes washers	4%
Room air conditioners	4%

Note: Total exceeds 100% because multiple responses were allowed. Source is KEMA survey conducted in May-July 2005.

Table 3-13 shows that over half of the participating contractors either install only lighting measures and programmable thermostats or only install lighting. However, the remaining eleven contractors offer a wide variety of measure combinations.

Table 3-13
Participating Contractor EE Installations
by Measure Type Combinations

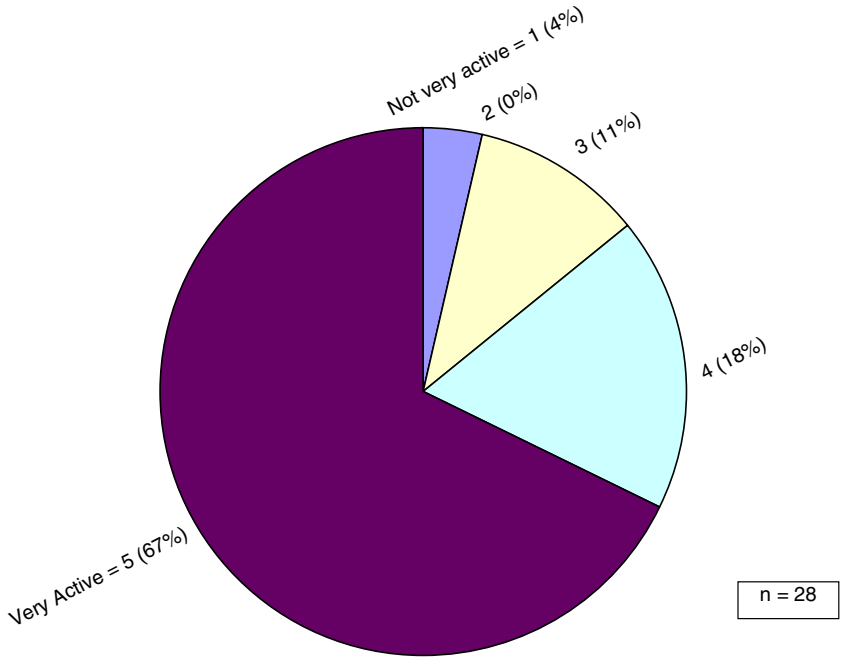
EE Measures Offered	# of Contractors Installing Measures
Lighting, pstats	9
Lighting only	7
Boiler measures	2
Lighting, pstats, CACs	1
Lighting, pstats, CACs, heat pumps	1
Lighting, pstats, showerheads/aerators	1
Lighting, pstats, showerheads/aerators, duct sealing	1
Lighting, pstats, showerheads/aerators, boiler measures	1
Lighting, pstats, showerheads/aerators, windows	1
Lighting, pstats, water heaters, showerheads/aerators, boiler measures, windows, clothes washers, heat pumps	1
Pstats, boiler measures, insulation, CACs, heat pumps, duct sealing	1
Pstats, water heaters, boiler measures	1
Pstats, water heaters, CACs, RACs, heat pumps, duct sealing	1
Total	**28**

Note: Source is KEMA survey conducted in May-July 2005.

3.3.1.3 Activity in the Program and Other Energy Efficiency Programs

KEMA asked the contractors how actively they promote rebates offered by the program. The contractors were asked to rate their activity using a scale where one indicated "Not Very Active" and five indicated "Very Active." Figure 3-14 shows that two-thirds of the contractors consider themselves as very active promoters of the program rebates. The average contractor activity rating was 4.5.

Figure 3-14
Contractor Activity in the Program



Note: Source is KEMA survey conducted in May-July 2005.

The survey data also showed that the participating contractors are very dependent on the program for their business. On average, contractors estimated that 72 percent of their installations use program rebates. Only five of the contractors said that the program rebates were used in less than half of their installations.

KEMA asked the contractors what other California energy-efficiency programs they participate in. The most commonly cited programs were the Express Efficiency Program (64 percent of respondents) and the Standard Performance Contract Program (39 percent).

3.3.1.4 Sales Practices

Interviews with the program managers indicated there was interest in the sales practices of participating contractors. These practices include how contractors locate interested multifamily property managers/owners and how they sell the energy-efficient measures to them.

Locating the opportunities – KEMA asked the contractors how they found out which multifamily properties to target for energy-efficiency improvements. Almost all the contractors use some combination of leveraging existing relationships with property managers/owners and seeking out new business through cold calling or knocking on doors. Contractors who have been in business a number of years rely more on

existing relationships. However, even these long-standing contractors will supplement this business with cold calling or knocking on doors, especially if they are operating outside their home base.

Information sources – The most-cited sources of prospective customers were referrals and word-of-mouth. However, other sources of information cited by more than one contractor included apartment/homeowner associations, listing of property management associations, phone books, and the Internet. A couple of contractors mentioned using the Internet to do geographic searches. For example, one contractor would do an Internet search with a zip code and produce a list of all the apartment buildings that used that zip code.

Contact methods – The two most popular marketing methods are in-person sales visits and telemarketing. Larger contractors have dedicated marketers who do nothing but sales visits. A couple of contractors use direct mail and one uses faxes.

Special targets – A number of contractors target large property management companies. Developing relationships with these companies can be advantageous not only because they have large property portfolios but also because they are often acquiring new properties. Larger property management firms often do not have the internal staff to review the state of energy-using equipment in new acquisitions. In these cases, they will hire independent contractors to conduct audits and perform low-cost retrofits. However, large property managers/owners can also be difficult to gain as customers, as discussed in Subsection 4.15. One contractor said that his company targets "older buildings" although he did not explain how this was done.

Master-metered properties – KEMA asked the contractors whether property managers/owners were more likely to have pursue energy-efficient measures if they had master-metered properties.[15] Twelve of the contractors (43 percent) said that this was the case. For example, one contractor said that if a large property management firm gives him a list of properties to audit, the firm would usually insist that the master-metered properties be audited first. Three other contractors said that the existence of a master meter could encourage property managers/owners to adopt energy-efficient measures, but it depended on the owner/manager.

Avoided multifamily property types or locations – The contractors were asked if there were any types of multifamily properties that they avoid, whether this was based on the type of housing or its geographic area. Ten of the contractors (36 percent) said that they avoid certain multifamily property types or locations. Four contractors mentioned that they only work with multifamily properties above a certain minimum size. This minimum size ranged from five units to 40 units depending on the contractor. Four contractors also mentioned that they avoid multifamily properties in certain geographic areas, mostly based on driving distance. Other reasons for avoiding multifamily properties included the lack of an onsite manager, the lack of an English-speaking manager, a property manager/owner with a poor reputation for paying bills, and the fact that the property was new and therefore already relatively energy-efficient.

[15] Owners of master-metered properties may be more likely to invest in energy-efficient equipment because such properties – which usually have centralized heating or hot water systems -- are more likely than individually-metered properties to: 1) include some energy costs as a part of the rent or 2) charge fixed fees for such energy costs. Under both these scenarios the property owner would directly benefit from installing a centralized boiler or water heater that had greater energy-efficiency.

Sales pitches – KEMA asked the contractors what sales pitches they typically used to promote their energy-efficient measures. The most widely -cited components of the sales pitch were emphasizing the energy savings (14 contractors) and describing the program and its rebates (12 contractors). Nine of the contractors also mentioned emphasizing the financial benefits of the energy-efficient improvements. Some of them actually calculated the Return on Investment or payback for their prospective clients. Others simply told the managers/owners that the new measures would enhance their property values.

Other elements of the sales pitches that were cited by at least two contractors included:

- Showing the energy-efficient measures that would be installed;
- Emphasizing improved property aesthetics due to new fixtures and better quality light;
- Promoting product warranties;
- Providing positive company information such as number of years in the business or references;
- Promoting longer bulb/equipment life;
- Offering free energy audits of the customer's property; and
- Offering free analysis of the customer's energy bills.

Finally elements of the sales pitches that were mentioned by only a single contractor included "free light bulbs," "if you don't do this somebody else will," higher tenant satisfaction, environmental benefits, lower personal liability (e.g., reduced risk of tenant scalding from old water heater), lower fire risk, and that property managers/owners are already paying for the rebates through a "tax" on their energy bills.

KEMA also asked whether this sales pitch varied depending on the type of energy-efficient measure being promoted, the type of property, or to whom they were making the sales pitch. The large majority of the contractors did not vary their sales pitch with the type of measure beyond explaining that rebates vary with equipment type. Very few contractors varied their sales pitch based on the property type or whom they were making the sales pitch to. A couple of contractors said that they use basically the same sales pitch, but they will vary the emphasis of key phrases depending on whether they are talking to the property owner or a maintenance supervisor. One contractor said that managers of high-end properties care more about capitalization and minimal tenant disruption while managers of low-end properties or smaller buildings will care more about cash flow and ongoing cost savings.

Information left behind – Most contractors said that after a sales call they leave behind brochures or application forms from the program or the program's website address. Five of the contractors said that they typically leave behind information on product specifications. A few contractors also supplement the program information with customized marketing materials. One contractor said that his company spends $2,000 per month on developing and printing customized brochures. However, other contractors appeared to be using a more low-cost approach – e.g., an inexpensive flyer containing customer testimonials.

3.3.2 Characterizing Nonparticipating Boiler/Plumbing Contractors

Due to the elimination of the programmable thermostat rebates for 2006-2008, program managers are very interested in getting more therm savings from measures such as central boilers, central water heaters, and boiler controls. In order to find out more about barriers to program participation by boiler/plumbing

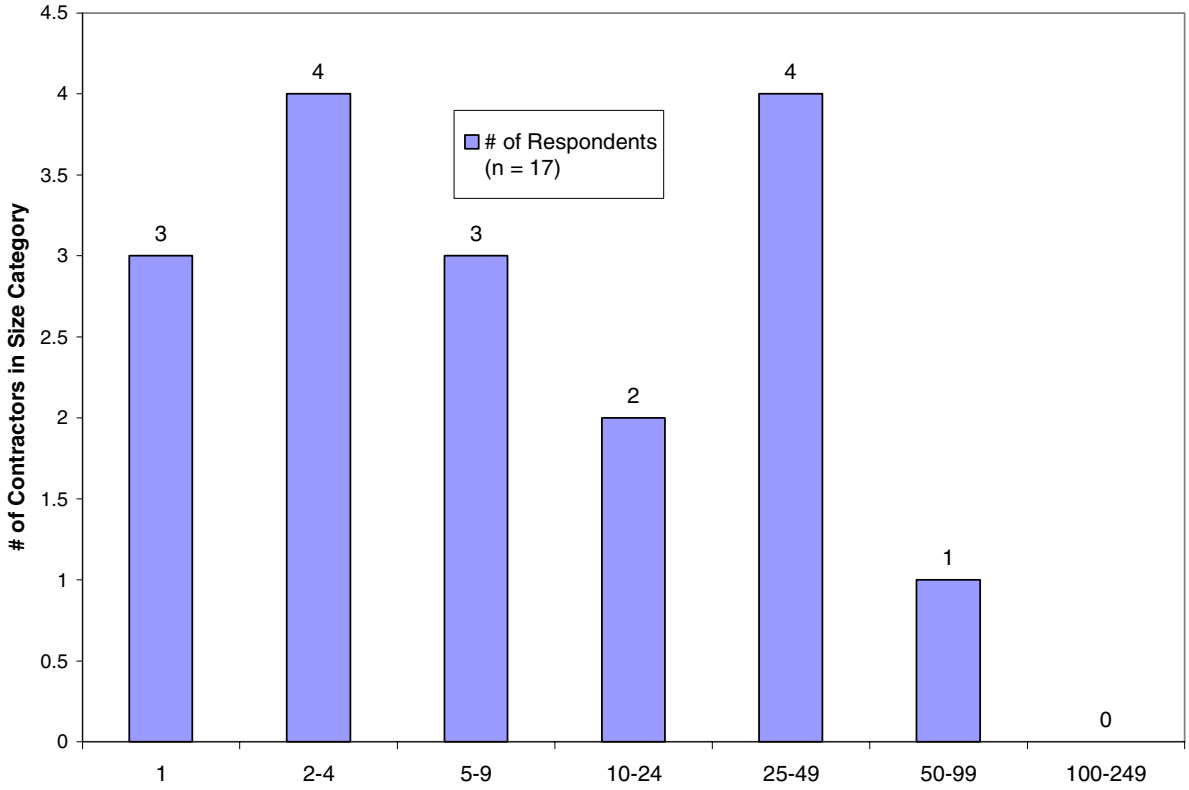
contractors, in May through June of 2006 KEMA interviewed 17 of these contractors who were not participating in the program.[16] In order to get meaningful information about the multifamily sector, KEMA used filtering questions to insure that surveys were only completed with boiler/plumbing contractors who either were active in the multifamily sector or who had an interest in doing work in this sector.

3.3.2.1 Company Size and Target Markets

Most of the nonparticipating boiler/ plumbing contractors were small- to medium-sized companies. Only one of the 17 contractors had at least 50 employees and the majority had fewer than 10 employees (Figure 3-15). The mean number of employees for these nonparticipating contractors was only 14, compared to 23 for the participating contractors.

[16] The sampling methodology for these contractors was described in a March 8, 2006 memorandum that was sent to program implementers and evaluators. In summary, the source data for the sample was Dunn and Bradstreet (D & B) data for Plumbing and Hydronic Heating Supplies (SIC Code 5074). Since this was a fairly broad category, "Line of Business" descriptions were used to weed out irrelevant subsectors (e.g., water softening vendors). The D & B data did not have reliable information on company size. For about 40 percent of the California plumbers and boiler/water heater contractors there was no information on the number of employees. Therefore due to this uncertain company size data and the small size of the overall sample, we did not stratify the sample by company size – e.g., all completed surveys received the same weight, regardless of size.

Figure 3-15
Size of Nonparticipating Boiler/Plumbing Contractors
by Number of Employees



Note: Source is KEMA survey conducted in May-June 2006.

There was even great variability as to the number of multifamily projects that these nonparticipating boiler/plumbing contractors did in a typical year. Seven of them did 15 or fewer multifamily projects per year, three did 50-100 multifamily projects per year, three did 240-550 projects per year, and four could not provide an estimate. The mean number of year multifamily installations was 103 but the median was only 15.

KEMA asked the nonparticipating boiler/plumbing contractors which electric and gas utilities served most of their customers. Table 3-14 shows that we were most successful in completing interviews with nonparticipating contractors who were active in the PG&E service territory. While the participating contractors often had offices in both northern and southern California, the nonparticipating boiler/plumbing contractors were more localized. Only one of the nonparticipants named more than one utility as supplying electricity or gas to its customers.

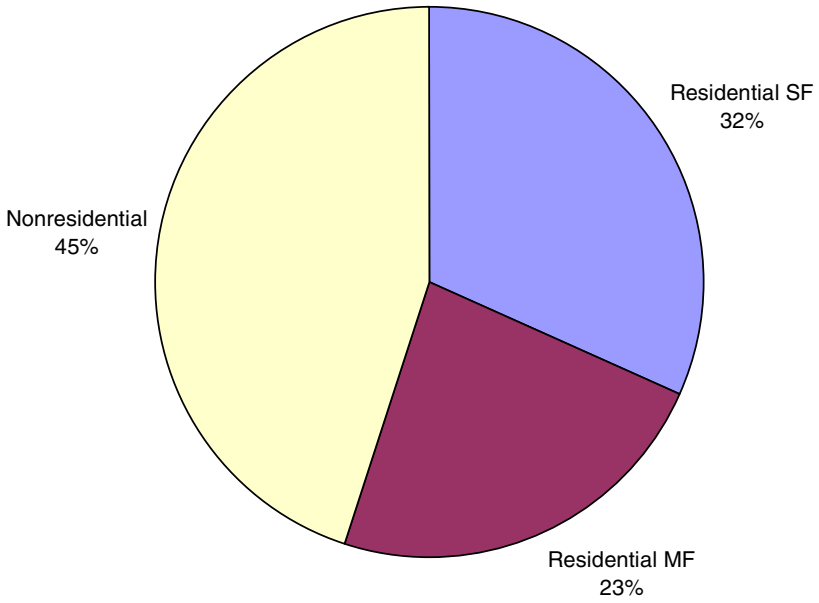
Table 3-14
Primary Electric and Gas Utilities
for Customers Served by Nonparticipating Boiler/Plumbing Contractors

Fuel Supplied	PG&E	SCE	SCG	SDG&E	SMUD
	(% of contractors citing service territory as primary customer location)				
Electric	47%	18%	0%	35%	6%
Gas	53%	0%	24%	29%	0%

Note: Multiple responses allowed, n = 17. SMUD is the Sacramento Municipal Utility District. Source is KEMA survey conducted in May-June 2006.

The nonparticipating boiler/plumbing contractors were very different from the participating contractors in terms of the importance of the multifamily sector for their businesses. While the multifamily sector accounted for an average of 64 percent of the participating contractor's business, it only accounted for an average of 23 percent of the nonparticipant contractor's business. Although participation in the program was likely an important factor in accounting for this difference, it is difficult to determine how important it was in determining the market focus of these contractors. For example, were the participating contractors heavily involved in the multifamily sector because of the program, or had they always targeted this sector and gravitated to the program because of the rebates? Only 13 percent of the nonparticipating contractors did any proactive outreach or marketing to try to gain more work in the multifamily sector, but only 12 percent of them were even aware of the program. If they had been aware of the program and its rebates, would they have made the multifamily sector a bigger focus of their business? Or could it be argued that if the nonparticipating contractors really wanted to expand their presence in the multifamily sector they would have found out about the program and become a participant? KEMA was unable to disentangle the answers to these questions from the available survey data.

Figure 3-16
Nonparticipating Boiler/Plumbing Contractor Installations
by Market Sector



Note: Source is KEMA survey conducted in May-June 2006.

3.3.2.2 Energy-Efficient Measures Installed

KEMA asked the nonparticipating boiler/plumbing contractors whether they install some of the technologies that are rebated by the program. Table 3-15 shows that nearly two-thirds of them install central natural gas water heaters and about half install gas storage water heaters, water heater or boiler controls, and programmable thermostats. Therefore most of them could take advantage of the rebates offered by the program.

3.3.2.3 Awareness of the Program and Participation in Other California EE Programs

Awareness of the program among the nonparticipating boiler/plumbing contractors was very low. Only 12 percent had heard of the program. Only four of the 17 contractors had participated in other California energy efficiency programs. Two of these had participated in the Single Family Energy Efficiency Rebate Program and two others had participated in the Express Efficiency Program.

3.3.2.4 Sales Practices, Barriers and Opportunities

Two thirds (67 percent) of the nonparticipating boiler/plumbing contractors rely solely on referrals from previous work and general word-of-mouth to get work. Only 20 percent did some sort of advertising. One of the contractors has a standing contract for work with a large property management firm. One of the contractors also has his administrative staff search for RFPs from general contractors on the Internet. Only 13 percent of these contractors did any proactive outreach or marketing to try to gain more work in the multifamily sector.

Table 3-15
Nonparticipating Boiler/Plumbing Contractors
Relevant Measures Installed

Measure	% of Nonparticipating Contractors (n = 16) Who Install the Measure
Central gas water heaters	63%
Gas storage water heaters	50%
Boiler/WH controls	44%
Energy Star programmable thermostats	44%
Central gas boilers < 300 MBtuh	38%
Energy Star dishwashers	38%
Central gas boilers >= 300 MBtuh	25%
Energy Star clothes washers	6%

Note: Source is KEMA survey conducted in May-June 2006

Twenty-seven percent of the nonparticipating boiler/plumbing contractors said that they have more difficulty doing business with the large property management firms. Two of the contractors said that these larger firms tend to be more cost-conscious than other property management firms and one of them said that the larger firms take longer to pay. The other two boiler/plumber contractors pointed to more layers of decision-making and general bureaucracy to deal with when doing business with the larger firms.

Nearly half (47 percent) of the nonparticipating boiler/plumbing contractors thought that property managers with master-metered properties were more likely to invest in energy-efficient technologies than property managers with individually-metered properties.

3.4 Market Potential

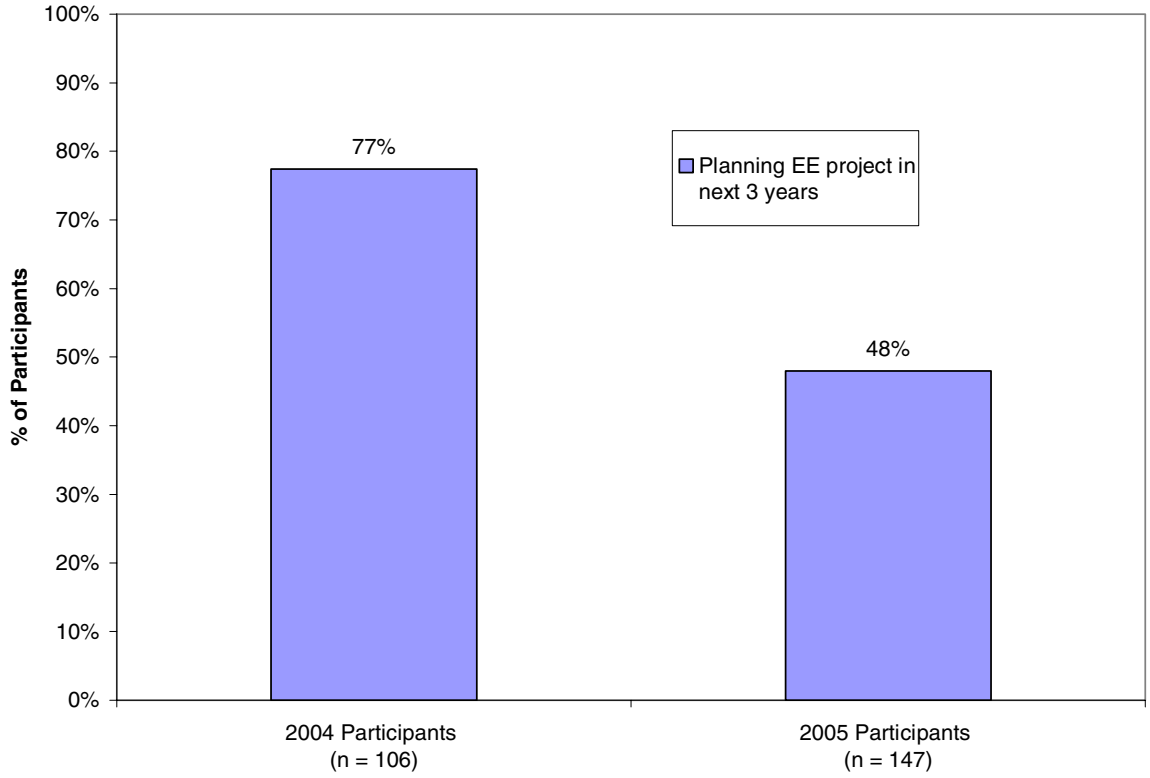
KEMA looked at the potential for energy efficiency in the California multifamily marketplace from a number of different perspectives. Participating property managers/owners were asked about their plans for future energy-efficiency projects. Nonparticipating property managers/owners were asked whether they were interested in any of the energy-efficiency measures offered by the program. Finally, contractors were asked to assess the market potential of CFLs, T5s/T8s, and programmable thermostats.

3.4.1 Participant Plans for Future Energy-Efficiency Projects

The 2005 participants were much less likely than their 2004 counterparts to have plans for future energy-efficiency projects. As Figure 3-17 shows, while over three-quarters of the 2004 participants had plans to install energy-efficient measures over the next three years, less than half of the 2005 participants did so. There was some variation among the different utilities with 59 percent of PG&E participants reporting plans for short-term projects compared to only 38 percent for SCG. Participants who said that their 2005 rebated-projects were mainly their own ideas were also more likely (64 percent) to have projects than

those who said that the ideas for their projects came from the installation contractors (48 percent) or other sources (40 percent).

Figure 3-17
2004 vs. 2005 Participants
Planning to Install EE Measures Over Next Three Years

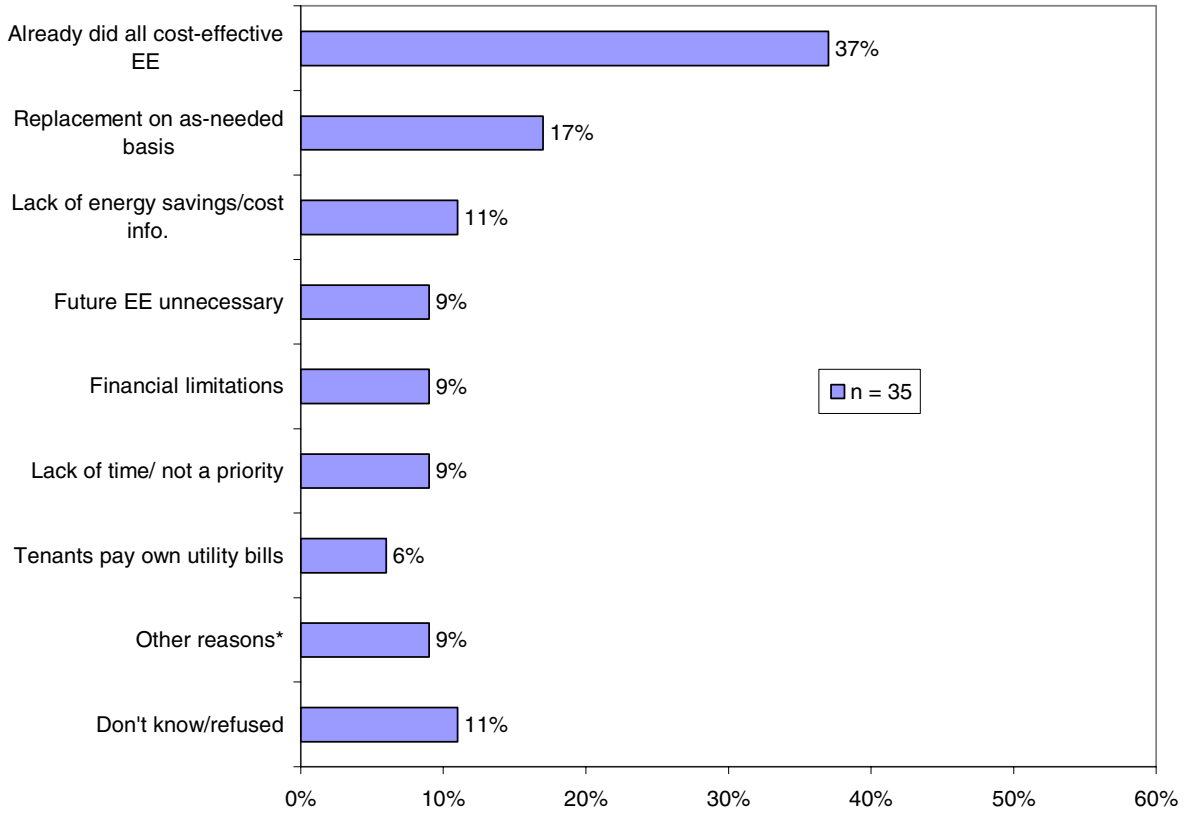


Note: Source is KEMA survey conducted in June 2006

What accounted for this reduced planning for energy-efficient projects among the 2005 participants? Figure 3-18 shows that the most-cited reason for not having future plans was a belief that all cost-effective energy-efficiency measures had been implemented. Since the program has been operating a number of years, this might be an early indicator that for some multifamily properties the inexpensive opportunities for energy-efficiency improvements have already been seized.

Other reasons for not having future plans included policies of only replacing equipment on an as-needed basis and lack of information on energy savings and costs. The reasons for not having future project plans did not vary to any significant degree among the participants based on their utility service territory, property size, measure type, project location (common area vs. tenant units), source of project idea, or metering type. However, the relatively small sample size (n = 35) made finding statistically-significant differences more difficult to find.

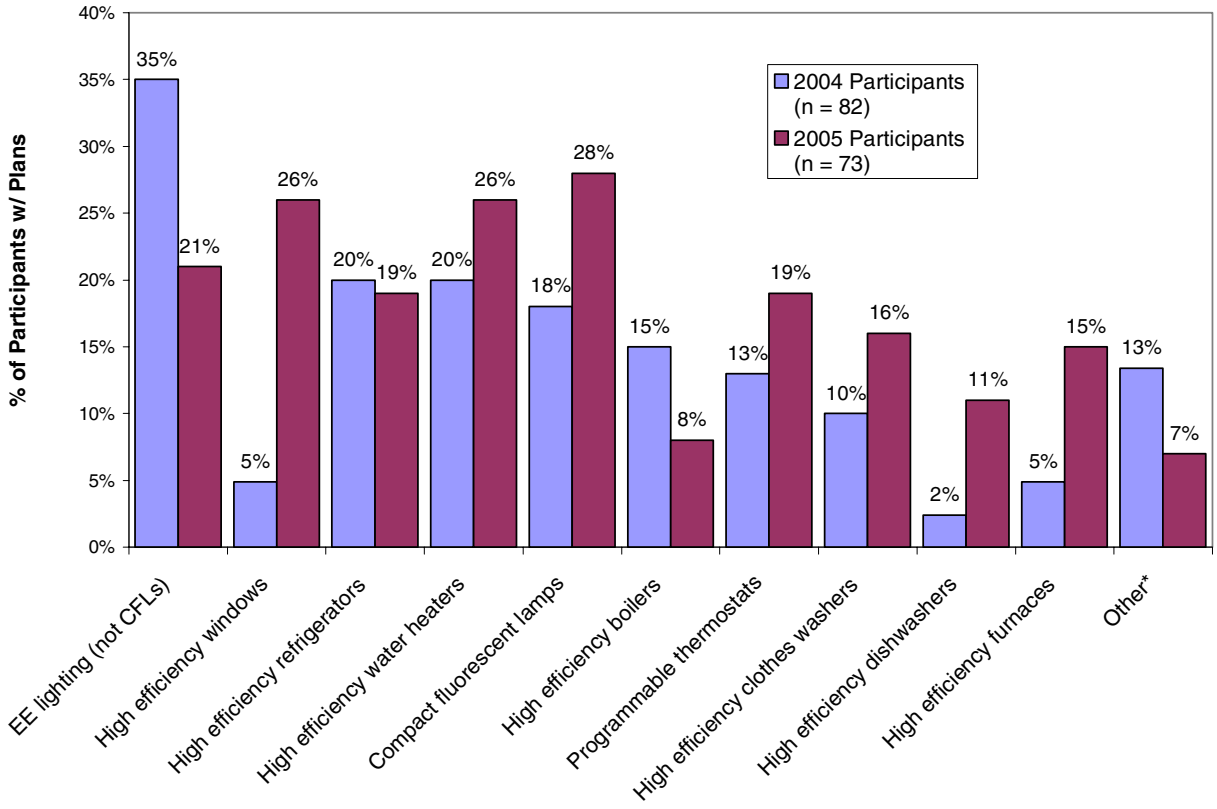
Figure 3-18
2005 Participants
Reasons for No Short-Term Plans For EE Projects



Source: KEMA survey conducted in June 2006

The 2005 participants who did have plans for future energy efficiency projects, however, tended to have much more comprehensive plans than the 2004 participants. Figure 3-19 shows that while there was significant reduced interest in non-CFL lighting and energy-efficient boilers, there was increased interest in most of the other measures. The 2005 participants expressed significant increases in interest in high efficiency windows, dishwashers, and furnace as well as CFLs. One possible reason for this is that the 2005 participant population contained more self-initiators – property managers who joined the program on their own accord rather than being brought into the program by an installation contractor. These self-initiators would likely have a broader concept of their energy efficiency opportunities than contractor-driven participants – who may have only heard suggestions from a contractor that specialized in a certain type of energy efficiency technology.

Figure 3-19
2004 vs. 2005 Participants
Energy-Efficient Measures
Plan to Install Over the Next Three Years



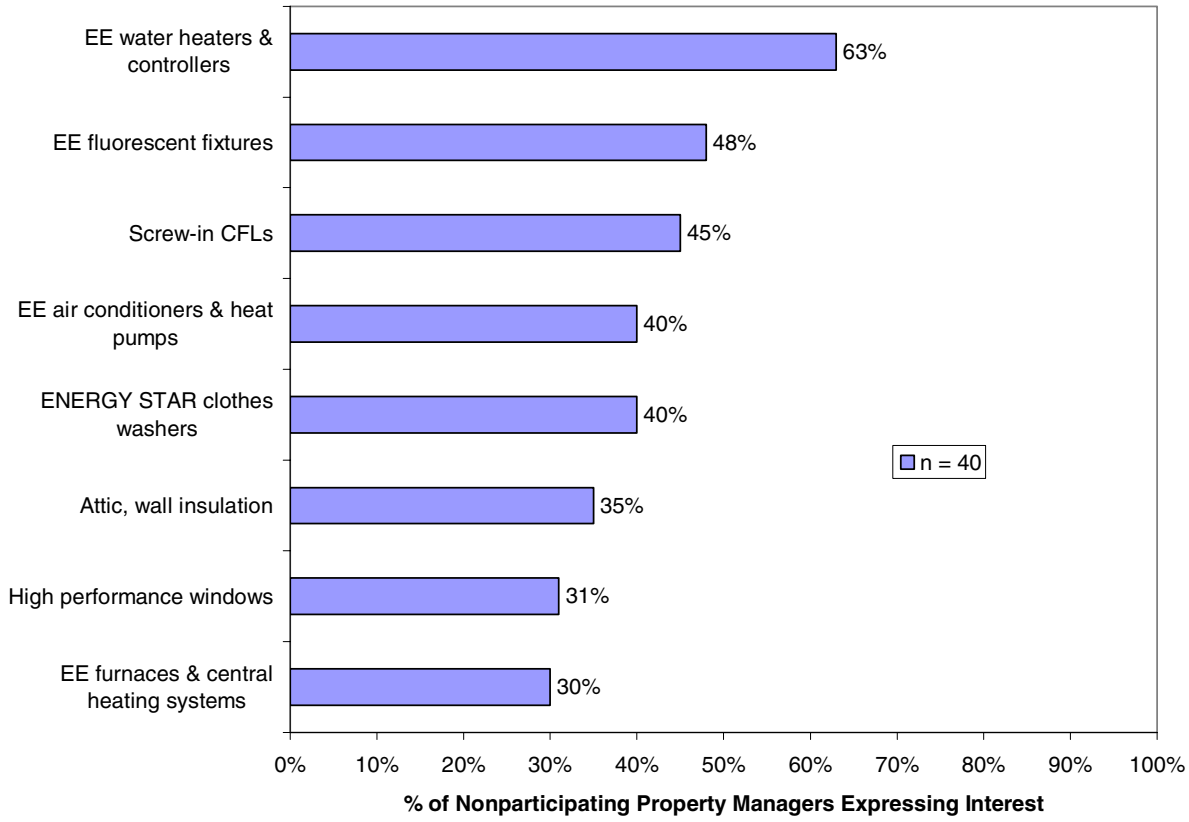
Note: Total exceeds 100% because multiple responses were allowed. 2004 participant data is from a KEMA survey conducted in August 2005. 2005 participant data is from a KEMA survey conducted in June 2006. *Other measures includes energy-efficient air conditioning, insulation; solar panels, low-flow toilets, irrigation equipment et al.

3.4.2 Nonparticipant Interest in Energy Efficiency Measures

As described in the Interim Report, KEMA asked the nonparticipating multifamily property managers/owners about their level of interest in a range of measures currently offered by the program. For each measure, the nonparticipants were asked to rate their level of interest on a five-point scale where five indicated "Extremely interested" and one indicated "Not all interested." For each measure, the surveyors also described the range of rebates currently available for that measure. Nearly two thirds of the nonparticipants were interested in energy-efficient water heaters and controllers.[17] At least 40 percent of the respondents were also interested in energy-efficient fluorescent fixtures, screw-in CFLs, energy-efficient air conditioners and heat pumps, and ENERGY STAR clothes washers. Figure 3-10 shows property manager/owner interest in all the program measures they were asked about.

[17] "Interested" participants are those who gave a level of interest rating of four or five.

Figure 3-20
Nonparticipating Property Manager/Owner Interest
in Energy-Efficiency Measures Rebated by the Program



Note: Source is KEMA survey conducted in July 2005.

We also asked the nonparticipants whether there were any other energy-efficient measures, besides those already mentioned, for which they wished there were utility rebates. Only 30 percent (12 nonparticipants) said that there were. The most cited non-rebated measure was an energy-efficient refrigerator (four nonparticipants). A number of other measures – including electric fireplaces, space heaters, kitchen ranges, dishwashers, and hot tubs – were only mentioned by a single nonparticipant.

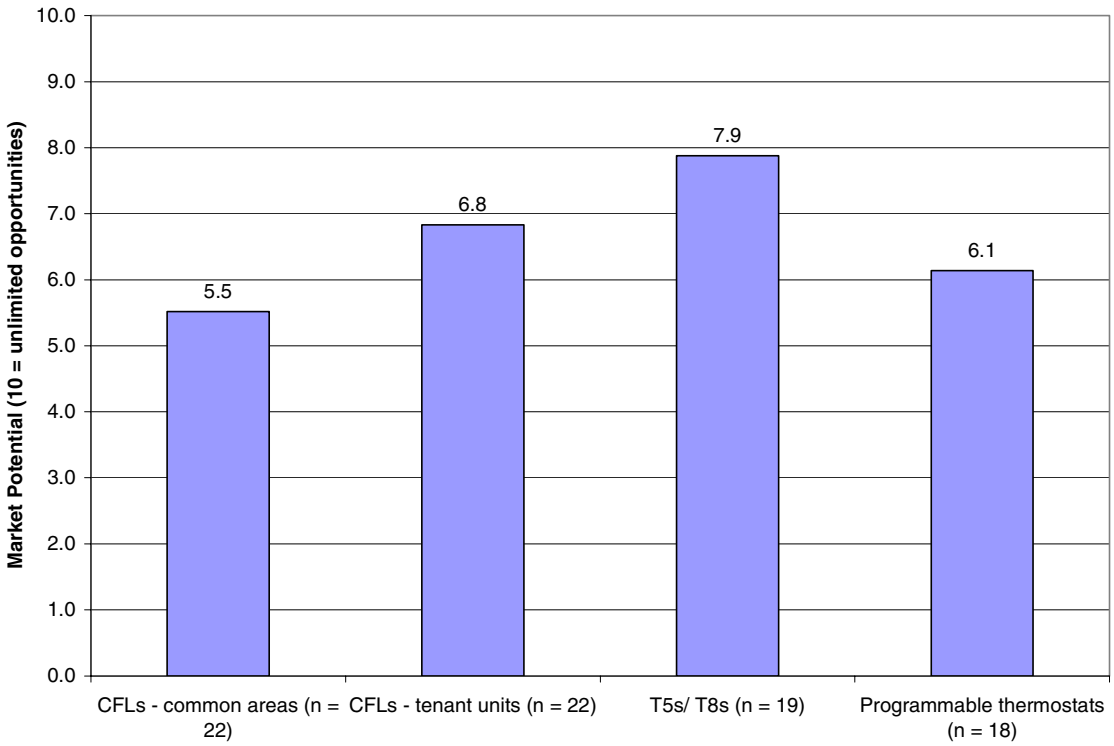
3.4.3 Contractor Assessment of Market Potential for Selected Measures

KEMA asked the participating contractors to assess the current market opportunities for installing compact fluorescent lamps, T5/T8 lamps, and programmable thermostats. Contractors were asked to use a 10-point scale where 10 indicated "unlimited opportunities" and 1 indicated "no opportunities."[18] Figure 3-21 shows that contractors believed that the greatest market potential was for T5/T8 lamps and the least market potential was for CFLs installed in common areas. This lower rating for common-area CFLs

[18] Contractors were asked to assess the market opportunities for programmable thermostat before the decisions was made to eliminate this measure from the Multifamily Rebate Program.

suggests that many of these measures have already been installed. Contractor reasons for assigning these ratings are discussed in the next two sections.

Figure 3-21
Contractor Assessment of Market Potential
for Selected Rebated Measures



Note: Source is KEMA survey conducted in May-July 2005.

3.5 Multifamily Market Drivers

This section discusses some of the multifamily market characteristics and trends that are driving the current market for energy-efficiency improvements and will continue to do so in the future. In addition to rating the market opportunities for compact fluorescent lamps, T5/T8 lamps, and programmable thermostats, contractors were also asked to explain their ratings. These explanations shed light on what they perceive to be the market drivers for these measures. Interviews with program managers also revealed more general multifamily characteristics and trends that should encourage future energy-efficiency implementation. This section also discusses drivers for participation in the program.

3.5.1 Technology-Specific Multifamily Market Drivers

3.5.1.1 Compact Fluorescent Lamps

3.5.1.1.1 Installations in common areas

Nine of the 22 contractors (41 percent) who assessed the market for CFLs in common areas said that the market has good potential.[19] Many simply said that they were experiencing strong demand for this measure. A few of the contractors cited specific reasons why CFLs in common areas were attractive to property managers/owners. These included growing knowledge of the energy savings benefits of CFLs, the fact that CFLs could be used in a variety of fixtures, and the prevalence of old fixtures in many common areas. They viewed the biggest barrier to market expansion as being the unavailability of Multifamily Program rebates. Therefore despite the growing knowledge of the property managers/owners and the prevalence of CFL-installation opportunities, it appears that these drivers alone are not enough to overcome first cost barriers in many instances.

3.5.1.1.2 Installations in tenant units

Thirteen of the 22 contractors (59 percent) who assessed the market for CFLs in common areas said that the market has good potential. They cited strong demand for the measure from property managers/owners and tenants and general satisfaction with the measure.

3.5.1.2 T8 and T5 Lamps

Thirteen of the 19 contractors (59 percent) who assessed the market for T8 and T5 lamps in the multifamily sector said that the market has good potential. They suggested that the market is greater for the T8s than the T5s due to their lower cost, wider availability, and larger size. They also said that the T8s are popular because of their long life, their energy savings, their brightness, and the fact that they are natural replacements for the common T12 lamps. The contractors said that the most popular locations for these are in the kitchens and bathrooms of the tenant units.

3.5.1.3 Programmable Thermostats

Ten of the 18 contractors (56 percent) who assessed the market for programmable thermostats in the multifamily sector said that the market has good potential. As noted, these assessments were all made without the contractors being aware that the program plans to eliminate the rebate in 2006. The major reason for optimism among the contractors was the prevalence of older multifamily buildings – many of them built in the 1960s and 1970s. They said that these buildings have old or non-functioning thermostats and that many property managers/owners are happy to get new ones. Energy savings and greater accuracy are also effective selling points for the programmable thermostats. One contractor also said that because the programmable thermostats are more difficult to install, some property managers/owners are happy to have the contractors do it for them. Another contractor has found a niche market installing programmable thermostats for heat pumps.

[19] They gave the market a rating of 7 or greater on a 10-point scale where 10 indicated “unlimited opportunities” and 1 indicated “no opportunities.”

3.5.2 Other Multifamily Market Drivers

KEMA asked program managers to identify general reasons why multifamily property managers/owners are implementing energy-efficiency measures. As first reported in the Interim Report, they identified a number of reasons including:

- *Growing realization of the energy savings and reduced maintenance benefits of energy-efficient measures in common areas.* Program managers told KEMA that their interactions with multifamily property managers/owners reveal that these managers/owners are becoming increasingly aware of the benefits of energy efficient equipment in common areas. These benefits include lower energy bills and reduced equipment maintenance (e.g., less frequent replacement of bulbs).
- *The opportunity to improve the appearance and value of the property by updating lighting fixtures and other equipment.* Program managers told KEMA that this as the biggest driver of energy-efficiency improvements in tenant units. "Through past experience we have learned that the property manager is mostly interested in improving the apartment, especially if there's very little cost to himself or herself," one program manager said. "Because most of these improvements are going into tenant dwellings, for the most part these savings are not being realized by the owner," the manager noted. "Mostly it's just to make the apartment nicer and an easier sell to new tenants." Another program manager observed that many California multifamily properties were built in the 1960s and 1970s and managers of these properties view any new light fixture as a property upgrade. Two program managers mentioned the turnover of ownership of a multifamily property as a major catalyst in such property management decisions. "I think what's happening is sometimes there is turnover – somebody is buying that building and they want a write-off to enhance the building," one of the program managers commented. "And obviously if the window is broken and they are replacing it, they are looking at their investment increasing, because they are enhancing it."
- *Other drivers.* Program managers pointed to other drivers for property manager/owner implementation that are largely attributable to the program itself. These include the existence of program rebates that makes some energy-efficient measures costless to the property managers/owners and the existence of the program contractors who can provide installation resources for property managers/owners that lack a maintenance staff or the time to manage an installation project.

3.5.3 Drivers of Program Participation

KEMA asked both 2004 and 2005 participating property managers/owners what was their primary motivation for joining the program. Table 3-16 shows that saving energy was the most-cited motivation for both participant groups. However, the 2005 participants were more motivated by the desire to make property improvements in their tenant units and less motivated by the rebates than the 2004 participants. Greater competition in the California apartment market might account for this greater interest in improving tenant units.

Table 3-16
Participating Property Manager/Owner Motivations for Joining Program

Motivations for joining program	Primary motivations for 2004 participants (n = 106)	Primary motivations for 2005 participants (n = 96)
Saving energy	43%	46%
Taking advantage of rebates	33%	15%
Property improvements in tenant units	16%	25%
Property improvements in common areas	3%	3%
Replacing broken equipment	3%	8%
To save money	0%	2%
Don't know	4%	1%

Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

3.6 Summary of Multifamily Market Characterization Findings

3.6.1 Multifamily Property and Manager/Owner Characterization

- While smaller properties were underrepresented among the 2004 participants when compared to a market baseline, they were overrepresented among the 2005 participants. The Interim Report theorized that the under-representation of smaller properties among 2004 participants may have been due to some contractors avoiding smaller properties for cost reasons as well as multifamily properties with fewer than five units not being eligible for the program during 2004-2005. The overrepresentation of smaller properties among the 2005 participants is more difficult to explain. One possibility is that in 2005 there were fewer project opportunities in medium and large buildings and therefore the installation contractors had to shift their focus to the smaller buildings. Program managers have also said that some of their marketing strategies – such as making presentations at apartment association meetings – are designed, in part, to recruit more of these smaller properties. So some of these efforts may be paying off.
- There is evidence that the program is reaching multifamily properties that face split incentive barriers.
  - A little more than half of the 2005 participants have heating systems that supply all tenant units and less than half have cooling systems that do so. However, the large majority (81 percent) of the participating properties have central water heating systems.
  - The large majority of 2005 participating multifamily properties have tenants pay their own energy bills. Multifamily properties in which tenants pay their own energy bills

face the so-called "split incentive barrier" to greater energy efficiency. This is because the property owner who purchases the equipment that provides heating, cooling, and lighting to the tenant units has no direct economic incentive to purchase more expensive higher efficiency equipment.[20]

  - Only a small minority of 2005 participating properties has master meters and most of these are for natural gas.

- *A greater share of participating companies both own and manage their buildings than is the case for nonparticipants.* This may be due to companies that both own and manage having greater autonomy to let contractors into their buildings. Another likely factor is the difficulty of many participating contractors in doing business with large property management firms.
- The latest survey evidence suggests that recent program efforts to recruit more large property management firms into the program may be producing results. KEMA's survey of 2005 participating property managers/owners found increased representation by these large property management firms. This level of representation is now closer to levels measured in the nonparticipant and market baseline samples.

3.6.2 Multifamily Property Manager/Owner Energy-Efficiency Awareness and Decision-making

- 2005 participating property managers/owners were less aware that they were participants in the program than 2004 participants. Awareness of participation declined from 87 percent of 2004 participants to 78 percent of nonparticipants. This decline in participation awareness is puzzling because other data indicate that the so-called "self initiator" participants were better represented in the 2005 program than in the 2004 program and these participants tend to have a greater awareness of their participation than contractor-driven participants. While lower awareness of participation could be due to staff turnover – e.g., the survey respondent is a new hire who had replaced the project-aware property manager – it is not clear why this staff turnover would be higher among 2005 participants than it was among 2004 participants.
- Half of the 2005 participants said that they had participated in other California energy efficiency programs besides the program, but only 22 percent could recall the program name. Only 9 percent of the 2005 participants were able to name a program that they had participated in that was something other than the program.
- Participating multifamily property managers/owners were much more likely than nonparticipants to rely on energy equipment-purchasing information from internal maintenance staff as well as outside contractors. Nonparticipating property managers/owners were more likely than participants to rely on information from equipment dealers and distributors.
- However, 2005 participants relied less on their internal maintenance staff and more on the Internet than 2004 participants for energy equipment-purchasing information. Some

[20] Some argue that property owners have an indirect incentive to invest in energy-efficient equipment because the less that their tenants pay in utility costs, the less likely they are to default on their rent payments.

of this may have been due to the fact that the 2005 participants were generally smaller properties and therefore fewer of them may have had internal maintenance staffs to rely on.

3.6.3 Multifamily Property Manager/Owner Energy-Efficiency Activities

- The most common measures installed through the program were CFLs, high performance windows, insulation, programmable thermostats, and T8 fluorescent fixtures. CFLs and programmable thermostats alone accounted for 88 percent of the kWh savings claimed by the program for 2004-2005. Boiler controls and programmable thermostats alone accounted for 87 percent of the 2004-2005 claimed therm savings.
- CFLs, other types of energy-efficient lighting, and high-performance windows were the most-cited energy-efficiency measures installed by nonparticipating property managers/owners. When asked how they define energy-efficient equipment, over half of the nonparticipants said energy-efficient equipment was equipment with an ENERGY STAR label.
- Forty-three percent of the 2005 participants said that their projects included both common areas and tenant units. Only 19 percent said that their projects were only in the common areas. This focus by participating property/managers on improving the tenant units could be due to a number of reasons. First it could be evidence that the program rebates are making the split incentive barriers less relevant. Second there is evidence that the desire to make property improvements, due to competitive pressures, is an important driver of energy efficiency improvements. Third it simply could be a result of the fact that many property managers/owners have already take care of most of the common area improvements, and the remaining opportunities are in the tenants units.
- Ninety-four percent of nonparticipating boiler/plumbing contractors agreed that most building managers only replace central boilers or water heaters when they have broken down or are not performing satisfactorily. This confirms concerns from program managers that use of rebates for energy-efficient central boilers and water heaters is inherently hampered by the reluctance of most property managers/owners to do early replacement of these systems.

3.6.4 Multifamily Contractor Size, Target Markets, Energy-Efficiency Measures Installed, and Program Activity

- *Most contractors participating in the program are small- to medium-sized companies.* Only two of the 28 participating contractors had more than 50 employees and the majority of contractors had fewer than 10 employees. The number of annual projects ranged from 5 to 1,000.
- Most of the contractors participating in the program get the majority of their installation business from the multifamily sector. Sixteen of the twenty-eight participating contractors get at least 70 percent of their business from this sector. Only eight contractors receive less than 45 percent of their business from the multifamily sector.

- *Participating contractors are very dependent on the program for their business.* On average, contractors estimated that 72 percent of their installations use program rebates. Two-thirds of the contractors consider themselves as very active promoters of the program rebates.
- Over the half of the participating contractors either install only lighting measures and programmable thermostats or only install lighting.
- Contractors reported that, on average, almost half of their projects involved installations in both the common areas and tenant units. This proportion was similar to self-reports from participating property managers/owners. Contractors reported a higher percentage of common-area-only installations (29 percent) compared to the 2005 participating property managers/owners (10 percent). However, the fact that common-area-only projects were still a small part of the contractors' installation is further evidence of the strength of the tenant unit market, as discussed above.
- The distribution of multifamily building sizes that participating contractors are reaching is fairly representative of the population as a whole.
- *Participating contractors said that, on average, over 70 percent of their lighting products come directly from manufacturers.* Since quality-control testing of CFLs by organizations such as PEARL is currently limited to retail products, this raises concerns that the CFLs installed by participating contractors may be of lower quality than those that are subject to quality testing.
- *Most of the nonparticipating boiler/ plumbing contractors were small- to medium-sized companies.* Only one of the 17 contractors had at least 50 employees and the majority had fewer than 10 employees.
- The nonparticipating boiler/plumbing contractors were very different from the participating contractors in terms of the importance of the multifamily sector for their businesses. While the multifamily sector accounted for an average of 64 percent of the participating contractor's business, it only accounted for an average of 23 percent of the nonparticipant contractor's business. Participation in the program is likely a big explanatory factor in this difference, although it is difficult to determine whether program participation is a cause or an effect of this difference.
- Nearly two-thirds of the nonparticipating boiler/plumbing contractors install central natural gas water heaters and about half install gas storage water heaters, water heater or boiler controls, and programmable thermostats. Therefore most of them could take advantage of the rebates offered by the program.

3.6.5 Multifamily Contractor Sales Practices

- Almost all the participating contractors target multifamily properties by using some combination of leveraging existing relationships with property managers/owners and seeking out new business through cold-calling or knocking on doors. The most-cited sources of prospective customers were referrals and word-of-mouth.
- The two most popular marketing methods are in-person sales visits and telemarketing.
- Multifamily property types that participating contractors target or avoid include:

  - A number of participating contractors target large property management companies not only because of their size but because they have frequent churn in their property holdings and often do not have the internal staff to review the state of energy-using equipment in new acquisitions. However, this is a tough segment of the market to access.
  - Forty-three percent of the participating contractors said that property managers/owners were more likely to pursue energy-efficient measures if they had master-metered properties.
  - Nearly half (47 percent) of the nonparticipating boiler/plumbing contractors thought that property managers with master-metered properties were more likely to invest in energy-efficient technologies than property managers with individually-metered properties.
  - Thirty-six percent of contractors said that they avoid certain multifamily property types or locations including small properties and properties that require too long a drive.
- The most widely -cited components of the participating contractor sales pitch were emphasizing the energy savings (50 percent of contractors) and describing the Multifamily Program and its rebates (43 percent). Other elements of the sales pitches cited by at least two contractors included showing the measures that would be installed, emphasizing improved property aesthetics due to new fixtures and better quality light, promoting product warranties, providing positive company information such as number of years in the business or references, promoting longer bulb/equipment life, offering free energy audits of the customer's property, and offering free analysis of the customer's energy bills.
- Most participating contractors did not vary their sales pitch based on the type of energy-efficient measure being promoted, the type of property, or to whom they were making the sales pitch.
- After a sales visit, most participating contractors left behind brochures or application forms from the program or the program's website address.

3.6.6 The Potential for Future Energy-Efficiency Improvements in the Multifamily Sector

- The 2005 participating property managers/owners were much less likely than their 2004 counterparts to have plans for future energy-efficiency projects. While over three-quarters of the 2004 participants had plans to install energy-efficient measures over the next three years, less than half of the 2005 participants did so. The most-cited reason why 2005 participants did not have future project plans was a belief that all cost-effective energy-efficiency measures had been implemented. Since the program has been operating a number of years, this might be an early indicator that for some multifamily properties the inexpensive opportunities for energy-efficiency improvements have already been seized.
- The 2005 participants who did have plans for future energy efficiency projects, however, tended to have much more comprehensive plans than the 2004 participants. While there

was significant reduced interest in non-CFL lighting and energy-efficient boilers, there was increased interest in most of the other measures. The 2005 participants expressed significant increases in interest in high efficiency windows, dishwashers, and furnace as well as CFLs. One possible reason for this is that the 2005 participants population contained more self-initiators – property managers who joined the program on their own accord rather than being brought into the program by an installation contractor. These self-initiators would likely have a broader concept of their energy efficiency opportunities than contractor-driven participants – who may have only heard suggestions from a contractor that specialized in a certain type of energy efficiency technology.

- Nearly two thirds of the nonparticipating property managers/owners were interested in energy-efficient water heaters and controllers. At least 40 percent of the respondents were also interested in energy-efficient fluorescent fixtures, screw-in CFLs, energy-efficient air conditioners and heat pumps, and ENERGY STAR clothes washers.
- Participating contractors believed that the greatest market potential was for T5/T8 lamps and the least market potential was for CFLs installed in common areas. Using a scale where 10 indicated "unlimited" market opportunities and 1 indicated "no opportunities," contractors gave a 7.9 rating to T5s/T8s, a 6.8 rating to CFLs in tenant units, a 6.1 rating to programmable thermostats, and 5.5 rating to CFLs in common areas. This lower rating for common-area CFLs suggests that many of these measures have already been installed.

3.6.7 Multifamily Market Drivers

- Contractors who had rated the multifamily market potential for certain energy-efficiency measures as "good" gave the following reasons:
  - *CFLs* – Proponents of the CFL market cited strong demand, growing knowledge of CFL energy savings benefits, the fact that CFLs could be used in a variety of fixtures, and general satisfaction with this measure.
  - *T8s/T5s* – Contractors who touted the T8/T5 market said that T8s are popular because of their long life, their energy savings, their brightness, and the fact that they are natural replacements for the common T12 lamps. They suggested that the market is greater for the T8s than the T5s due to their lower cost, wider availability, and larger size.
  - *Programmable thermostats* – Proponents of the programmable thermostat market pointed to the prevalence of older multifamily buildings with old or non-functioning thermostats where property managers/owners are happy to get new ones. They also said that energy savings and greater accuracy are effective selling points.
- Program managers also pointed to a number of general reasons why multifamily property managers/owners are implementing energy-efficiency measures. These include:
  - *Growing knowledge by property managers/owners of the energy savings and reduced maintenance benefits of energy-efficient measures in common areas.*
  - *The opportunity to improve the appearance and value of the property by updating lighting fixtures and other equipment.* Program managers viewed this as the biggest driver of energy-efficiency improvements in tenant units.

- *Drivers that are largely attributable to the program itself.* These include the existence of program rebates that makes some energy-efficient measures costless to the property managers/owners and the existence of the program contractors who can provide installation resources for property managers/owners that lack a maintenance staff or the time to manage an installation project.

- Saving energy was the most-cited motivation for Program participation for both 2004 and 2005 participating property managers/owners. However, the 2005 participants were more motivated by the desire to make property improvements in their tenant units and less motivated by the rebates than the 2004 participants. Greater competition in the California apartment market might account for this greater interest in improving tenant units.

4. Market Barriers, Program Theory, and Program Attribution

This section summarizes survey evidence concerning the barriers to implementation of energy efficiency in the multifamily sector as well as barriers to program participation. The section then discusses the existing program theory for the program – in its inchoate and unformulated state -- and examines whether the recent survey evidence supports this existing program theory or suggests alternative formulations. Finally this section discusses the findings from the net-to-gross analysis for program attribution.

4.1 Multifamily Market Barriers

This evaluation explored barriers to the implementation of energy-efficient measures in the multifamily sector from a number of different perspectives. Both 2004 and 2005 participating property managers/owners were asked why they had not made the rebated energy-efficiency improvements on their own, before becoming involved with the program. Nonparticipating property managers/owners who had expressed interest in the energy-efficient measures rebated by the program were asked what would prevent them from implementing these measures once they had the information they needed about the program, the rebates, and the installation contractors. KEMA also queried nonparticipants to find out if they had any negative attitudes towards energy efficiency that might explain their nonparticipation. Participating contractors were also asked what were the main reasons why multifamily property managers/owners do not implement energy-efficient measures on their own. In addition, contractors were asked about barriers for certain types of energy-efficient technologies and any difficulties they face in gaining access to the large multifamily property management sector.

4.1.1 Market Barriers for Participating Property Managers/Owners

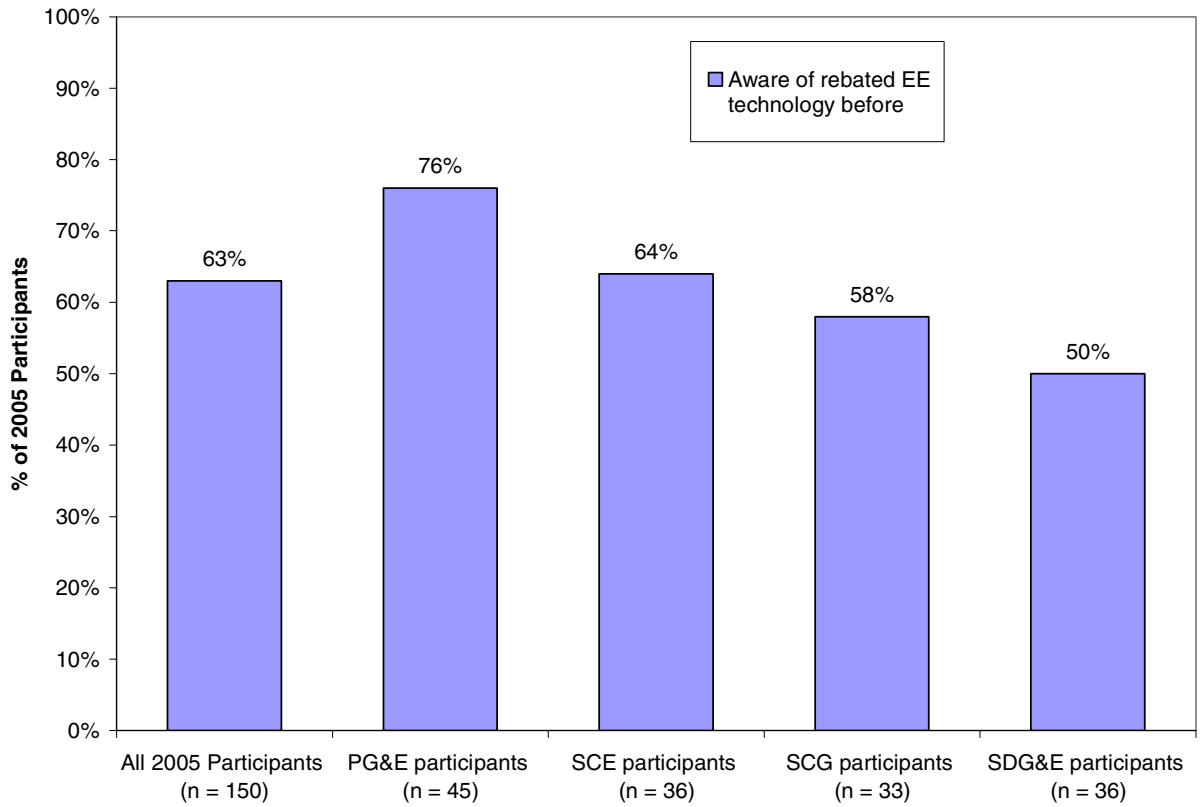
The evaluation of the 2005 Program conducted a more thorough exploration of market barriers and how the program might be overcoming these barriers then was done for the 2004 program. Barrier-related questions for the 2005 participants included:

- Previous knowledge of and experience with the rebated technology
  - Whether the respondents were aware of the rebated technology before having it installed through the program.
  - Whether the respondents, before having the rebated measures installed, had the same technology installed at any of their other properties and whether these previous installation had received rebates.
- *Barriers to* implementation
  - For those who had not installed the rebated measures before, why they had not done so.
  - For those whose tenants paid their own utility bills, how important this was as a barrier to energy efficiency improvements in the tenant units.

4.1.1.1 Previous Knowledge of and Experience with the Rebated Technology

KEMA asked the 2005 participating property managers/owners whether they were aware of the technology that the 2005 Program had rebated before having it installed at their property. Figure 4-1 shows that less than two-thirds of these participants were previously aware of the rebate technology. The figure also shows that there were some significant differences in technology awareness levels among participants depending on which utilities served them. It's not clear why this would be the case, unless the greater potential for heating savings in northern California made participating property managers more aware of energy-efficiency opportunities. Not surprisingly, previous awareness of the measures was much higher (77 percent) among those participants who claimed to be the main source of their project idea than it was for participants who said the project idea came from their contractor (47 percent). Previous awareness was lowest among boiler control participants (35 percent).

Figure 4-1
2005 Participating Property Managers/Owners
Previous Awareness of Rebated Technology

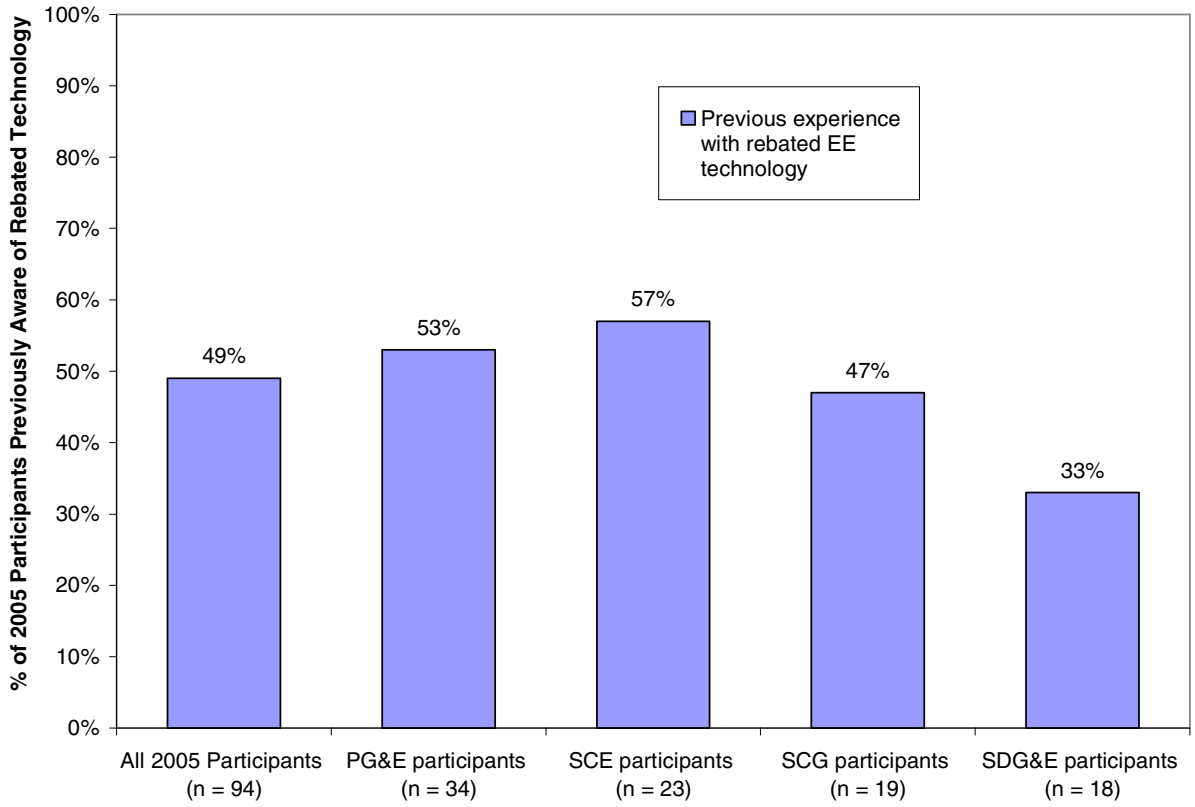


Note: Data source is KEMA survey conducted in June 2006.

In addition to total unawareness of energy efficiency technologies, unfamiliarity with such technologies can also be a significant barrier. KEMA asked the 2005 participating property managers/owners whether before installing the rebated measure in 2005 they had installed the same measure technology at that location or any of the other properties that their companies owned. This question was only asked of those who had indicated previous awareness of the rebated technology. Figure 4-2 shows that about half of the 2005 participants who were previously aware of the rebated technology also had previous experience with

this technology in one of their properties. This time there was less variation among the different utilities. Previous experience was lowest among Energy Star clothes washer participants. KEMA also asked the 2005 participants with previous experience with the rebated technologies whether they had received utility rebates for these previous installation. Fifty-four percent of the previous installers said that they had received utility rebates.

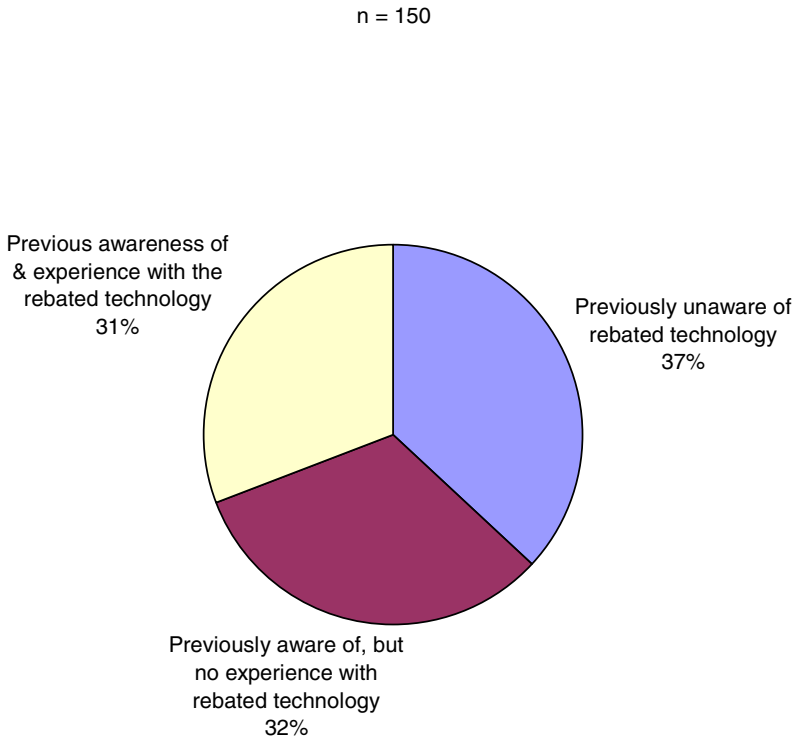
Figure 4-2
2005 Participating Property Managers/Owners
Previous Experience With Rebated Technology



Note: Data source is KEMA survey conducted in June 2006.

Finally KEMA combined the data from these two questions to get an overall sense of the measure awareness and familiarity barriers faced by the 2005 participating property managers/owners. Figure 4-3 shows that only 31 percent of the 2005 participants came to the program with previous awareness of and familiarity with the rebated energy efficient technologies.

Figure 4-3
2005 Participating Property Managers/Owners
Awareness, Familiarity with Rebated Technology



Note: Data source is KEMA survey conducted in June 2006.

4.1.1.2 Why No Previous Installation of the Rebated Technology

As noted in the Interim Report, KEMA asked the 2004 participants why they had not made these energy efficiency improvements on their own before becoming involved with the program. We asked them for both primary and second reasons. Table 4-1 shows that unawareness of energy-efficiency opportunities was the most-cited primary and secondary reason. Managers of small multifamily properties (100 or fewer units) were more likely than managers of medium-sized properties (101-250 units) to cite lack-of-time as a barrier. Managers of the medium-size properties were more likely than the small property managers/owners to cite financial barriers as their reasons for not implementing the energy-efficiency improvements on their own.[21] There were no significant variations based on the type of measure installed.

[21] This difference and the previous one are both significant at the 95 percent confidence level using a two-tailed test.

Table 4-1
2004 Participating Property Managers/Owners
Reasons Why Had Not Implemented Rebated EE Projects On Their Own

Reason	% of Respondents Citing It As Primary Reason (n = 106)	% of Respondents Citing It As Secondary Reason (n = 87)
Unaware of/unable to identify measures	43%	20%
Financial limitations	16%	8%
Lack of time/not a priority	9%	3%
New to building	5%	5%
Replacing on an as-needed basis	3%	7%
Timing wasn't right	3%	6%
It was unnecessary	3%	2%
Lack of savings-cost or energy--information	2%	7%
No other reasons	---	32%
Don't know	18%	14%

Note: Total in second column exceeds 100% because multiple responses were allowed. Data source is KEMA survey conducted in August 2005.

The survey of 2005 participating property managers/owners asked a similar question: "How come your company had not installed the [rebate measure] on its own before becoming involved with the 2005 [utility] multifamily rebate program?" Yet this time the question was addressed only to those participants who said that they had previous awareness of the technology, but their company had no experience installing the technology (those in the 32 percent slice of Figure 4-3). Table 4-2 shows that once the measure-unaware participants are removed from the sample, financial limitations emerge as the top barrier.

Table 4-2
2005 Participating Property Managers/Owners
Reasons Why Had Not Implemented Rebated EE Projects On Their Own

Reason	2005 Participants With Previous Awareness But No Previous Experience with the Rebated Technology (n = 48)
Financial limitations	21%
Unaware of/unable to identify measures	13%
Already did all cost-effective energy efficient improvements	8%
Tenants pay their own utility bills	8%
Replacing on an as-needed basis	6%
Lack of energy savings/cost information	6%
Timing wasn't right	4%
It was unnecessary	4%
Other reasons*	6%
Don't know	27%

Note: *Other reasons included lack of maintenance staff to install measures, concerns about unreliable EE equipment, and concern about unreliable energy savings information. Total exceeds 100 percent because respondents were allowed to cite multiple reasons. Data source is KEMA survey conducted in June 2006.

4.1.1.3 Importance of the Split Incentive Barrier

KEMA asked 2005 participating property managers/owners who said that their tenants pay at least some of their own energy bills, how important this was as a reason why they did not make these energy efficiency improvements earlier.[22] Table 4-3 shows that only about a third thought that this was an important reason. Programmable thermostats participants were more likely to consider this barrier important (average importance rating of 3.75 vs. 2.50-2.75 for participants installing other technologies). Table 4-1 and Table 4-2 above and Table 4-4 and Table 4-6 below also provide additional evidence that the split incentive barrier was not identified as a major barrier by respondents.

[22] Multifamily properties in which tenants pay their own energy bills face the so-called "split incentive barrier" to greater energy efficiency. This is because the property owner who purchases the equipment that provides heating, cooling, and lighting to the tenant units has no direct economic incentive to purchase more expensive higher efficiency equipment. However, some argue that property owners have an indirect incentive to invest in energy-efficient equipment because the less that their tenants pay in utility costs, the less likely they are to default on their rent payments."

Table 4-3
2005 Participating Property Managers/Owners
Importance of Split Incentive Barrier

Importance of fact that tenants pay own bills as reason for delaying EE improvements	2005 Participating Property Managers/Owners Whose Tenants Pay At Least Some Energy Bills (n = 88)
5 = Extremely important	18%
4	15%
3	18%
2	5%
1 = Not at all important	23%
Don't know	22%

Note: Data source is KEMA survey conducted in June 2006.

4.1.2 Market Barriers for Nonparticipating Property Managers/Owners

4.1.2.1 General Barriers

KEMA asked the nonparticipating multifamily property managers/owners who had expressed interest in the energy-efficient measures rebated by the program what would prevent them from implementing these measures once they had the information they needed about the program, the rebates, and the installation contractors. The two most-cited barriers were the need to get higher-level approval for the projects and lack of capital (Table 4-4). The survey did not probe further to determine whether the need to get higher-level project approval was a serious barrier or just a simple acknowledgement of the multilateral decision-making that characterizes most multifamily property management companies.

Table 4-4
Barriers Remaining for
Interested Nonparticipating Property Managers/Owners
After Having All Needed Program, Rebate, and Contractor Information

Remaining barriers to EE implementation after have needed information	% of Interested Nonparticipants (n = 32)
Have to get higher-level approval	31%
Lack of capital	16%
Too busy/ can't find the time	9%
High cost of EE equipment	9%
Other barriers (tenant pays energy bill, lack of knowledge of EE options, payback periods too long)	9%
No other barriers	1%
Don't know	25%

Note: Total may not exactly equal 100% due to rounding. Data source is KEMA survey conducted in July 2005.

Eight of the 40 nonparticipants (20 percent) were not interested in any of the energy efficient measures rebated by the program. The most common explanation (three respondents) was that they had already taken all necessary actions to improve energy efficiency. Other reasons cited by just a single respondent included being too busy, tenants paying the energy bills, lack of capital, the high costs of energy-efficient equipment, payback periods for energy-efficient equipment being too long, their building being too old, and their building being located in an area that was not eligible for the program rebates. Three of the nonparticipants did not explain why they were not interested in the energy-efficiency measures.

4.1.2.2 Attitudinal Barriers

KEMA also examined the possibility that there might be attitudinal barriers towards energy efficiency or energy-efficiency products that might explain why some multifamily property managers/owners are not implementing energy-efficiency projects. We read some statements about energy efficient appliances and equipment to nonparticipating property managers/owners and then asked them to state their level of agreement with this statement based on a 5-point scale with 5 meaning “completely agree.” They were read in random order and included both positive and negative statements.

Most of the nonparticipants did not appear to have any preconceptions about energy efficiency that might explain their unwillingness to implement energy-efficient projects. Less than a third agreed with any of the negative statements about energy efficiency (Table 4-5). Furthermore, nearly half believed that there were other benefits to using energy-efficient appliances and equipment besides saving energy.

Table 4-5
Nonparticipating Property Manager/Owner
Agreement with Statements About Energy Efficiency

Statement about Energy Efficient Measures	% of Nonparticipants Agreeing with Statement (ratings of 4,5 with 5 = "Completely agree")	Average Agreement Rating (5 = "Completely agree")
Negative Statements About Energy Efficient Measures		
EE appliances and equipment are too expensive	31%	2.63
EE appliances and equipment are not as reliable as standard appliances and equipment	28%	2.46
It takes too much time and hassle to find out which appliances and equipment are truly EE	20%	2.26
EE appliances and equipment do not save as much energy as they are supposed to	13%	2.17
Neutral, Positive Statements About Energy Efficient Measures		
I have already done all cost-effective things to improve the energy efficiency of my building	25%	2.58
There are other benefits to using EE appliances and equipment besides saving money on energy	48%	3.69

Note: Data source is KEMA survey conducted in July 2005.

4.1.3 Market Barriers for Multifamily Property Managers/Owners – From the Contractor's Perspective

KEMA asked both the participating contractors and the nonparticipating boiler/plumbing contractors what were the main reasons why multifamily property managers/owners do not implement energy-efficient measures on their own. As Table 4-6 shows, the barrier most cited by the participating contractors was that multifamily property owners and managers lack the staff to install this equipment. They noted that many property managers/owners do not have maintenance staff to begin with and even those that do usually do not have staff qualified to do the installations. Some of the equipment rebated by the program requires installation by an electrician or an HVAC contractor. Property managers/owners being "too busy," financial constraints, and lack of knowledge of energy-efficient measures were other oft-cited barriers. The contractor survey data also supports the property manager/owner data in finding that, despite program theory, the fact that many property managers/owners do not pay for tenant energy costs – the split incentive barrier -- is not considered a major barrier by market participants.

Table 4-6
Participating Contractor Assessment
of Barriers to EE Implementation
by Multifamily Property Managers/Owners

Main reasons why property managers/ owners not implementing EE measures on their own	% of contractor respondents (n = 28)
Lack of maintenance staff, installation expertise	36%
Too busy	32%
Financial constraints	21%
Lack of knowledge of EE measures	21%
Unawareness of MFEER Program	18%
Contractors can do it faster	7%
Owner/ manager not paying for tenant energy costs	4%
Don't know/ Refused	4%

Note: Data source is KEMA survey conducted in May-July 2005.

The nonparticipating boiler/plumbing contractors had a different assessment of the main barriers. They pointed to financial constraints and an unwillingness to pay higher first costs as the predominant barrier to the implementation of energy-efficient measures for multifamily property managers/owners (Table 4-7). Since these boiler/plumbing contractors deal with very expensive central boilers and water heaters, it is understandable why they would emphasize this being the main barrier. In contrast, many of the participating contractors deal with measures such as CFLs and programmable thermostats that do not have high first costs.

Table 4-7
Nonparticipating Boiler/Plumbing Contractor Assessment of Barriers to EE Implementation by Multifamily Property Managers/Owners

Main reasons why multifamily property managers and owners do not implement EE measures on their own	% of Nonparticipating boiler/plumbing contractors citing it as main reason (n = 15)
Financial constraints/ unwilling to pay higher first cost	73%
Tenants pay for energy costs	13%
They're too busy to learn about EE	13%
They don't know about EE	13%
Don't keep properties long enough to see payback	7%
They do care about EE, especially if they own the building	7%
Don't know	7%

Note: Data source is KEMA survey conducted in May-June 2006.

4.1.4 Technology-Specific Multifamily Market Barriers

An earlier subsection of this report provided explanations of why participating installation contractors thought that certain energy-efficient technologies had great market potential. However, contractors had differing opinions on these issues. This subsection summarizes the reasons why participating contractors thought that certain energy-efficient technologies had low market potential.

4.1.4.1 Compact Fluorescent Lamps

4.1.4.1.1 Installations in common areas

Nine of the 22 participating contractors (41 percent) who assessed the market for CFLs in common areas said that the market has low potential.[23] They identified a number of reasons for this including:

- *Limitations on the number of fixtures that can use CFLs* – Six participating contractors mentioned this as a barrier to market expansion. They noted that common areas in multifamily buildings use many fixture types such as PL13s, R30s, R40s, HIDs, and T12s that cannot easily be replaced with CFLs. One contractor said that apartment complexes with recreation rooms offer better opportunities for common area CFL lighting;

[23] They gave the market a rating of 4 or less on a 10-point scale where 10 indicated "unlimited opportunities" and 1 indicated "no opportunities."

- *Rebates not available* – Five participating contractors said that the unavailability of Multifamily Program rebates for most of the year is a major constraint on their ability to make more installations in multifamily common areas. This suggests that high first costs may still be barrier in some situations;
- *Property managers/owners doing their own CFL installations* – Four participating contractors said that property managers/owners are becoming increasingly aware of the energy that can be saved by CFLs and many are doing their own common area installations. A couple of them thought that this was truer of the larger property management firms due to larger maintenance staffs and greater awareness of CFLs. One contractor said that his company is only called to do common-area installations when the jobs are simply too big for the existing maintenance staff. Another contractor said that property manager/owner CFL self-installations in common areas are being done even when no rebates are available;
- *Market saturation* – Four participating contractors simply said that the market for CFLs in common areas was saturated, without providing any explanations for why this was so; and
- *Other barriers* – Participating contractors also pointed to poor quality CFLs as well as lamp theft and breakage problems as other barriers to wider installation of CFLs in common areas.

It should be noted that some of these reasons – such as property owners becoming more self-sufficient and market saturation for CFLs in common areas – are not descriptions of market barriers and are, in fact, desirable outcomes for the program, even though they may be reducing business opportunities for the installation contractors.

4.1.4.1.2 Installations in tenant units

Three of the 22 participating contractors (14 percent) who assessed the market for CFLs in tenant units said that the market has low potential. Barriers cited by these and other contractors included getting access to tenant units (5 contractors), tenant theft of lamps (3), market saturation (2), slow utility inspections (1), unspecified administrative hassles (1), and lack of rebate monies (1).

4.1.4.2 T8 and T5 Lamps

Only one of the 19 participating contractors (5 percent) who assessed the market for T8/T5 lamps in the multifamily sector said that the market had low potential. However, even the contractors who positively assessed the T8/T5 market acknowledged it had some limitations. These included longer installation times, a higher installation skill level required, and the fact that tenant unit installation locations were mostly limited to kitchens and bathrooms.

4.1.4.3 Programmable Thermostats

Four of the 18 participating contractors (22 percent) who assessed the market for programmable thermostats in the multifamily sector said that the market had low potential. They said that the market was saturated due to the availability of Program rebates and the fact that most new multifamily buildings already have programmable thermostats. A couple of contractors also said that some property

managers/owners were unwilling to install programmable thermostats because they do not pay for air conditioning costs.

4.1.5 Contractor Access to Large Property Management Firms

KEMA asked both the participating contractors and the nonparticipating boiler/plumbing contractors whether they had difficulty getting business with the large property management firms. Nine of the twenty-eight participating contractors (32 percent) said that they did. The most cited reason (four contractors) was that layers of bureaucracy make it difficult to locate the key decision-maker. Other reasons included larger firms having their own maintenance firms, requiring liability insurance and workers' compensation, and seeking greater competition for contracts. Another three contractors said that larger firms could be more difficult depending on the firm and the circumstances. For example, one contractor said that if the large firm has older properties it is more willing to do business. Fifteen of the contractors (54 percent) said that they did not have difficult obtaining business from large firms. One contractor did not seek the business of such firms.

As noted earlier, four of the fifteen (27 percent) nonparticipating boiler/plumbing contractors said that they have more difficulty doing business with the large property management firms. Two of the contractors said that these larger firms tend to be more cost-conscious than other property management firms and one of them said that the larger firms take longer to pay. The other two boiler/plumber contractors pointed to more layers of decision-making and general bureaucracy to deal with when doing business with the larger firms.

KEMA also asked the program managers why they thought that the contractors in particular, as well as the program in general, had difficulty reaching the large property management sector. They pointed to some of the same reasons cited by the contractors such as difficulty finding the key decision maker and many larger property management firms having their own maintenance crews. However, they also thought that some property management firms simply did not want to work with the contractors who participate in the program. For example, one program manager said:

> *My belief is that the reason why our team of independent contractors hasn't already broken through to the large property management firms is because they don't want them there. They have their own people. They don't want to deal with some contractor that they don't know. So they do all the work themselves.*

4.2 Program Theory

In its April 2005 Best Practices Gap Analysis memorandum, KEMA identified that one of the program's key gaps was the absence of an explicit and complete explanation of the program theory. The memorandum noted, however, that interviews with program managers suggested that they had a richer understanding of the important end user targets, market and programmatic barriers, and program strategies to overcome these barriers than they had ever described in their program plans. For example, in interviews, program managers cited a number of barriers to energy efficiency improvement in the multifamily sector including lack of knowledge of energy efficiency and its benefits, cost hurdles, hassle factors, and split incentives. Yet most of program plans – both for the 2004-2005 period and the 2006-2008 period – do not reflect this richer understanding of market barriers.

One problem with this lack of an explicit program theory is that it fails to explain the purpose of key program activities. For example, most program plans only identify one barrier for the multifamily sector: the classic split incentive barrier where property managers/owners are responsible for purchasing energy-using equipment but are usually not responsible for the energy costs of their tenants. Yet if this were the only barrier, it would not explain why the program was paying rebates for common-area improvements and treating master-metered units. Interviews with the program managers indicated that the common-area rebates were necessary to overcome other barriers to implementation such as hassle factors. A clear statement of program logic would have made this clear.

A clear statement of the barriers should make it easier to identify appropriate strategies for mitigating these barriers. For example, some of the program managers expressed concern about being able to meet their gas savings goals if programmable thermostats are no longer rebated through the program. A phase-out of the programmable thermostat rebates would make programs more reliant on measures such as boiler and water heater replacement, which are more difficult to address through the existing delivery model. By clearly identifying the barrier – e.g. key decision-maker at the time of boiler/ water heater replacement is unaware of energy-efficient options and program rebates -- program managers can make their strategies to address these barriers more focused.

Finally, an explicit statement of desired program outcomes, as well as associated metrics for measuring their achievement, would be useful for measuring program progress and success. In the interviews, the program managers indicated a number of desired outcomes for their program besides meeting their energy savings goals. These included increasing the number of "self-initiators" (see description below), increasing the diversity of EE measures, reducing the number of participant complaints, etc. Program metrics could be developed for these desired outcomes.

The following subsections describe both the explicit and implicit elements of the program theory of the program and examine whether the recent survey evidence supports the existing program theory or suggests alternative formulations. This truing-up process provides a more formal understanding of the market and the barriers it faces in installing energy-efficient measures. Furthermore, it allows for an assessment of how the program is currently aligned and how it could be more effectively designed to address market barriers.

Program theory development is a dynamic process. Program theories must be updated regularly to address changing market realities, to address changing program goals, and to try to understand why expected program outcomes are not being realized. Hopefully this analysis will inform the program's future efforts at program theory development.

4.2.1 Sectors and Sub-sectors Targeted by the Program

The Program, based on its current eligibility rules, targets apartment dwelling units of five units or more, the common areas of apartment and condominium complexes, and mobile home parks. Starting in 2006 the program has allowed multifamily properties with fewer than five units to participate. Program managers have also identified two sub-sectors of the multifamily sector that are of special interest to the program for additional recruitment. These include large property management firms and multifamily property managers/owners that are "self-initiators." Large property management firms are of interest to program managers not only because of their size but also because of their elusiveness. Program managers believe that the program is having difficulty reaching these large companies for a variety of reasons

discussed in next subsection. “I’ll be starting to target [large property managers] this year, in preparation for the 2006 program,” one program manager told KEMA.

Self-initiators are property managers/owners who join the program on their own accord without being driven to do so by an installation contractor. The program managers said that one assumed benefit of having more self-initiators is the chance of greater diversity in the types of energy efficiency measures installed at a given property, thereby leading to greater on-site energy savings. This supposition of great measure diversity among self-initiators is based on the assumption that contractor-driven participants tend to install the energy efficiency measures that their contractors specialize in. Another hope of the program managers is that self-initiators will gain enough experience and confidence from managing their first projects through the program that they will be interested in doing other projects in the future. “When we see [self-initiators] participating, we feel that the message is really getting to that property owner and they are really understanding the idea behind energy efficiency and perhaps solutions that they can start considering,” one program manager said. One program manager also noted that self-initiators may be participants from geographic areas not being targeted by contractors.

The most recent survey results do shed some light on the question of whether the large property management firms and self-initiators are appropriate targets for the program. First, as discussed previously. large multifamily property management companies have historically been underrepresented in the program, although this representation appears to be improving. Second, interviews with participating contractors revealed that these large property management companies are a desirable target market not only because they have large property portfolios but also because they are often acquiring new properties. Contractors who have been able to get business with larger firms said that these firms often do not have the internal staff to review the state of energy-using equipment in new acquisitions. Therefore, they will sometimes hire independent contractors to conduct audits and perform low-cost retrofits. A couple of contractors said that they already target large property management companies. However, contractors, as discussed in Section 4.1.5, also face many barriers in getting access to this market subsector.

In the Interim Report KEMA found no evidence that 2004 participating property managers/owners who were self-initiators were more likely than contractor-driven participants to have a diversity of measure types or have plans for future energy efficiency projects. KEMA looked at these issues again with the 2005 participating property managers/owners. This time we used as proxies of self-initiators those participating property managers/owners who said that energy efficiency project rebated by the program was mainly their idea.[24] Table 4-8 shows that once again there was no significant difference between the contractor-driven participants and the self-initiators in terms of their measure diversity. However, this time the self initiators were more likely than contractor-driven participants to have plans for future energy efficiency projects (Table 4-9). This change could be due to the new, more precise categorization of the self-initiators. Of course, while customers who plan to do more energy efficiency projects in the future would be more desirable from a perspective of acquiring gross savings; such plans would also raise the specter of free ridership.

[24] For our evaluation of the 2004 participants we defined self-initiators as those who first heard of the program through non-contractor sources as well as those who had filled out their own rebate application forms.

Table 4-8
2005 Participating Property Manager/Owner Project Measure Diversity
by Origin of Project Idea

Source of Project Idea	Projects with multiple measure types	Projects with a single measure type
Project mainly participant's idea (n = 48)	13%	88%
Project mainly contractor's idea (n = 30)	13%	87%
Project idea came from other sources (n = 19)	21%	79%
Project idea came from multiple sources (n = 47)	17%	83%
Don't know origin of project idea (n = 6)	17%	83%

Note: Data source is KEMA survey conducted in June 2006.

Table 4-9
2005 Participating Property Manager/Owner Plans for Future Energy Efficiency Projects
by Participant Category

Source of Project Idea	Organization is planning EE improvements over next 3 years	Organization is not planning EE improvements over next 3 years	Don't know about future plans
Project mainly participant's idea (n = 48)	63%	17%	19%
Project mainly contractor's idea (n = 30)	47%	30%	20%
Project idea came from other sources (n = 19)	11%	21%	63%
Project idea came from multiple sources (n = 47)	51%	23%	26%
Don't know origin of project idea (n = 6)	17%	0%	83%

Note: Data source is KEMA survey conducted in June 2006.

4.2.2 Barriers Identified by Program Managers

In interviews, Program managers cited a number of barriers to energy efficiency improvement in the multifamily sector. These included:

- *High first costs* – Program managers said that this was more of a barrier for the implementation of boiler and water heating measures than for lighting or programmable thermostats.
- *Hassle costs* - "[Property managers/owners] definitely don't want anything that's a hassle factor," one program manager remarked. "They have too many hassles with tenants, with problem tenants, and maintenance and all that."
- *Lack of awareness or knowledge of energy efficiency and its benefits* – "[Property managers/owners] just don't really think about energy efficiency," one program manager said. "They either aren't aware of it or they may be aware of it but do not understand how to apply it to themselves – either in the short- or the long-term."
- *Split incentive barrier* – "[Large property managers/owners of non-master-metered properties] are less likely to go into the tenant dwelling units to install the energy efficient lighting and products in there because there will be a cost to do so and there's no cost benefit for them to do that since the tenant is paying the electric bill," said one program manager.
- *Lack of maintenance staff* – "You have little- to smaller- complexes, where they don't have a maintenance crew," noted one program manager.

The survey evidence (see Table 4-10) indicates that Program managers – at least collectively -- are aware of the key market barriers to energy efficiency implementation in the multifamily sector, even though they have not fully described them in a program theory or formal logic model. At least 20 percent of one of the surveyed market participant groups (participating property managers/owners, nonparticipating property managers/owners, participating contractors) agreed that these were barriers.

Table 4-10
Comparing Program Manager Perceptions of Barriers with the Survey Evidence

Barriers Identified by Program Staff in Interviews	Evidence from the Survey
High first costs	**Participant Surveys** • "Financial limitations" was the most-cited reason (21 percent) why 2005 participating property manager/owners, who were aware of the rebated technology, had not implemented the program-rebated energy efficiency projects on their own. • "Financial limitations" was the second-most cited primary reason (16 percent) why 2004 participating property managers/owners had not implemented the program-rebated energy efficiency projects on their own. Eight percent of them also cited it as a secondary reason. **Nonparticipant Survey** • "Lack of capital" was the second-most cited reason (16 percent of respondents) why nonparticipants said that they might not implement energy-efficient measures once they had the information they needed about the program, the rebates, and the installation contractors. The "high cost of EE equipment," was also cited as a barrier by nine percent of the nonparticipants. • Thirty-one percent of nonparticipants agreed with the statement that "energy-efficient appliances are too expensive." **Contractor Surveys** • Twenty-one percent of participating contractors cited "financial constraints" as a main

Barriers Identified by Program Staff in Interviews	Evidence from the Survey
	reason why property managers/owners do not implement energy-efficiency measures on their own. • Seventy-three percent of the nonparticipating boiler/plumbing contractors said that “financial constraints/ unwilling to pay higher first costs” was the main reason why multifamily property managers do not implement energy-efficient measures on their own.
Hassle costs	**Participant Surveys** • None of the 2005 participating property manager/owners who were aware of the rebated technology, but had not implemented the program-rebated energy efficiency projects on their own, cited this as a reason for not doing so. • "Lack of time/ not a priority" was the third-most cited reason why 2004 participating property managers/owners had not implemented the program-rebated energy efficiency projects on their own. However, only nine percent of participants cited it as a primary reason and only three percent cited it as a secondary reason. **Nonparticipant Survey** • Nine percent of participants cited "too busy/can't find the time" as a reason why they might not implement energy-efficient measures once they had the information they needed about the program, the rebates, and the installation contractors. • Twenty percent of nonparticipants agreed that "It takes too much time and hassle to find out which appliances and equipment are truly energy efficient." **Contractor Surveys** • Thirty-two percent of participating contractors cited being “too busy” as a main reason why property managers/owners do not implement energy-efficiency measures on their own. This was the second-most-cited reason. • Thirteen percent of nonparticipating boiler/plumbing contractors cited the multifamily property managers/owners as being too busy to learn about energy-efficient options.

Barriers Identified by Program Staff in Interviews	Evidence from the Survey
Lack of awareness or knowledge of energy efficiency and its benefits	**Participant Surveys** • Thirteen percent of the 2005 participating property manager/owners who were aware of the rebated technology, but had not implemented the program-rebated energy efficiency projects on their own, cited "unaware of/unable to identify measures" as a reason for their previous inaction. Six percent also named lack of energy savings or cost information as a reason. • "Unaware of/unable to identify measures" was the most cited reason why participants had not implemented the program-rebated energy efficiency projects on their own. Forty-three percent of respondents cited it as a primary reason and 20 percent named it as a secondary reason. However, only 2 percent of participants named lack of energy/cost savings as a primary reason for not implementing projects on their own (seven percent named it as secondary reason). **Nonparticipant Survey** • Forty-eight percent of nonparticipants agreed that "that there are other benefits to using energy-efficient appliances and equipment besides saving money on energy." • Twenty percent of nonparticipants agreed that "It takes too much time and hassle to find out which appliances and equipment are truly energy efficient." • Twenty-eight percent of nonparticipants agreed that "energy efficient appliances and equipment are not as reliable as standard appliances and equipment" **Contractor Surveys** • Twenty-one percent of participating contractors cited lack of knowledge of energy efficiency measures as a main reason why property managers/owners do not implement energy-efficiency measures on their own. • Thirteen percent of nonparticipating boiler/plumbing contractors cited lack of knowledge of energy efficiency as a main reason why property managers/owners do not implement energy-efficiency measures on their own. Thirteen percent also said the multifamily property managers/owners were too busy to learn about energy-efficient options.
Split incentive barrier	**Participant Surveys** • Thirty-three percent of 2005 participating property managers/owners whose tenants pay at least some of their own energy bills said that this was an important reason why they had delayed making energy-efficient improvements.[25] **Contractor Survey** • Forty-three percent of participating contractors said that property managers were more likely to have energy-efficient measures installed if they had master-metered properties. • Nearly half (47 percent) of the nonparticipating boiler/plumbing contractors thought that property managers with master-metered properties were more likely to invest in energy-efficient technologies than property managers with individually-metered properties.
Lack of maintenance staff	**Contractor Survey** • Lack of maintenance staff and installation expertise was cited by the most participating contractors (36 percent) as the main reason why property managers/owners do not implement energy-efficiency measures on their own.

The survey evidence also helps to clarify some of the more ambiguous market barriers such as the "lack of knowledge of energy-efficiency" barrier. The survey evidence suggests that most property managers/owners are aware of the benefits of energy-efficient equipment, with nearly half even believing

[25] When asked how important the fact that their tenants paid their own bills was as a reason for not implementing energy efficiency measures on their own, 18 percent of the respondents gave it a rating of 5 ("Extremely important") and another 15 percent gave it a rating of 4 – see Table 4-3.

in the non-energy benefits of such equipment. What these property managers/owners appear to be less aware of is how to identify the energy-efficient opportunities on their properties.

4.2.3 Program Strategies to Help Mitigate Market Barriers

The Program's current program strategies appear appropriately targeted to help mitigate most of the key barriers. The program's rebates help overcome the "high first cost" and "split incentive" barriers. The program's installation contractors help overcome the "hassle cost" and "lack of maintenance staff" barriers. The contractors also help mitigate the "lack of knowledge of energy efficiency" barrier by helping the property mangers/owners identify energy efficiency opportunities. Program efforts to make presentations before apartment associations and write articles for multifamily trade journals also help to reduce the "lack of knowledge" barrier.

Program strategies for reaching the large property management sector – based on what KEMA has learned from interviews with program managers as well as a review of utility 2006-2008 program plans -- appears to involve program staff contacting key decision makers at these larger firms. For example, SCE's 2006-2008 program plan says that the utility will initiate contact with the top 100 property management firms. The plan says that "at the very least, personally contacting and working with these customers will help entrench the [Program] as an available resource they can utilize for future energy plans."

Will program managers have any more success reaching the large property management firms than the contractors? The contractors' most-cited reason for not reaching these firms is that layers of bureaucracy make it difficult to locate the key decision-maker. The Program, using the prestige and perceived objectivity of its utility members, should have better luck finding these key decision-makers and making them aware of the program than small installation contractors. Program managers have also speculated that large property management firms may be shutting out participating contractors because they do not know them or trust them. The program may also be help in this regard by using the prestige of the utilities to reassure the large property management firms that the program has site inspections and other quality assurance practices to discourage poor quality installations.

Although the program seems to have the right strategies for mitigating these key barriers, what participating property managers/owners and contractors would like to see improvement in is the extent to which these strategies are implemented. For example, although the program does provide rebates, contractors point out that many utilities involved in the program only offer some rebates for a very short period of time. Participant satisfaction and recommendations for program improvement are discussed in the next section.

4.3 Barriers to Program Participation

4.3.1 Property Manager/Owner Barriers to Participation

KEMA tried to determine what information or process barriers might be keeping aware and interested multifamily property managers/owners from participating in the program. First the surveyors asked the nonparticipants – both those who were previously aware of the program and those that were not – how interested they were in the energy efficient measures offered by the program. For each measure, the

surveyors also described the range of rebates currently available for that measure. The responses to these "level of interest" questions are summarized in Subsection 3.3.2

Second the surveyors asked the nonparticipants who had expressed interest in at least some of the rebated measures whether there were any additional types of information or services that they would need before participating in the program. Table 4-11 shows that the interested nonparticipants were most interested in more general program information, information about which equipment was rebate eligible, and information about rebate levels. Nonparticipating property managers/owners cited utility direct mail and email/faxes as their preferred means of getting more program information, as is described in more detail in Subsection 5.1.3.1.

Are utilities in the program providing nonparticipating property managers/owners with the desired program information? Chapter 5 discusses the utility marketing efforts as well as the ways that nonparticipants would prefer receiving program information.

Table 4-11
Additional Information or Services
Needed by Interested Nonparticipants
Before Participating in the MFR Program

Additional Information or Services Needed Before Participating in MFR Program	Nonparticipants Unaware But Interested (n = 13)	Nonparticipants Aware and Interested (n = 19)
General program information	31%	47%
Which equipment is eligible for the rebates	23%	32%
Rebate amounts	15%	37%
Cost of energy-efficient equipment	15%	32%
Which contractors/dealers sell/ install this equipment	15%	11%
Help filling out rebate forms	15%	11%
Amount of paperwork	15%	5%
Information on the equipment quality	0%	16%
Level of energy savings	8%	5%
Information on the contractor quality	0%	11%
No additional information needed	23%	11%
Don't know	0%	5%

Note: Totals exceed 100% because multiple responses were allowed. Data source is KEMA survey conducted in July 2005.

4.3.2 Contractor Barriers to Participation

As mentioned earlier, awareness of the program among the nonparticipating boiler/plumbing contractors was very low. Only 12 percent had heard of the program. Therefore this was the biggest barrier to their participation in the program. Other reasons for not participating in the program included:

- Two contractors said that they were busy enough already and did not have a need to seek additional work.
- One contractor said that he mainly did new installations and the main opportunities to "upsell" equipment were in the replacement market. He claimed that "owners of new building know what they want so you can't sell up to them."
- One contractor said that all the installations he did were pre-specified and therefore he only installed what he was told to install.

It is important to note that only 13 percent of these contractors did any proactive outreach or marketing to try to gain more work in the multifamily sector. However, it's possible that they might find this sector more desirable if they were aware that rebates for energy-efficient equipment were available.

KEMA also asked the participating contractors how actively they promote rebates offered by the program. Using a scale where 1 indicated "Not Very Active" and 5 indicated "Very Active," four contractors (14 percent) gave themselves ratings of 3 or less. Reasons for their lack of activity included rebate funds running out quickly, demand for the rebates being so strong that no promotion was necessary, reduced installation opportunities, and demands for services from non-program clients.

4.4 Program Attribution

4.4.1 Introduction

KEMA asked the participating property managers/owners a series of questions to determine how influential the Multifamily Rebate Program was on their decision to implement the energy-efficient measures. These questions covered:

- *Project* conception
  - Who came up with the idea for rebated energy efficiency improvements?
- Influence of past California energy-efficiency programs
  - For those who mentioned past participation in a California energy-efficiency programs, how important this past participation was in helping to identify the -rebated improvements.
- Previous knowledge of and experience with the technology
  - Whether the respondents were aware of the rebated technology before having it installed through the program.
  - Whether the respondents, before having the -rebated measures installed, had the same technology installed at any of their other properties and whether these previous installation had received rebates.
- Barriers to implementation
  - For those who had not installed the -rebated measures before, why they had not done so.
  - For those whose tenants paid their own utility bills, how important this was as a barrier to energy efficiency improvements.
- Program assistance in overcoming barriers
  - Whether the program helped identify opportunities for energy efficiency improvements.
  - Whether the program helped to install the energy efficient measures
  - For those who had identified "financial limitations" as an implementation barrier, what the program had done to overcome this barrier.
  - For those who had identified the split incentive as an implementation barrier, what the program had done to overcome this barrier.
- Likelihood of implementation without the program

  - How likely they would have installed the -rebated measure if the program had not provided rebates to them or their contractors or had not provided installation assistance.
- The effects of the program on project timing, efficiency, and size.
  - Whether the timing of the installation of the -rebated measure would have been different if the program had not offered rebates and installation assistance.
  - Whether the energy efficiency of the installed measures would have been different if the program had not offered rebates and installation assistance.
  - Whether the quantity of the installed measures would have been different if the program had not offered rebates and installation assistance.
- Plans/barriers for future energy-efficiency implementation
  - Whether they are planning similar energy efficiency improvements over the next three years and what types of improvements they are considering.
  - Whether they would consider making these future improvements without rebates or installation assistance from the program.
  - For those who didn't have plans for future energy efficiency improvements, why they did not have such plans.

Earlier sections of this report discussed the findings from the questions related to market barriers and future plans for energy-efficiency implementation. This section will first summarize some of the findings related to the program's role in helping to overcome some of the more important barriers. Then it will summarize the methodology used to calculate the program attribution factors. Finally it will show the program attribution factors for three key rebated measures.

4.4.2 Program Assistance in Overcoming Barriers

KEMA asked the 2005 participating property managers/owners whether the program and its installation contractors helped them overcome key barriers to the implementation of energy efficiency equipment. Table 4-12 show that a large majority of the participants said that the program was helpful in overcoming these measure identification, installation, and financial barriers.

Table 4-12
2005 Participating Property Managers/Owners
Program Assistance
in Overcoming Key Barriers

Ways that MFEER Program helped overcome barriers	% of 2005 participating property managers/owner respondents*
Program and its contractors helped identify opportunities for installing measures (n = 94)	82%
Program and its contractors helped install measures (n = 94)	77%
Program rebates helped overcome financial barriers (n = 10)	100%

Note: *The first two questions were asked of all 2005 participants who had indicated prior awareness of the rebated measures. The third question was only asked of previously-aware 2005 participants who had named financial barriers as a reason why they had not implemented the rebated measures sooner. Data source is KEMA survey conducted in June 2006.

4.4.3 Program Attribution Methodology

This section describes the methodology that KEMA used to calculate the program attribution factors (net-to-gross ratios) used in our impact analysis. We calculated per-measure program attribution using the following six steps:

1. Assessment of energy-efficient measure awareness
2. Initial assignment
3. Calculation of simple free ridership
4. Adjustment of free-ridership calculation
5. Delayed free-ridership calculation
6. Calculation of final program attribution

4.4.3.1 Step 1: Assessment of energy-efficient measure awareness

The first step in calculating program attribution was to determine whether the surveyed program participants were even aware of the rebated technology before having it installed through the program. If the participants had not been aware of the technology before participating in the program, they were skipped out of most the remaining program attribution questions, and the program was given full attribution for this/these implemented measure(s).

4.4.3.2 Step 2. Initial Assignment

All surveyed participants who said that they were previously aware of the rebated technology were asked how likely they would have had the rebated measure installed if the program had not provided rebates to them or their contractors or had not provided installation assistance. Based on their response to this question, they would be sent down two different paths:

1. If the participants said that it was "very unlikely" that that they would have installed the measures without the program, or if the likelihood question was not answered (don't know or refused), the program was given full attribution for this/these implemented measure(s) and the participants were skipped out of most of the remaining program attribution questions.

2. If the participants had responded to the likelihood question by saying that it was "very likely," "somewhat likely," or "not very likely," that they would have had the rebated measure installed without the program, then they were asked additional questions in Step 3 to determine the simple free-ridership level

4.4.3.3 Step 3: Calculation of simple free ridership

KEMA asked an additional series of program attribution questions of participants who had previously been aware of the rebated measure and indicated some likelihood of having this measure installed without the program's help. In this step, simple free ridership factor F was calculated as the fraction of savings that would have been implemented at some time without the Multifamily Rebate Program rebate. This fraction was calculated as the fraction of units that would have been implemented without the program rebate, times the fraction of the efficiency improvement (relative to a baseline) that would have been implemented without the program rebate. For some measures, incremental quantities or efficiency was not relevant. If only one of these fractions was meaningful, F equaled that fraction. If neither fraction was meaningful or a question used to determine the relevant fractions was not answered (don't know or refused), simple free ridership was assigned based on the value of the likelihood question (see Table 4-15).

Thus, for cases where the survey provided information on the efficiency fraction and/or the quantity fraction,

$$F = \begin{cases} Q \times E, \text{ if both are meaningful} \\ Q, \text{ if Q is meaningful but E is not} \\ E, \text{ if E is meaningful but Q is not} \end{cases}$$

where

Q = the fraction of units (quantity) that would have been implemented without the program rebate

E = the fraction of efficiency improvement that would have been implemented without the program rebate

The program receives credit for the non-free-rider fraction. That is, the initial attribution from the simple free rider calculation is
$A_1 = 1 - F$.

The efficiency fraction E was based on whether the efficiency would have been greater, the same, or less without the program rebate (Question z16). If the same or greater efficiency would have been implemented, the efficiency fraction was set at 100 percent. If lower efficiency would have been used, Question z17 probes what the efficiency would have been without the rebate. This qualitative response is then translated into a specific efficiency fraction as described in Table 4-13.

Table 4-13
Efficiency Fraction Assignments

Question/ Response	Efficiency Fraction E
Question z16. Without the rebates from the program, how different would the energy efficiency level of the <MEASURE TYPE> been? Would you say the efficiency would have been the… [same, lower, higher, don't know, refused]	
Greater or same	100%
Less	Value from z17
Question z17. How much lower ….? [READ LIST]	
Standard efficiency or according to code	10%
Slightly higher than standard efficiency	30%
About midway between standard and the high efficiency that was used	50%
Slightly lower than the high efficiency that was used	70%

The quantity fraction Q was based on a similar pair of questions (z18 and z19). If the same or a greater quantity would have been installed, the quantity fraction was 100%. If a smaller quantity would have been installed, the fraction was obtained from the follow-up question (z19). These assignments are summarized in the table below.

Table 4-14
Quantity Fraction Assignments

Question/ Response	Quantity Fraction Q
Question z18. Without the rebates from the program, how different would the quantities of installations have been for the <MEASURE TYPE> you installed? Would you say the quantity would have been the…[READ LIST]	
Greater or same	100%
Less	Value from z19
Question z19. About what percentage of these <MEASURE TYPE> would your organization have installed without the rebates from the program?	
Value given	Value reported

Simple free ridership could not be calculated if neither E nor Q was meaningful, or if no answer (don't know or refused) was given for either the initial or follow-up question (z16 or z17; z18 or z19). For these cases, the simple free ridership was assigned based on the response to z13, on the likelihood that the measure would have been implemented without the program rebates. These assignments are indicated in the table below.

Table 4-15
Simple Free Ridership Assignment
if Not Based on Efficiency and Quantity Fractions

Reason F can't be calculated from E and Q	Question z13. If <UTILITY NAME>'s multifamily rebate program had not paid the rebates to your company or your installation contractor in 2005, how likely would it have installed the <MEASURE TYPE>? Would you say that the likelihood would have been…				
	Very Likely	Somewhat Likely	Not Very Likely	Very Unlikely	Don't Know/ Refused
Both E (z16, z17) and Q (z18, z19) are inapplicable	90%	50%	10%	F not calculated, program attribution = 100%	
One or more of z16, z17, z18, z19 = don't know or refused	75%	50%	10%		

4.4.3.4 Step 4: Adjustment of free-ridership calculation

Participant assessments of their likelihood of implementing the rebated measures without the program might be overstated or understated for various reasons. Some participants might overstate the true likelihood because they wish to appear more proactive about energy efficiency than they actually are.

Some participants might understate this true likelihood because they think that the evaluation surveyor is with the program and they want to please the surveyor by giving the program more attribution than it deserves. KEMA's methodology tried to adjust for these possible biases by incorporating information concerning the participant's pre-program experience with similar energy-efficiency measures and the program's assistance in overcoming key barriers.

1. *Previous experience installing the measure* - If the participants said that they had previously installed a similar energy-efficient measure in one of their properties, then 25 percent was added to their simple free-ridership factor (F), as had been calculated in Step 3. If the participant said that they had not previously installed a similar energy-efficient measure in one of their properties, then 25 percent was subtracted from this factor.

2. *Program assistance in overcoming key barriers* – The evaluations of the program have found that two of the most significant barriers to energy efficiency implementation in the multifamily sector are the inability to identify energy efficiency opportunities and the lack of maintenance staff and installation expertise. If the participant said that the program had helped them identify energy efficiency opportunities then 10 percent was subtracted from the simple free-ridership factor (F). If the participant said that the program had helped them with the installation, then an additional 10 percent was subtracted from this factor.

These adjustments resulted in an adjusted free-ridership factor (AF). This factor AF was further adjusted so that it was not less than 0 percent or greater than 100 percent. The initial estimate of program attribution (A_1) was calculated as 1 – AF.

4.4.3.5 Step 5: Delayed free-ridership calculation

In addition to affecting the quantity and efficiency of the installed measures, the program can affect the timing of these measures. For example, the program rebates or the availability of an installation contractor may cause a planned energy efficiency project to occur more quickly than it otherwise would have. Therefore the program was given credit for a portion of the adjusted free ridership savings based on the amount of time that the program accelerated implementation. The credit given to the program for the accelerated savings was calculated as

$A_2 = (m^*/48) * AF$

where

$m^* = \min(m, 48)$

m = number of months by which the program rebate accelerated the implementation.

A pair of questions determined whether the project timing have been earlier, the same, or later (z14) without the program; and if later, how many months later (z15). If the measure would have been installed at the same time or earlier, then number of months (m) was set at 0. If a respondent did not answer (don't know or refusal) either of the timing questions, the number of months by which the program rebate accelerated the implementation was set at 48.

4.4.3.6 Step 6: Calculation of final program attribution

The final program attribution factor for the measure was calculated as the sum of the initial estimate of program attribution (A_1) plus the credit for accelerated savings (A_2). Thus, the total fraction of savings attributed to the program rebate was calculated as:

$A = A_1 + A_2$

$= (1\text{-}AF) + (m^*/48)\ AF.$

4.4.4 Program Attribution Results

KEMA calculated program attribution factors (a.k.a. net-to-gross ratios) for a wide variety of energy efficiency measures rebated by the program. However, there were only sufficient sample sizes for the program's three largest sources of energy savings – boiler controls, CFLs, and programmable thermostats. Following the advice of an outside evaluator, KEMA calculated these program attribution factors, both including and excluding respondents that had answered 'don't know' to one of the key program attribution questions, or had refused to answer one of these questions.[26] Table 4-16 shows the program attribution factors for these three measures. It shows that excluding the partial nonrespondents produced program attribution factors that were very similar to those produced when these partial nonrespondents were included.

[26] In response to the draft version of this report, one outside reviewer suggested that including participants who had answered 'don't know' to one of the key program attribution questions, or had refused to answer one of these questions, might bias the results. KEMA's main reason for including these data points were that we did not have any strong reason to believe that including them would bias the program attribution factors in any particular direction. In addition, each data point requires a significant amount of effort to gather. Finally the respondents for which we calculated program attribution factors only answered "don't know" or were non-responsive to questions concerning the likely efficiency or quantity of the installed measures in absence of the program. None of these respondents were non-responsive to the key question as to how likely they would have had the rebated measure installed if the program had not provided rebates to them or their contractors or had not provided installation assistance.

However, it is possible to think of reasons why including or excluding such people might bias the results in any particular direction. For example, one might argue that customers who had a clearer idea of what they would have done in the absence of the program would be less likely to answer 'don't know' to the program attribution questions. If this was true, then leaving out the partial non-respondents might actually decrease program attribution. Therefore to test these theories, and in accordance with the advice of the outside evaluators, KEMA reran its program attribution calculations, this time leaving out those respondents that had answered 'don't know' to one of the key program attribution questions, or had refused to answer one of these questions.

Table 4-16
Program Attribution Factors for Key Rebated Measures
With and Without Partial Non-Respondents

Rebated measure (sample sizes for respective columns)	Program attribution factor (including partial nonrespondents*)	Program attribution factor (not including partial nonrespondents*)
Boiler controls (n = 20, 18)	81%	83%
Compact fluorescent lamps (n = 47, 34)	76%	78%
Programmable thermostats (n = 45, 41)	79%	79%

Note: Data source is June 2006 KEMA survey. The attribution factors including partial nonrespondents are slightly different than those that appear in the draft report due to the discovery of two errors in the original program attribution calculation.

These factors represent the percentage of verified gross savings that can be attributed to the program rebates after adjusting for free-ridership effects including partial free ridership and delayed free ridership. For calculating net savings in this report for boiler controls, CFLs, and programmable thermostats, KEMA decided to use the program attribution factors Table 4-16 that do not include the partial nonrespondents.

It should be noted that these program attribution factors are comparable to the default net-to-gross factors currently being used by the programs. Currently, PG&E, SDG&E, and SCG use 0.89 as their net-to-gross ratio for all measures. SCE uses a net-to-gross ratio of 0.89 for ENERGY STAR split system air conditioners, ENERGY STAR programmable thermostats, high-efficiency exit signs, occupancy sensors, and photocells while using a net-to-gross ratio of 0.80 for all other measures.

4.5 Summary of Evaluation of Program Theory and Attribution

4.5.1 Multifamily Market Barriers

- Unawareness of energy-efficiency opportunities was the most-cited reason why 2004 participating property managers/owners had not made the rebated energy-efficiency improvements on their own, before becoming involved with the program. The existence of financial limitations was the second most-cited reason for not making the energy-efficiency improvements.
- Financial limitations was the most-cited barrier to energy efficiency improvements by 2005 participating property managers/owners. This barrier question was only addressed to 2005 participants who said that they had previous awareness of the technology, but their company had no experience installing the technology. This explains why the unawareness of energy-efficiency opportunities was not as important to these participants as it was the 2004 participants.

- Thirty-three percent of 2005 participating property managers/owners whose tenants pay at least some of their own energy bills said that this was an important reason why they had delayed making energy-efficient improvements.[27]
- The need to get higher level approval for projects and the higher cost of energy-efficient equipment were the two most-cited implementation barriers for nonparticipating property managers/owners once they had overcome informational barriers. These were the barriers that would remain after these nonparticipants had the information they needed about the program, the rebates, and the installation contractors.
- Most of the nonparticipants did not appear to have any preconceptions about energy efficiency that might explain their unwillingness to implement energy-efficient projects. Less than a third agreed with any of the negative statements about energy efficiency. Furthermore nearly half believed that there were other benefits to using energy-efficient appliances and equipment besides saving energy.
- The unavailability of staff to install equipment was the most-cited reason why multifamily property managers/owners do not implement energy-efficiency measures on their own, according to participating contractors. Property managers/owners being "too busy," financial constraints, and lack of knowledge of energy-efficient measures were other oft-cited barriers.
- Nonparticipating boiler/plumbing contractors pointed to financial constraints and an unwillingness to pay higher first costs as the predominant barrier to the implementation of energy-efficient measures for multifamily property managers/owners.
- Contractors who had rated the multifamily market potential for certain energy-efficiency measures as "bad" gave the following reasons:
  - *CFLs* – Detractors of this market pointed to limitations on the number of fixtures that can use CFLs, limited availability of program rebates, an increasing number of property managers/owners doing their own installations, difficulty getting access to tenant units, theft of lamps, and general market saturation.
  - *T8s/T5s* - Only one of the 19 contractors who assessed the market for T8/T5 lamps in the multifamily sector said that the market had low potential. However, even contractors who positively assessed the T8/T5 market acknowledged it had limitations including longer installation times, a higher installation skill level required, and the fact that the tenant unit installation locations were mostly limited to kitchens and bathrooms.
  - *Programmable thermostats* – Detractors of this market pointed to measure saturation due to the availability of program rebates and the fact that most new multifamily buildings already have programmable thermostats.
- A third of participating contractors and over a quarter of nonparticipating contractors reported having difficulty getting doing business with large property management firms. Difficulty finding the right decision-maker, larger firms having their own maintenance

[27] When asked how important the fact that their tenants paid their own bills was as a reason for not implementing energy efficiency measures on their own, 18 percent of the respondents gave it a rating of 5 ("Extremely important") and another 15 percent gave it a rating of 4 – see Table 4-3.

firms, bureaucratic hassles, and excessive cost consciousness were prominent reasons for these difficulties.

- Program managers agreed with the contractors that key barriers for accessing large property management firms included difficulty finding the key decision maker and the fact that many larger property management firms having their own maintenance crews. However, they also thought that some property management firms simply did not want to work with the contractors who participate in the program.

4.5.2 Program Theory

- *The Program is currently disadvantaged by the lack of an explicit program theory. A*n explicit program theory would help explain the purpose of key program activities, help identify appropriate strategies for mitigating market barriers, and help measure program progress and success through metrics that are based on desired program outcomes. KEMA's interviews with program managers indicated that they had a richer understanding of the important end user targets, market and programmatic barriers, and program strategies to overcome these barriers than they had ever described in their program plans. It would be a useful exercise for the program managers to develop an explicit program theory, preferably using a formal logic model to organize their existing knowledge and to stimulate new insights.
- Program managers have identified two sub-sectors of the multifamily sector that are of special interest for the program for additional recruitment. These include large property management firms and multifamily property managers/owners that are "self-initiators."
  - The survey evidence indicates that large property management companies do seem to be underrepresented in the program.
  - There is no survey evidence that self-initiators are more likely than contractor-driven participants to have a diversity of measure types (and therefore implicitly greater on-site energy savings). However, the survey of 2005 participating property managers/owners did find evidence that self-initiators are more likely than contractor-driven participants to have plans for future energy efficiency projects.
- The survey evidence indicates that Program managers – at least collectively -- are aware of the key market barriers to energy efficiency implementation in the multifamily sector, even though they have not described them in a program theory. These barriers include high first costs, hassle costs, lack of awareness or knowledge of energy efficiency and its benefits, the split incentive barrier, and the lack of maintenance staff.
- The Program's current program strategies appear appropriately targeted to help mitigate most of the key barriers.
- The Program, using the prestige and perceived objectivity of its utility members, should have better luck finding key decision-makers in large property management firms and making them aware of the program, than small installation contractors. The program may also be able to help large property management firms overcome suspicions of participating contractors by pointing out the site inspections and other quality assurance practices to discourage poor quality installations.

- Although the program seems to have the right strategies for mitigating these key barriers, what participating property managers/owners and contractors would like to see improvement in is the extent to which these strategies are implemented.

4.5.3 Barriers to Program Participation

- Nonparticipants who had expressed interest in the measures rebated by the program said that the additional information or services that they would most need before participating included general program information, information about which equipment was rebate eligible, and information about rebate levels.

4.5.4 Program Attribution

- A large majority of the 2005 participating property managers/owners said that the program was helpful in overcoming their measure identification, installation, and financial barriers.
- KEMA calculated program attributions factors of 78 percent for compact fluorescent lamps, 79 percent for programmable thermostats, and 83 percent for boiler controls. These factors exclude respondents who respondents that had answered 'don't know' to one of the key program attribution questions, or had refused to answer one of these questions. We also calculated the attribution factors including these partial nonrespondents and obtained very similar results. These factors represent the percentage of verified gross savings that can be attributed to the program rebates after adjusting for free-ridership effects including partial free ridership and delayed free ridership.

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5. Program Processes and Satisfaction

This section summarizes findings from our evaluation of program processes. Separate subsections discuss program marketing, participation activities, quality assurance issues, satisfaction with program processes, and recommendations for program improvements. Sources for these findings include the 2004 and 2005 participating property manager/owner surveys, the nonparticipating property manager/owner survey, the participating and nonparticipating contractor surveys, the April 2005 Best Practices Gap Analysis, interviews with program managers, and a review of past multifamily evaluation reports.

5.1 Marketing

5.1.1 Program Marketing Activities and Strategies

Interviews with Program managers indicated that they viewed prospecting by installation contractors as the main means of marketing the program. However, the program managers mentioned other marketing efforts for the program including:

- Bill inserts;
- Direct mail campaigns to plumbers, boiler/water heater installation companies, and insulation contractors;
- Direct mail campaigns to multifamily property managers/owners;
- Email campaigns to participating contractors and multifamily property managers/owners;
- Advertisements and articles in magazines that cater to multifamily property managers/owners;
- Presentations to apartment associations and housing boards;
- Exhibits at multifamily trade shows;
- Networking with non-profit associations that work with low-income multifamily housing;
- Information dissemination and lead development by utility field representatives; and
- Program websites.

Program managers acknowledged that these marketing methods have their challenges and limitations. Direct mail has been a limited option because most of the participating utilities use a “first-come-first-served” method of distributing rebates. Since popular rebates such as lighting rebates are claimed very quickly, there is a very limited window of time for an effective direct mail campaign. SCE, which makes its rebates available year-round, has claimed to have had the most success with the direct mail option. In addition, the popularity of the rebates makes program managers question whether a major direct mail campaign is really necessary. For this reason, some utilities have focused their direct mail efforts on promoting rebates for measures such as boiler controllers, water heater controllers and insulation, which tend to go less quickly. Interviews with program managers indicated mixed results for this approach. Some utilities have also had difficulty identifying multifamily customers in their Customer Information System (CIS) databases.

Utility efforts to work with multifamily trade associations to promote the program is part of an effort to increase the number of what program managers call "self-initiators." As noted in Chapter 4, these are property managers/owners who join the program on their own accord without being driven to do so by an installation contractor. Program managers have valued self-initiators because they assume that they are more likely to install a greater diversity of energy-efficiency measures (and thus achieve greater on-site energy savings) than "contractor-driven" contractors. Program managers have also prized self-initiators due to assumptions that they will be more self-reliant than contractor-driven participants in terms of initiating future energy efficiency projects.[28]

As Chapter 4 shows, there is no significant difference between the contractor-driven participants and the self-initiators in terms of their measure diversity. However, there is some new evidence from 2005 participating property managers/owners that these self-initiators are more likely to have plans for future energy efficiency projects than contractor-driven participants.[29] However, regardless of whether self-initiators are a more desirable type of program participant, the types of marketing strategies that the utilities have been using to recruit more self-initiators – such as making presentations before apartment associations or paying for advertisements in multifamily trade publications – would likely benefit a broader range of property managers/owners than just the self-initiators. For example, SCE stated in its program plan that this work with apartment associations is one way to reach smaller property managers/owners. In summary, while the incremental benefits of recruiting self-initiators (as opposed to other types of participants) are debatable, planned methods for recruiting the self initiators have broader benefits.

In its April 2005 Gap Analysis Memorandum,[30] KEMA noted that the program did not appear to be leveraging existing tracking databases to identify untapped energy efficiency opportunities from past participants. This "data-mining" activity has been identified as a "best practice" for multifamily energy efficiency program in a national study.[31] When asked about this practice, some program managers told the KEMA evaluators, with some justification, that the program's recent success in meeting its energy savings has made such research unnecessary. Yet KEMA noted that it would still be useful for the utilities to get some practice in figuring out how to use their program tracking databases, as well as external market data, to identify remaining energy opportunities. The Gap Analysis Memorandum also observed that "with the possible phase-out of programmable thermostats and the growing saturation of some lighting measures, this kind of opportunity assessment will become increasingly important." Since this memorandum, the decision was made to eliminate programmable thermostat rebates from the program, starting in 2006. Since programmable thermostats accounted for 33 percent of the program's therm

[28] Program managers likely also value self-initiators because such participants are more likely to give credit to the utility rather than an installation contractor for their energy efficiency improvements.
[29] As mentioned in Chapter 4, while customers who plan to do more energy efficiency projects in the future would be more desirable from a perspective of acquiring gross savings, such plans would also raise the specter of free ridership.
[30] *Best Practices Gap Analysis – Multifamily Rebate Program*, April 5, 2005 memorandum from Marissa Myers, Quantum Consulting; Chris Dyson and Tami Rasmussen, KEMA to Helen Fisicaro, Fred Yoo, and Ingrid Bran, PG&E; Greg Haney and Shahana Samiullah, SCE; Rodney Davis, SCG; and Kurt Kaufman and Mary Wold, SDG&E.
[31] Best Practices Benchmark for Energy Efficiency Programs, "Residential Multi-Family Comprehensive Report," Quantum Consulting, Inc. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.

savings and 30 percent of the program's kWh savings in 2005, this phase-out will make it increasingly difficult for program managers to meet their energy savings goals. This makes alternative ways of finding new energy projects – such as "data-mining" – all the more necessary. However, since properties typically install the most cost-effective measures first, program cost-effectiveness might be reduced if properties install additional less cost-effective measures.

5.1.2 Hard-to-Reach Customer Goals

Each of the utilities participating in the program had their own goals for recruiting Hard-to-Reach (HTR) customers. Table 5-1 shows these goals. In most cases, calculations are based on the number of rebate applications that are physically located in a zip code that is deemed HTR by having met at least one HTR criteria. These criteria are renter, moderate income, or rural, although for the program the "renter" criterion cannot be used since all participants meet that criterion.

Table 5-1
Hard-to-Reach Customers Goals
for Program Utilities

Utility	HTR Goal
PG&E	30% of program applications must come from Hard-to-Reach areas.
SCE	36% of all rebate applications must come from Hard-to-Reach areas
SCG	29% of rebate applications must come from Hard-to-Reach zip codes
SDG&E	91% of installations must be in units in Hard-to-Reach areas.

KEMA's review of the program workbooks and subsequent communications with program staff confirmed that PG&E, SCE, and SCG all achieved their hard-to-reach customer goals. However, SDG&E fell just short (90 percent of installations instead of the 91 percent goal).

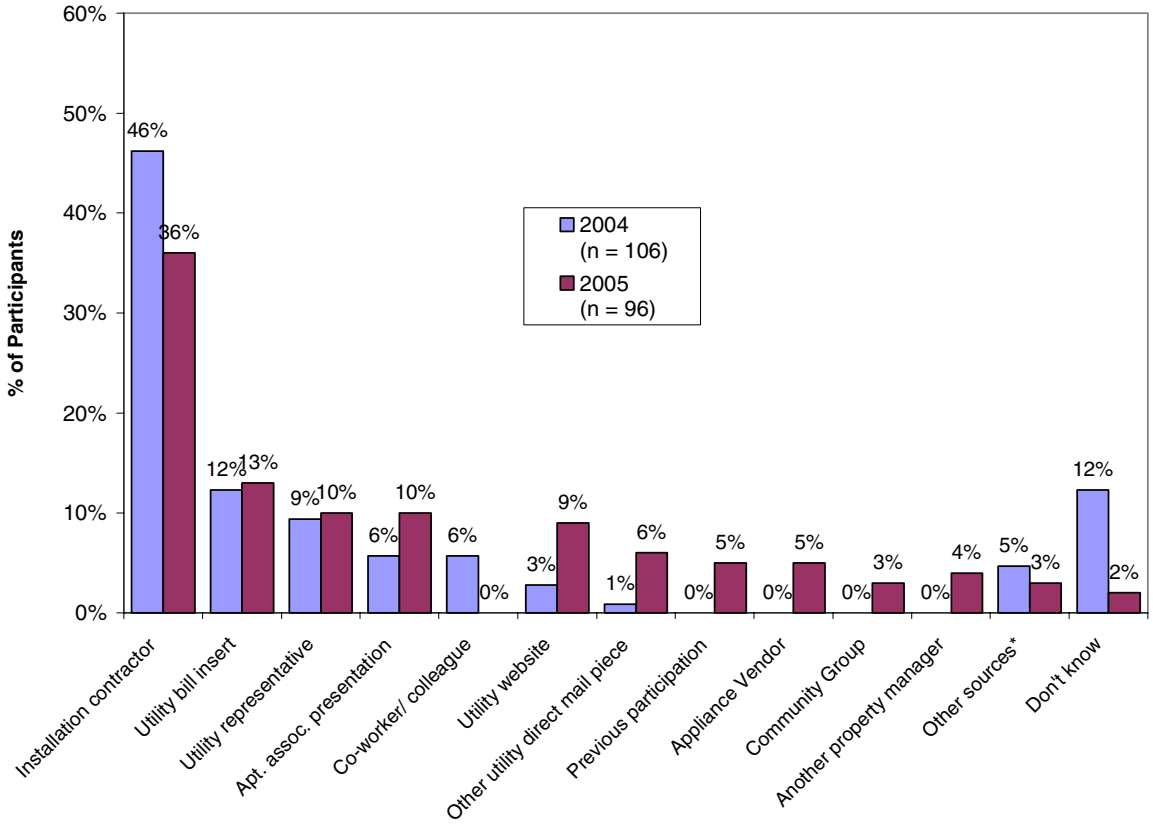
5.1.3 Sources of Program Awareness

5.1.3.1 Participating Property Managers/Owners

As reported earlier, 78 percent of 2005 participating property managers/owners and 63 percent of the nonparticipating property managers/owners surveyed in 2005 were aware of utility rebates for the multifamily sector. KEMA asked these program-aware participants and nonparticipants how they first learned about the program. As Figure 5-1 shows, the installation contractor was, by far, the most-cited source of program information for both 2004 and 2005 participants. However, the figure also shows that the 2005 participants cited a wider variety of program information sources than the 2004 participants had. This likely reflects recent efforts by utilities to try to attract more "self-initiating" participants through outreach to apartment associations, as well as the word-of-mouth echo effects of these activities.

The 2005 participants were also more likely to find out about the program through utility websites. Chapter 3 noted that 2005 participants also reported increased use of the Internet as a source for general energy efficiency information. So it's likely that Internet searches for this information are leading some property managers to the websites. If this trend continues it should be a positive one for the utilities by allowing them to acquire some share of their participants at very low marketing costs.

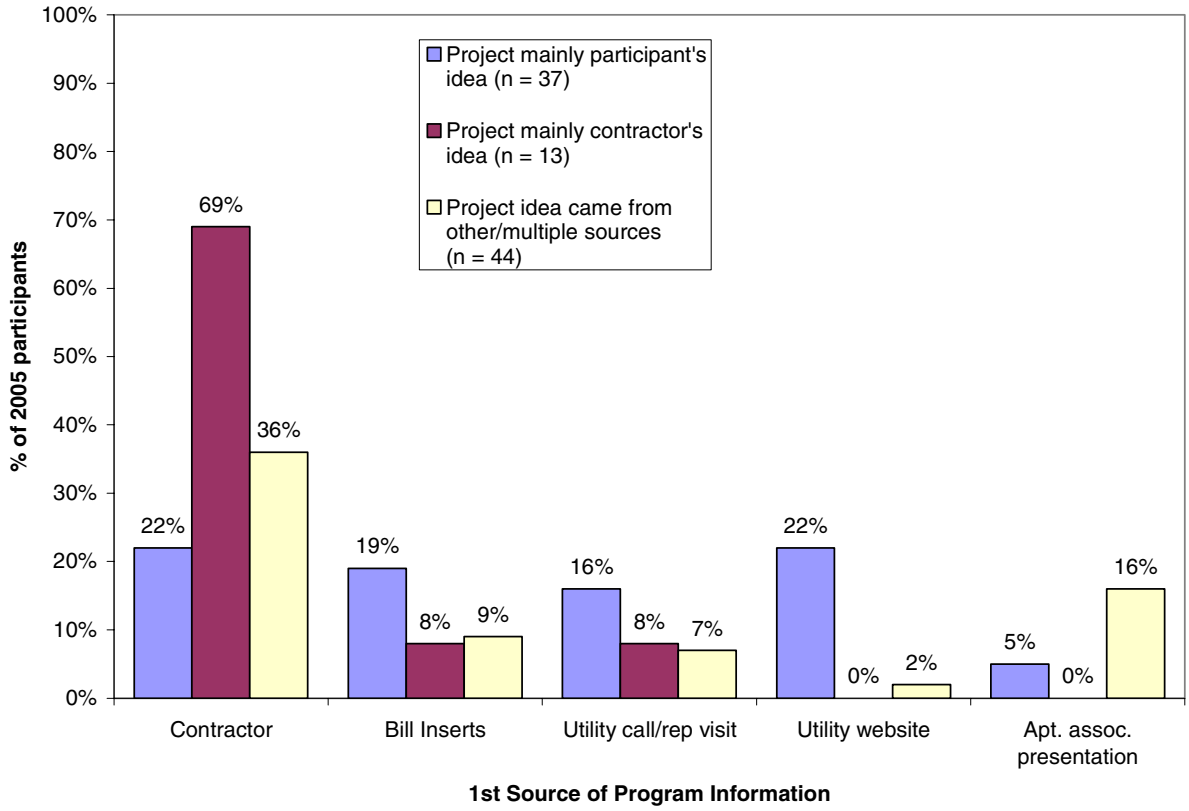
Figure 5-1
Initial Sources of Program Awareness
2004 vs. 2005 Participating Property Managers



Note: *Other sources include utility websites, tenants, word-of-mouth, other utility direct mail, and calls to the utilities. Differences between 2004 and 2005 percentages that are statistically significant at the 95 percent confidence level include coworker/colleague, utility website, other utility direct mail, previous participation, appliance vendor, community group, and another property manager. Data sources are KEMA surveys conducted in August 2005 and June 2006.

There were not significant differences among the different utilities in terms of how people found out about the program. However, there were differences depending on where the participating property manager/owner said that the idea for the project came from. Not surprisingly, projects that were identified as mainly contractor ideas were heavily correlated with contractors being the first source of program information. In cases where the project idea mainly came from the participating property manager/owner, there was a higher chance of bill inserts, utility calls/visits, and the utility website being the initial source of information about the program.

Figure 5-2
Initial Sources of Program Awareness
for 2005 Participating Property Managers/Owners
by Origin of Project Idea

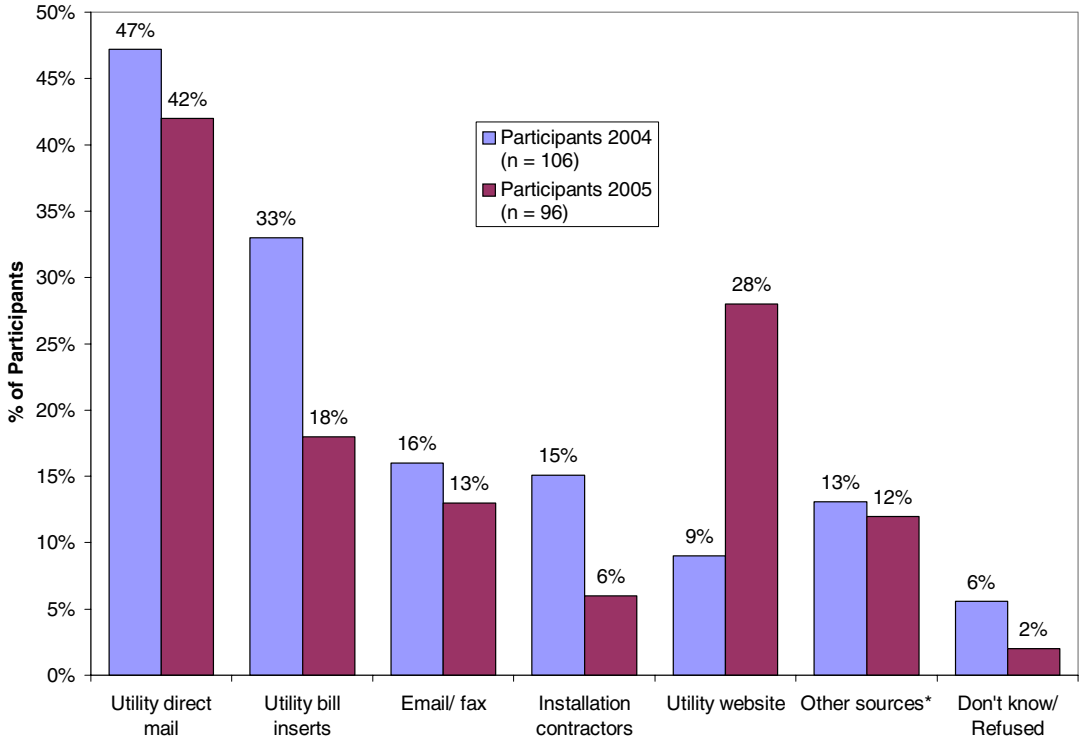


Note: Data source is KEMA survey conducted in June 2006.

We also asked participating program managers/owners how the utilities could best keep them informed of rebate programs. Figure 5-3 shows that utility direct mail and bill inserts were the most popular information channels for both the 2004 and 2005 participants. However, it also shows that the 2005 participants were more likely to prefer utility websites and much less likely to prefer bill inserts than the 2004 participants. This is further evidence of the growing comfort and familiarity of participating property managers with the Internet.

There were some variations in these preferences depending on the type of participants. Participants who said that their 2005 rebated-projects were mainly their own ideas were more likely (46 percent) to prefer the utility website as their source of program information than those who said that the ideas for their projects came from the installation contractors (20 percent) or other sources (26 percent). Managers/owners of smaller properties (100 units or less) were more likely to prefer bill inserts (22 percent vs. 6 to 9 percent for medium-large property managers/owners). These smaller property managers/owners were less likely to prefer email or fax (10 percent vs. 23 to 27 percent for medium-large property managers/owners).

Figure 5-3
Preferred Sources of Rebate Information
2004 vs. 2005 Participating Property Managers/Owners



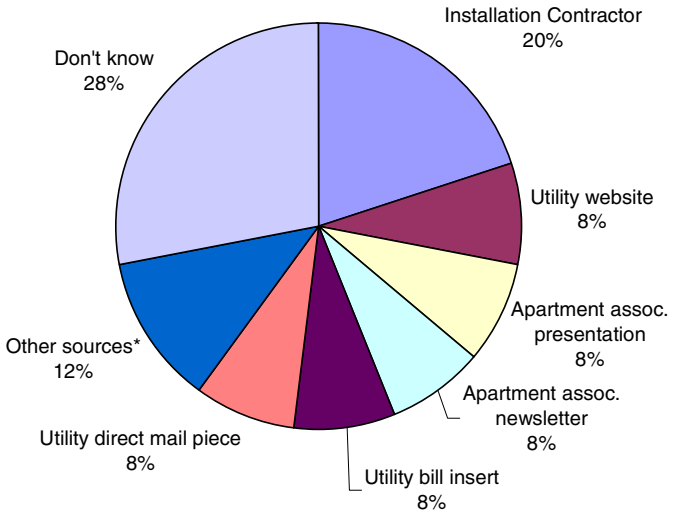
Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

5.1.3.2 Nonparticipating Property Managers/Owners

KEMA also asked nonparticipating property managers/owners about how they first became aware of the program. Once again the installation contractors were the most-cited initial source (Figure 5-4). However, these nonparticipants were much less likely to cite contractors as their information source than participants were. One simple explanation for this is that the participants got their program information from contractors because they were interested in doing a project and therefore contacted the contractors themselves, while the nonparticipants had no such interests. Another more complicated explanation is that it is an effect of contractor persuasion. In other words, if the nonparticipants had been exposed to the same contractor salesmanship as the participants had been, many of them would have become program participants. A third possibility is that the nonparticipating property managers/owners were different than the participants thereby predisposing them to decline their sales pitches.

Figure 5-4
Initial Sources of Program Awareness for
Nonparticipating Property Managers/Owners

n = 25



Note: *Other sources include co-worker/colleague, other word-of-mouth, and mass media. Data source is KEMA survey conducted in July 2005.

Like the participating property managers, the nonparticipating property managers favored utility direct mail and bills inserts as ways to get utility energy efficiency information (Table 5-2). Yet, only 5 percent of them preferred utility websites as a way to get this information, compared to 28 percent for the 2005 participants. There are a number of possible explanations for this. One factor could be the time difference between the surveys. The nonparticipants survey was conducted nearly a year earlier (July 2005) than the 2005 participant (June 2006). Figure 5-3 shows that preferences for utility websites can increase quickly in only a year. Another explanation is that many of the 2005 participants had positive experiences using the utility websites, while many of the nonparticipants had not yet had such experiences. A third possibility is that there is some correlation between the greater energy efficiency pro-activity of the participating property managers and their comfort using the Internet for energy efficiency information.

Table 5-2
Preferred Ways of Finding Out About Rebate Programs
Nonparticipating Property Managers/Owners

Information Source	Nonparticipants (n = 40)
Utility direct mail	30%
Utility bill inserts	18%
Email/ fax	33%
Installation contractors	3%
Utility website	5%
Other sources (t.v. ads, newspaper ads, phone calls, radio ads, apartment associations)	13%
Don't know/ Refused	0%

Note: Totals may exceed 100% because multiple responses were allowed. Data source was July 2005 KEMA survey.

5.1.4 Participating Contractor Assessment of Program Marketing

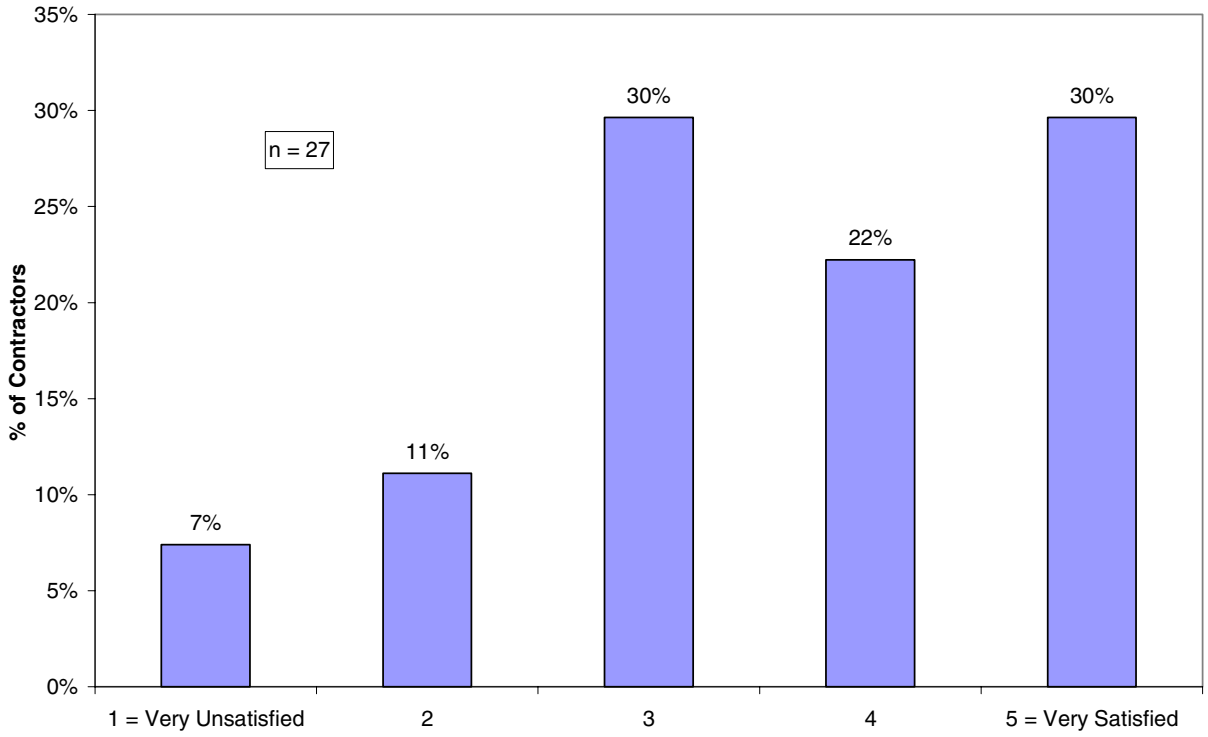
In interviews conducted in summer 2005,[32] participating contractors gave a middling rating to the program's marketing efforts. As Figure 5-5 shows, about half of the contractors were less than satisfied with the program's marketing efforts. The average satisfaction score was 3.6 on a five-point scale where 5 represented "very satisfied." The typical comment of the less-satisfied contractors was that the property managers/owners they encounter have rarely heard of the program.

Interestingly the contractors who agreed that the program was not doing much marketing did not agree as to whether the program should be doing more marketing. Some thought that more marketing would be beneficial. "It would be nice if they helped us to market," said one contractor. "They lack aggressive promotion," said another. However, others contractors thought differently. "It's my job to find [the property managers]," one contractor commented, "they're giving the money to me." Another thought that the utility staff did not work regularly enough with the property managers/owners to know how to market to them. A number of contractors thought that more marketing would not make sense unless the program also made more rebate funds available.

A couple of contractors even said that more marketing would hurt them rather than help them. "If these property managers know about the rebates already," said one contractor, "they might do the work themselves or give the work to my competitor." Another contractor admitted that he was reluctant to refer people to the program website because "once people see the site, they have all the information they need to do the project without us."

[32] KEMA did not interview participating contractors in 2006.

Figure 5-5
Participating Contractor Satisfaction with
MFR Program Marketing



Note: Date source is KEMA survey conducted in May-July 2005

KEMA asked the contractors for suggestions on how the marketing of the program could be improved. Their suggestions included utility bill inserts, print ads, wider availability of program brochures, educational seminars for property managers/owners with contractors as guest speakers, allowing contractors to use utility letterhead, and the circulation of lists of qualified local contractors to property managers/owners. One contractor also suggested that the utilities give the contractors more advanced notice when they do send out marketing flyers.

5.1.5 Nonparticipating Contractor Suggestions for Program Marketing

KEMA asked the nonparticipating boiler/plumbing contractors what would be the best way for the program to send them information about the program. As Table 5-3 shows, nearly three-quarters preferred direct mail as the way to receive program information.

Table 5-3
Nonparticipating Boiler/Plumbing Contractor
Preferred Ways of Receiving Program Information

Desired MFEER Program information source	Nonparticipating boiler/plumbing contractors (n = 17)
Direct mail	71%
Email	12%
Trade union/trade association	6%
Advertisement at home improvement/hardware stores	6%
Fax	6%

Note: Date source is KEMA survey conducted in May-June 2006

KEMA also asked these nonparticipating contractors what would the best way for the program to recruit contractors like themselves. Most of them said that simply getting more information about the program to the contractors would be the most effective recruitment strategy. In addition to direct mail, they mentioned telephone calls, emails, and advertisements at home improvement and hardware stores as ways to do this. Only one of these contractors mentioned higher rebates, and even he questioned whether the higher rebates would make much of a difference.

5.2 Program Participation Activities

This section summarizes how property managers/owners and contracts participate in the program. It discusses the degree to which they fill out rebate application forms and receive rebate payments. It also discusses how contractors keep up with changes in program requirements.

5.2.1 Rebate Application and Payment

5.2.1.1 Participating Property Managers/ Owners

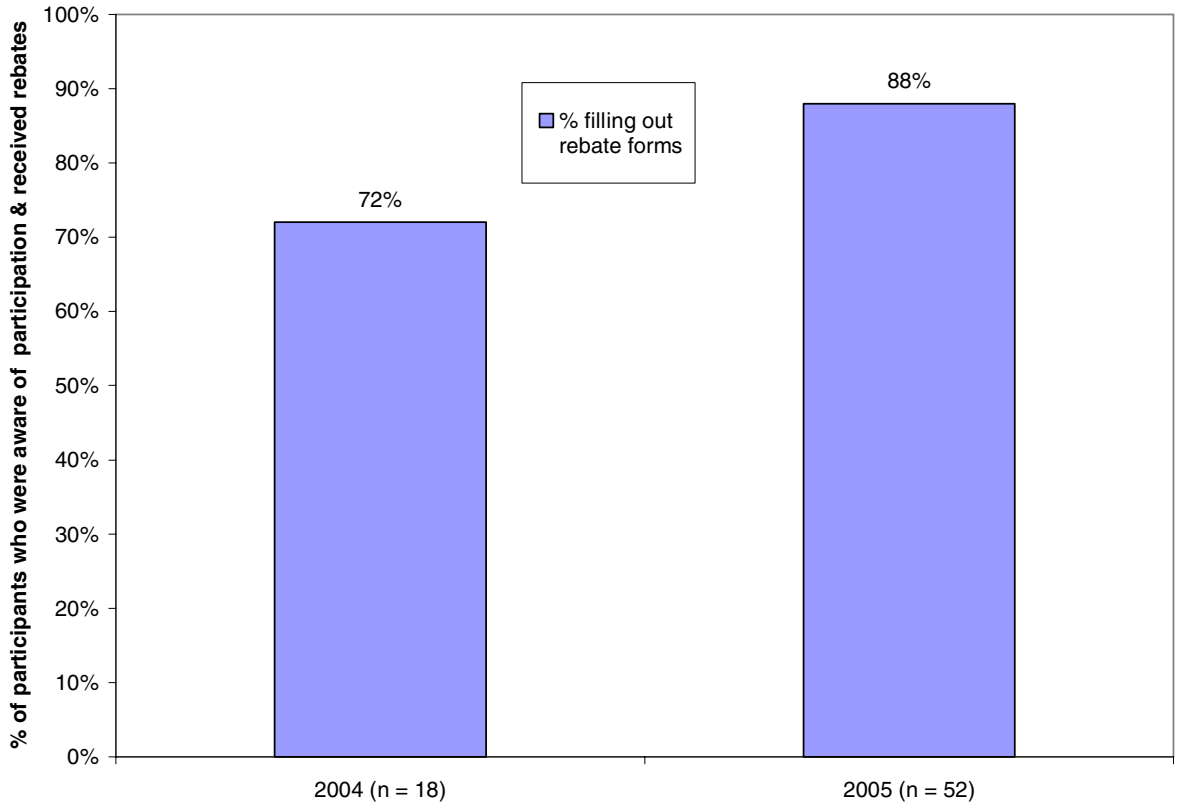
5.2.1.1.1 Filling Out Rebate Application Forms

The survey of 2005 participating property managers/owners only asked those who were aware that they participated in the program and who claimed that they (rather than their contractors) received the rebates whether they filled out rebate application forms. Figure 5-6 compares the response of these 2005 participants with a similar group of 2005 participants. It shows that in both cases a large majority of these participation-aware, rebate-receiving participants filled out their own forms. The increase between 2004 and 2005 is not statistically significant at the 95 percent confidence level.

A more surprising finding came out of the survey of 2004 participants. In this case all participants were asked if they filled out the rebate application form, whether they received the rebate or not (the contractor received the rebate or they didn't know). The data showed that about half (49 percent) of the

participation-aware participants that were not receiving rebates (n = 55) were still filling out the rebate application forms.

Figure 5-6
Filling out Rebate Forms
2004 vs. 2005 Property Managers/Owners



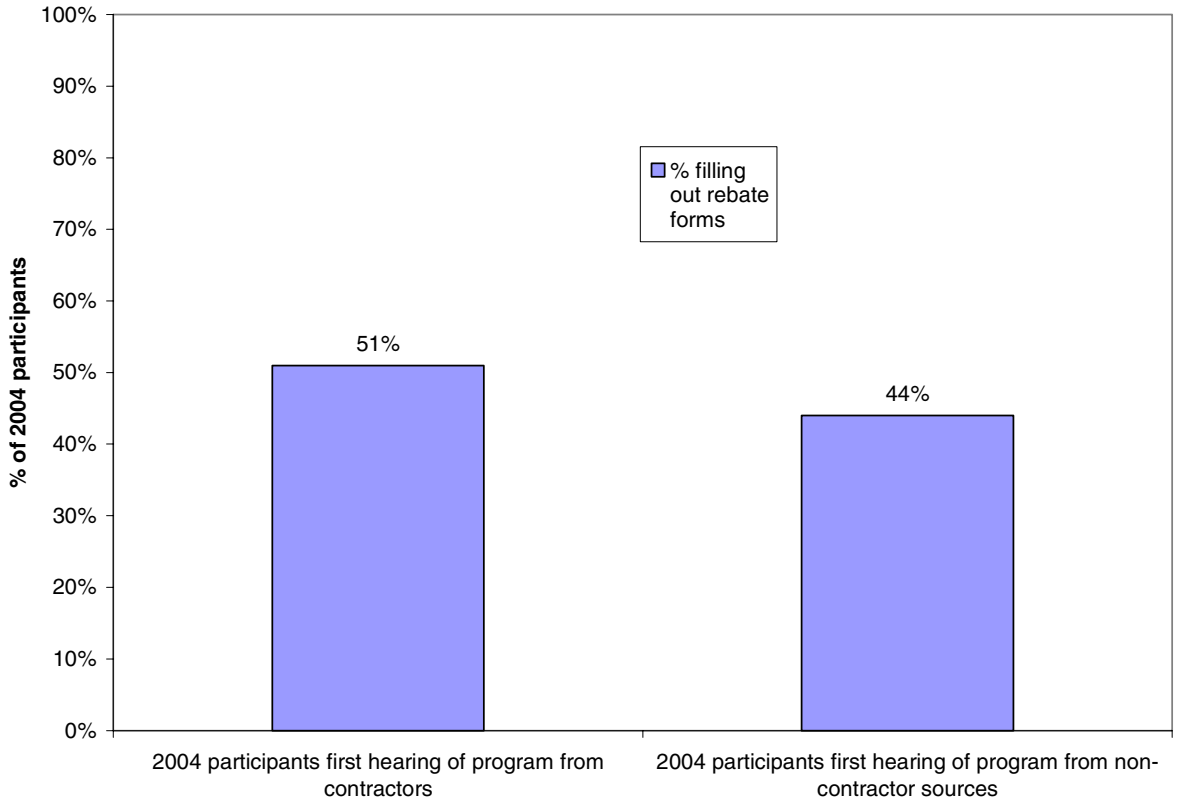
Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

As noted, the program is trying to recruit more participants that are self-initiators. One question that was explored in the Interim Report was whether increasing the number of self-initiators will increase the number of participants who call the program staff for help in filling out the rebate application forms and therefore create an undue burden on the program staff. This might be true if "contractor-driven" participants are more likely than self-initiators to get help from their contractors in filling out paperwork. However, as Figure 5-7 shows, 2004 participants[33] who heard about the program from non-contractor sources (self initiators) were actually less likely to fill out their own application forms than participants who heard about the program through contractors. One possible explanation for this is that participants

[33] As explained above, due to concerns about the length of the survey for 2005 participants, the rebate application completion question was only asked of participation-aware participants who had received a rebate. The use of this filter meant that only four of the respondents who said that their projects were mainly contractor ideas were asked whether they had filled out their own rebate forms. This was too small a comparison group to do a similar analyis.

who hear about the program from non-contractor sources may still end up hiring a contractor to do the installation and this contractor may provide help with the paperwork. In addition, participants who heard about the program from contractor sources may not be getting as much help from their contractors as one would expect.

Figure 5-7
2004 Participating Program Managers
Filling Out Rebate Application Forms
by Source of Program Awareness



Note: Data source is KEMA survey conducted in August 2005.

KEMA also looked at whether participants who heard about the program from non-contractor sources and completed their own application forms were more likely to call the program staff than participants who heard about the program from contractors and who completed their own application forms. This might be the case if "contractor-driven" participants were more likely to call their contractors rather than program staff for help with the paperwork. KEMA found that there was no significant difference between these two groups in terms of their tendency to call the program staff.[34]

[34]Fifty-two percent of the participants who heard about the program from non-contractor sources and who completed their own application forms called the program staff (n = 25). Forty-eight percent of the participants who heard

In summary, there is no evidence that participants who hear about the program from non-contractor sources are more likely to fill out their own rebate applications or are more likely to call the program staff when they do. This suggests that recruiting more participants who are self-initiators would not create an undue work burden on program staff. However, this also means that program staff will miss out on some of the positive aspects of interacting with these self-initiators – such as offering them advice on additional EE measures.

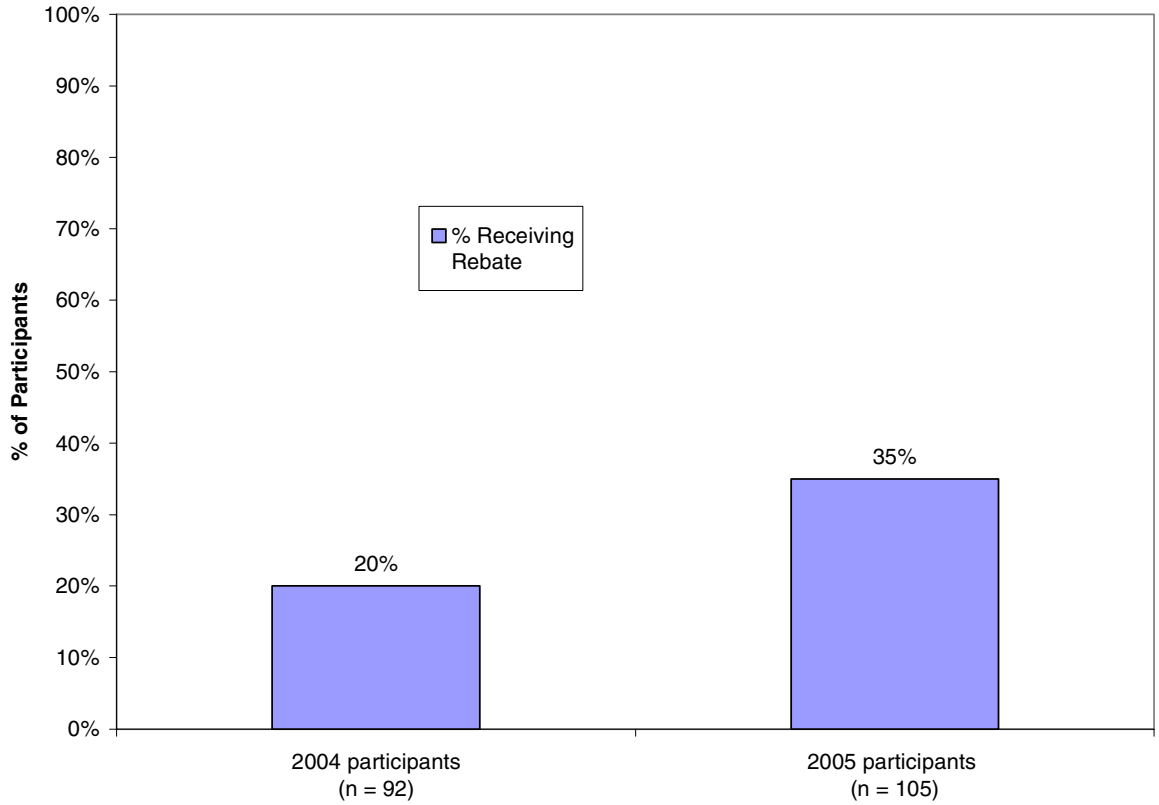
5.2.1.1.2 Receiving Incentive Payments

The 2004 and 2005 participating property managers/owners were asked if they or the contractors received the rebate payments. Figure 5-8 shows that the percentage of these participants receiving rebates has recently increased, although for about two-thirds of the projects the rebate payments still go to the contractors. An increase in the percentage of participants receiving rebates may be a sign of an increased share among the participants of self-initiators. Receipt of the rebate is highly correlated with self-initiation -- 54 percent of self-initiators received a rebate compared to only 13 percent of contractor-driven participants.[35] Receipt of the rebates is also highly correlated with the type of measures. For example, only 9 percent of 2005 CFL and programmable thermostat participants said that they received the rebate. However, 60 percent of boiler control participants and 84 percent of those who participated in the program through a measure that was not a CFL, programmable thermostat, or boiler control received a rebate.

about the program from contractors and who completed their own application forms called the program staff (n = 25).

[35] We were unable to directly measure whether the percentage of self-initiators increased from 2004 to 2005 because we didn't ask the question: "Who came up with the idea for the energy efficiency improvements at this address?" of the 2004 participants.

Figure 5-8
% of 2004-2005 Participating Property Managers
Receiving Rebates



Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

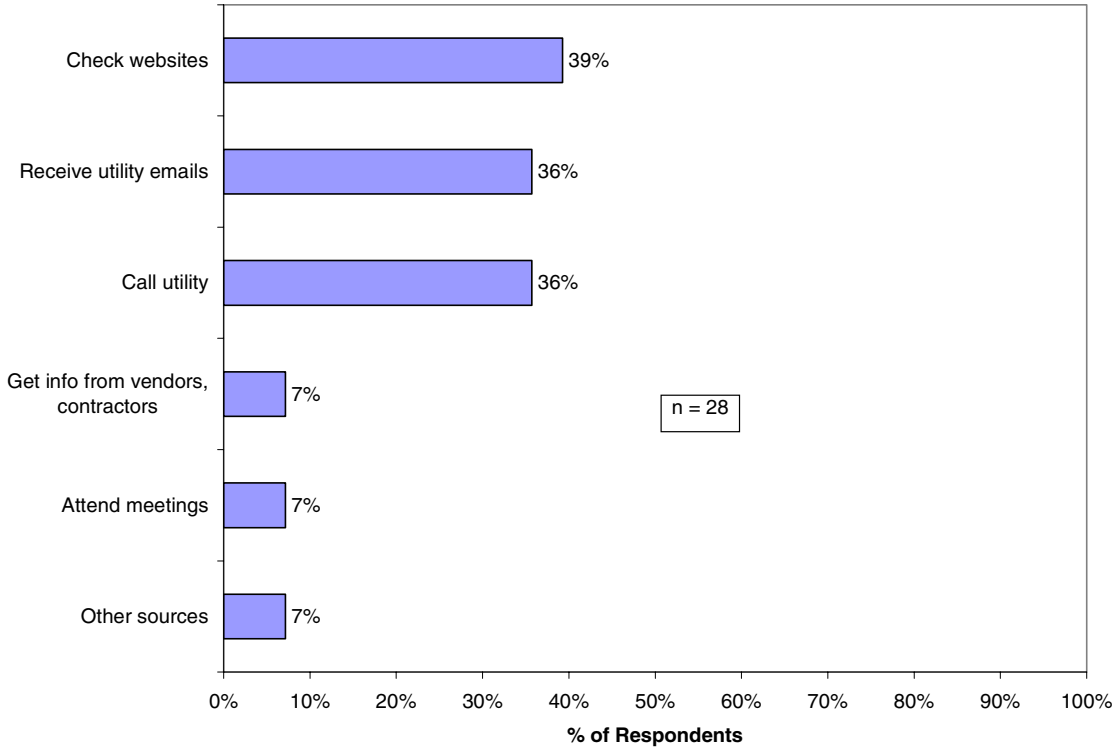
5.2.1.2 Participating Contractors

Seventy-one percent of the contractors said that they fill out rebate applications on behalf of their customers. A few commented that they do this because of the complexity of the application forms. One contractor said that in addition to frequently filling out the forms, he routinely reviews the applications that property managers/owners fill out.

5.2.2 Tracking Changes in Program Requirements

KEMA asked the contractors how they keep track of changes in the program's requirements. Figure 5-9 shows that the contractors cited checking websites, receiving utility emails, and calling the utility as the most common means of monitoring program developments. Contractors are not only checking the utility websites but also the ENERGY STAR website for product eligibility information. A number of contractors expressed dissatisfaction with the program's ability to give them current information about rebate availability.

Figure 5-9
How Participating Contractors Monitor
Changes in Program Requirements



Note: Data source is KEMA survey conducted in May-July 2005.

We asked the contractors whether it is difficult to find out which energy-efficient measures qualify for the program rebates. Only one of the contractors said that it was difficult. Contractors mentioned checking program websites, checking the Energy Star website, and calling the program staff as ways that they check on measure eligibility.

Finally KEMA asked the contractors whether any of their rebate applications had been rejected. Half of the contractors said that the program had rejected at least some of their applications. One contractor said his application rejection rate was as high as 10 percent but other estimates were 5 percent or less. Reasons for rejected applications included rebate monies running out, property managers/owners not allowing utilities to perform inspections, property managers/owners exceeding rebate eligibility limits, installing CFLs too soon after previous installation of CFLs, lighting measures no longer qualifying for Energy Star, and applications with incorrect information.

5.3 Quality Assurance

Program managers have long been concerned with improving the quality of the equipment and installations rebated through the program due to prior customer dissatisfaction that was reported in the

evaluations of the 2002 and 2003 programs as well as the Interim Report. Participating utilities have taken a number of actions to improve quality. These include:

- Conducting more frequent inspections of rebated projects;
- Conducting post-installation customer satisfaction surveys;
- Providing property managers/owners with manuals that help guide them in selecting contractors;
- Requiring contractors to provide contact information;
- Requiring contractors to provide single points of contact for warranty information;
- Requiring contractors to provide contact information for post-warranty product replacement;
- Requiring contractors to leave behind warranty information;
- Requiring contractors to provide post-installation customer satisfaction callbacks;
- Quickly responding to customer complaints and making contractors remedy the situation;
- Alerting contractors to quality concerns at annual program kickoff meetings;
- Increasing the incidence of inspections for problem contractors; and
- Gaining the authority to exclude noncompliant contractors from the program.

It is important to note that no one utility does all these things to assure quality. Some participating utilities provide property managers/owners with manuals for choosing contractors while others do not. Some utilities require contractors to provide warranty information while others only encourage contractors to do so. Some utilities conduct post-installation customer satisfaction surveys while other do not.

Interviews with the program managers revealed that they have different views as to the incidence of contractor quality problems and the best ways to address them. Some program managers prefer "jawboning" problem contractors rather than adding legal language to rebate applications or gaining legal power to exclude contractors. In some cases, financial constraints have prevented one utility from undertaking quality assurances measures that were implemented by another.

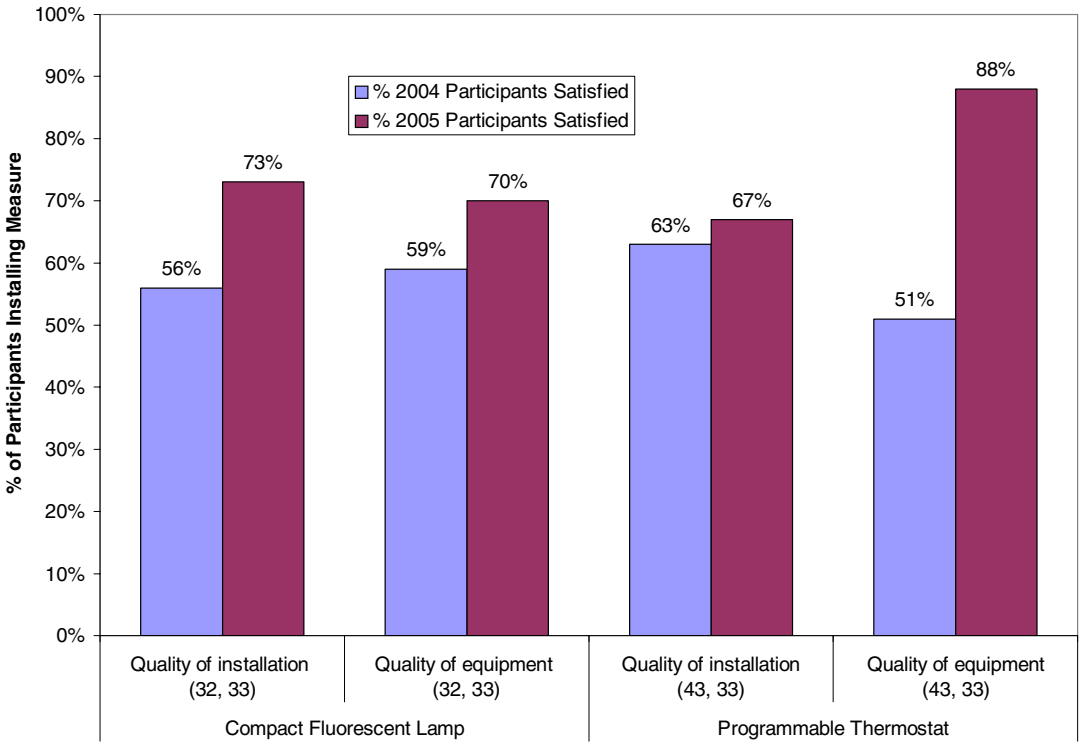
Some utilities are inspecting 100 percent of participant sites and one utility is calling back almost all of their participants. These practices were discussed in the April 2005 Best Practices Gap Analysis memorandum. This memorandum concluded that while program managers have good reason to be concerned about the quality of equipment and installations rebated by the program, such levels of project inspections may be unnecessarily expensive. Random samples of a much smaller percentage of sites or participants -- along with targeted inspections of new contractors, problem contractors, and very expensive measures -- would appear to be a more cost-effective approach to achieve the verification, deterrence, and information collection goals of the inspection process.

5.3.1 Satisfaction with Energy Efficiency Measures and Installation Contractors

KEMA asked the participating property managers/owners to rate their satisfaction with both the installation of the energy efficient equipment and the equipment itself. The ratings used a five-point scale

where 5 equaled "Extremely satisfied." The Interim Report had reported low levels of 2004 participant satisfaction with the quality of the installation and equipment for compact fluorescent lamps and programmable thermostats. The survey of 2005 participants, however, found improvement in these areas. Figure 5-10 shows that satisfaction ratings (4 or 5 satisfaction ratings) increased since 2004 for these two measures, and in some cases the level of increase was significant. Program efforts to improve quality control, as summarized above, likely deserve most of the credit for these improvements in program satisfaction. The level of 2005 participant satisfaction with other measures besides compact fluorescent lamps and programmable thermostats was fairly high, as Table 5-10 shows.

Figure 5-10
2004-2005 Participating Property Manager/Owners
Satisfaction with CFL and Programmable Thermostats
Installed in Tenants Units



Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

Table 5-4
2005 Participating Property Manager/Owner
Satisfaction with EE Equipment and Installation

Measure/ Installation Location	Satisfaction Category (Sample Size)	% 2005 Participants Satisfied
Common Area Installations		
Boiler Controls	Quality of installation (16)	100%
	Quality of equipment (16)	81%
Compact Fluorescent	Quality of installation (18)	56%
	Quality of equipment (18)	67%
EE Clothes Washers	Quality of installation (9)	100%
	Quality of equipment (9)	100%
EE Windows	Quality of installation (7)	86%
	Quality of equipment (7)	100%
Programmable Thermostats	Quality of installation (19)	68%
	Quality of equipment (19)	79%
Tenant Unit Installations		
Compact Fluorescent	Quality of installation (33)	73%
	Quality of equipment (33)	70%
EE Windows	Quality of installation (9)	89%
	Quality of equipment (9)	100%
Programmable Thermostats	Quality of installation (33)	67%
	Quality of equipment (33)	88%

Note: Data source is KEMA survey conducted in June 2006. For none of the measures were the differences between average satisfaction with common area installations and tenant unit installation statistically significant at a 95% confidence level.

Average satisfaction ratings were higher for projects that were mainly the participating property manager/owner's ideas (self-initiators) as opposed to those that were mainly contractor-driven (Table 5-5). Much of this had to do with the fact that 50 percent of the contractor-driven projects involved compact fluorescent lamps while only 21 percent of the self-initiator projects did. Of course, the 2005 participants were also less likely to criticize a project that they had conceived.

Table 5-5
2005 Participating Property Manager/Owner
Average Satisfaction Ratings
by Source of Project Idea

Origin of Project Idea (Sample Sizes)	Common Areas		Tenant Units	
	Quality of installation	Quality of equipment	Quality of installation	Quality of equipment
	Average Satisfaction Rating (5 = Very Satisfied)			
Project mainly participant's idea (37, 37, 34, 34)	4.63	4.62	4.30	4.61
Project mainly contractor's idea (17, 17, 25, 25)	3.82	3.59	3.96	3.92
Project idea came from other/multiple sources (41, 41, 56, 56)	4.38	4.56	4.26	4.31

Note: Data source is KEMA survey conducted in June 2006.

To explain the relatively low satisfaction ratings for CFLs reported in the Interim Report, one program manager theorized that some of the property managers/owners may have been dissatisfied with these lamps because they were unfamiliar with the technology. However, KEMA compared the CFL satisfaction ratings of the 2005 participants who have previously been aware of the CFL technology with those who had not been. As Table 5-6 shows, the 2005 participants who were new to the CFL technology were, on average, more satisfied with it than those who were already aware of the technology.

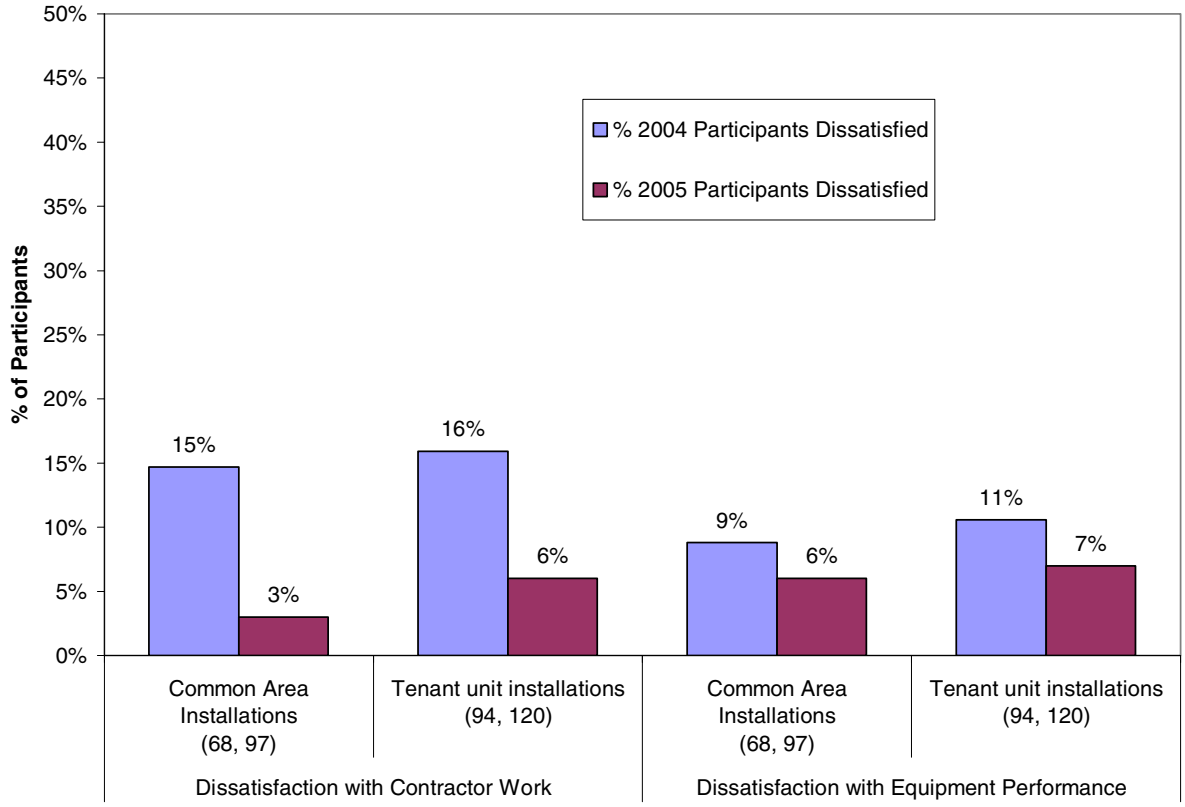
Table 5-6
2005 Participating Property Manager/Owner
Satisfaction Levels with CFLs
by Previous Familiarity with Technology

Origin of Project Idea (Sample Sizes)	Common Areas		Tenant Units	
	Quality of installation	Quality of equipment	Quality of installation	Quality of equipment
	% Satisfied (4,5)			
Prior awareness of measure (12, 12, 21, 21)	58%	67%	71%	62%
No prior awareness of measure (6, 6, 12, 12)	50%	67%	75%	83%

Note: Data source is KEMA survey conducted in June 2006.

KEMA also compared the 2004 and 2005 participants as to their dissatisfaction with their energy-efficient equipment and installation contractors. Figure 5-11 shows that 2005 participants were less likely to be dissatisfied than their 2004 counterparts, especially concerning the installation contractors. The 2005 participating property managers/owners who were dissatisfied with the equipment or the installations were asked why. Table 5-7 shows that the most-cited reasons for dissatisfaction were equipment breakdowns and poor-quality installations. The reasons for dissatisfaction did not vary by the type of measure to any significant degree.

Figure 5-11
2004-2005 Participating Property Manager/Owners
Dissatisfaction with EE Equipment and Installation



Note: Numbers in parentheses are sample sizes for 2004 and 2005 respectively. Data sources are KEMA surveys conducted in August 2005 and June 2006.

Table 5-7
2005 Participating Property Manager/Owner
Reasons for Dissatisfaction with Equipment and Installations

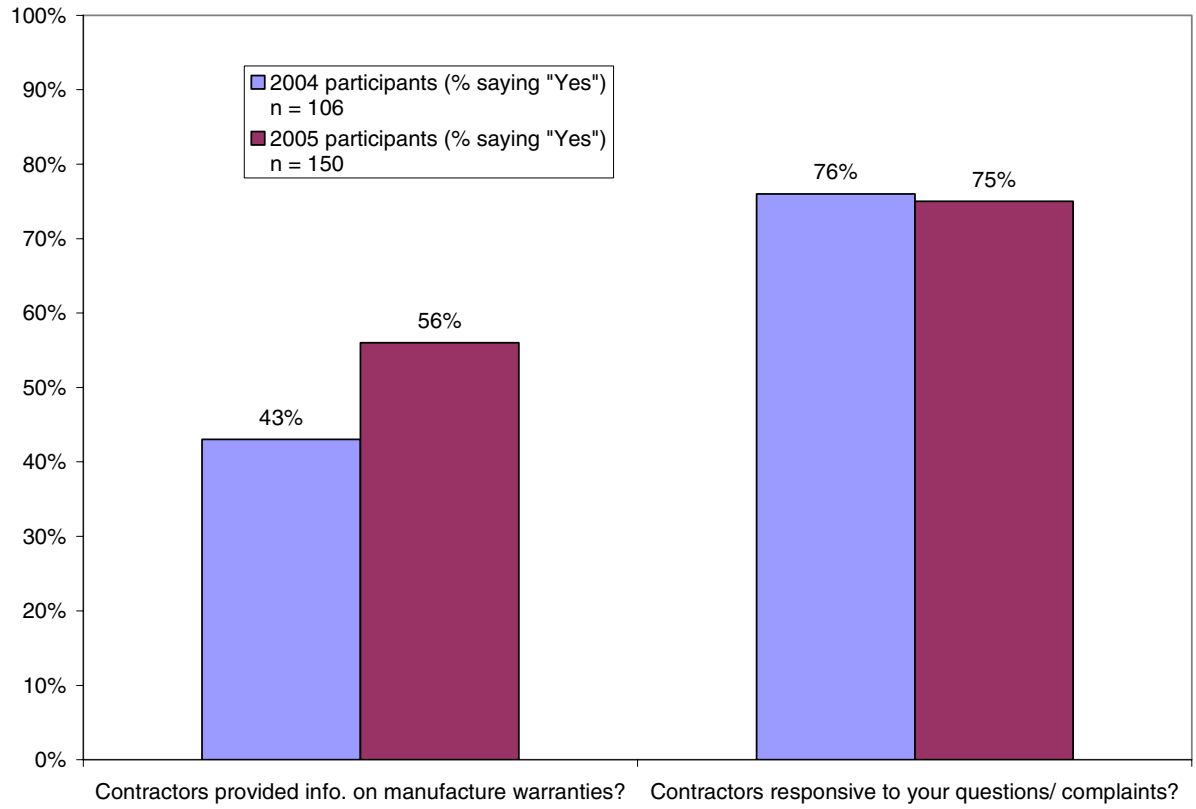
Respondent Group	Equipment broke down	Quality of equipment not up to our standards	Quality of installation not up to our standards	Didn't like the way the product looked	The installers didn't meet our standards	The job took to long	Installers were disruptive, messy	Other	Don't Know
Dissatisfied with contractor work in common areas (n = 16)	31%	31%	38%	6%	25%	13%	6%	1%	6%
Dissatisfied with equipment performance in common areas (n = 10)	60%	30%	40%	20%	20%	10%	0%	0%	0%
Dissatisfied with contractor work in tenant units (n = 24)	29%	21%	38%	8%	13%	17%	4%	8%	4%
Dissatisfied with equipment performance in tenant units (n = 16)	69%	13%	31%	0%	0%	6%	0%	6%	0%

Note: Data source is KEMA surveys conducted in June 2006.

5.3.2 Property Manager/Owner-Reported Quality Assurance

KEMA asked both 2004 and 2005 participating property managers/owners whether their contractors had provided any information on manufacturer warranties for the installed equipment and had been responsive to their questions and complaints. Figure 5-12 compares the responses of these two participant groups. It shows that the 2005 participants were more likely to have received information on manufacturer warranties than the 2004 participants. Three quarters of the 2005 property managers/owners said that their contractors were responsive to their questions and complaints, as was the case with the 2004 participants.

Figure 5-12
2004-2005 Participating Property Manager/Owner
Assessment of Contractor Quality Control Procedures



Note: Data sources are KEMA surveys conducted in August 2005 and June 2006.

5.3.3 Contractor Self-Reported Quality Assurance

KEMA asked the participating contractors whether they leave behind product information and information about warranties with the property manager/owner. As first reported in the Interim Report, twenty of the contractors (71 percent) said that they leave product warranty information behind. Ten of the contractors (36 percent) said that they routinely leave specifications and other product information behind. A number of contractors also said that they routinely provide their own contact information, instructions for operating programmable thermostats, and other O & M information.

The contractors who installed lighting measures were also asked if they leave behind extra lamps in case of early burnout. Seventeen of the twenty-one lighting installers (81 percent) said that they leave extra lamps behind as a standard practice. Three of these contractors said that they leave behind enough extra lamps to replace 10 percent of what they installed. Others reported spare lamps accounting for 2 to 5 percent of their installations. The four lighting contractors who do not routinely leave behind extra lamps all said that they leave behind lamps if the customer asks or replace early burnouts if the customer calls.

KEMA queried the contractors as to their standard operating procedures when customers are unhappy with the equipment they install or the installation itself. Twenty of the contractors (71 percent) said that their standard procedure is to send someone out to fix the problem. One contractor even said that his company's policy is to respond to all customer calls in one half hour and make service calls within three hours. Seven contractors commented that the incidence of customer complaints was either very small or even nonexistent.

Participating contractors said that, on average, over 70 percent of their lighting products come directly from manufacturers. Since quality-control testing of CFLs by organizations such as PEARL is currently limited to retail products, this raises concerns that the CFLs installed by participating contractors may be of lower quality than those that are subject to quality testing. As discussed earlier, participant satisfaction with CFLs was not very high.

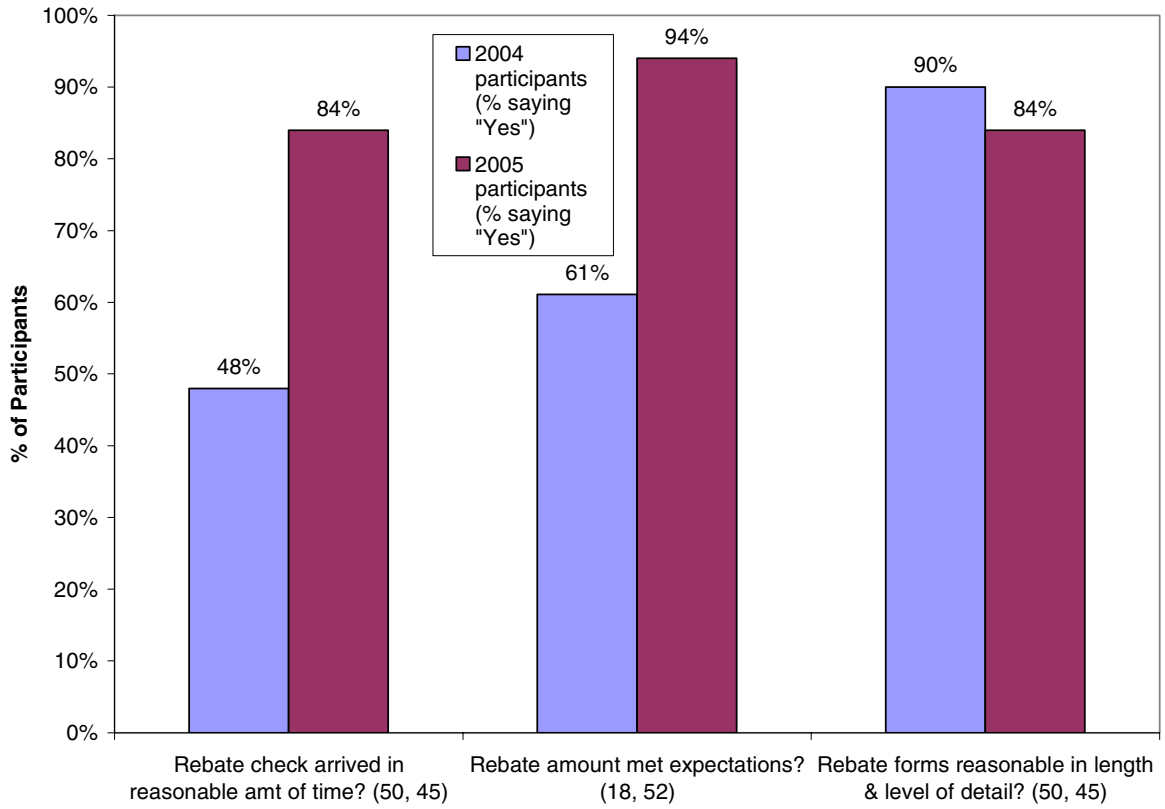
5.4 Satisfaction with Program Processes

5.4.1 Participating Property Managers/Owners

KEMA asked 2004 and 2005 participating property managers/owners who had either filled out a rebate application form or received rebates whether they were satisfied with the amount of the check, the timeliness of the check, and the user-friendliness of the rebate application forms. Figure 5-13 shows that 2005 participants were very satisfied with these program processes – with satisfaction levels in the 84 -94 percent range. It also shows that 2005 participants were much more likely than the 2004 participants to be satisfied with the timeliness of the rebate check and the rebate amount. Although there appears to be a decrease in satisfaction with the rebate forms, this difference between 2004 and 2005 participants was actually not significant at the 95 percent confidence level.

Since most rebate levels remained the same between 2004 and 2005, it is difficult to explain why satisfaction with rebate amounts would have increased so much. One possibility is that if there was a higher share of self-initiators in the 2005 participant pool, as discussed earlier in this report, this would translate into higher average participant knowledge of rebate levels and other project details. Therefore it would be less likely that participants would be disappointed because their contractors made unrealistic estimates of the rebate amounts. It is also possible that program staff and participating contractors did a better job of managing participant expectations concerning rebate payments for the contractor-driven projects. Another possibility is that increased satisfaction with the quality of the energy-efficient equipment and its installation (Figure 5-10) also made the 2005 participants more happy with the rebate payment.

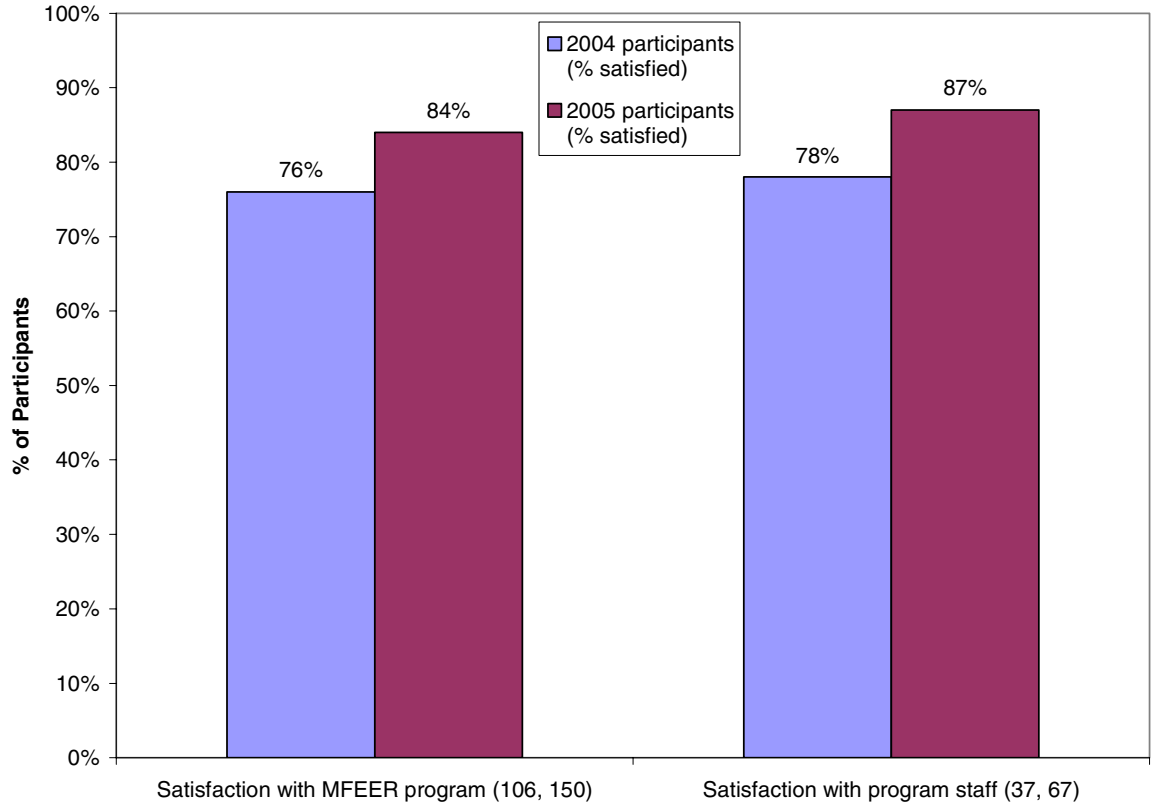
Figure 5-13
Participating Property Manager/Owner
Satisfaction with Rebate Process



Note: Numbers in parentheses are sample sizes for 2004 and 2005 respectively. Data sources are KEMA surveys conducted in August 2005 and June 2006.

KEMA also asked the participating property managers/owners about their satisfaction with program staff and the program as a whole and whether they would recommend this program to another property manager. Figure 5-14 shows that a large majority of the 2005 participants were satisfied with both the program staff and the program as a whole. When asked whether they would recommend the program to another property manager/owner, 93 percent (n = 150) said that they would. Only 15 of the 150 2005 participant respondents said that they were dissatisfied with the program as a whole. Poor product performance, poor workmanship, and not enough program information were the only reasons for dissatisfaction cited by more than one respondent.

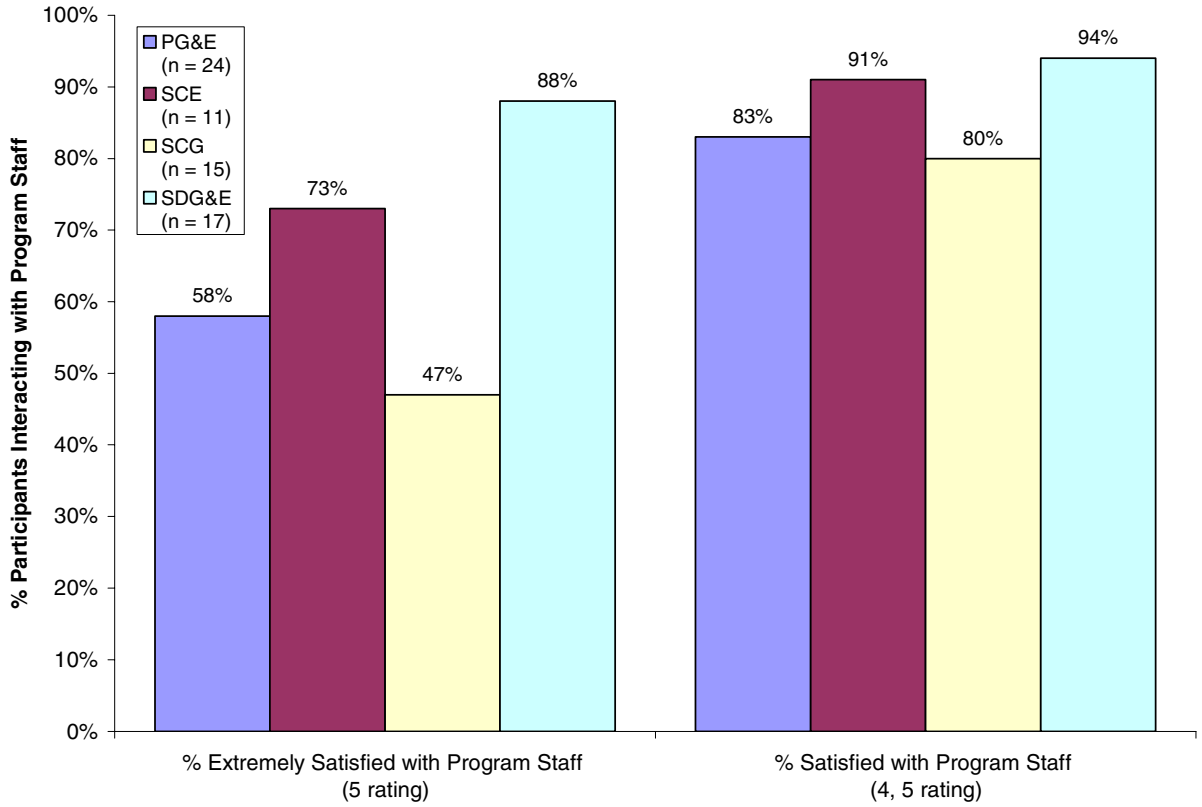
Figure 5-14
2004-2005 Participating Property Managers/Owners
Satisfaction with Program, Program Staff



Note: Numbers in parentheses are sample sizes for 2004 and 2005 respectively. Data sources are KEMA surveys conducted in August 2005 and June 2006. Neither of the differences in satisfaction levels between the 2004 and 2005 participants are statistically significant at the 95 percent confidence level.

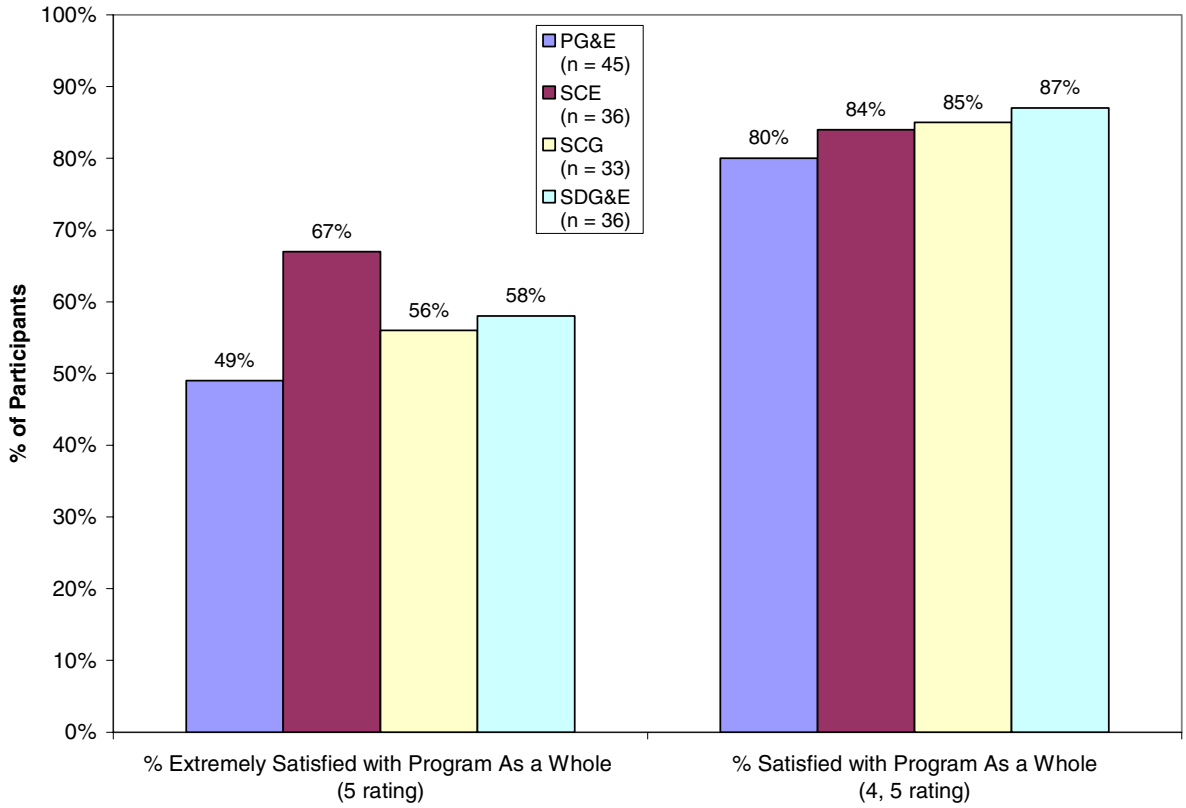
KEMA also looked to see whether 2005 participant satisfaction levels varied among the different utilities. Figure 5-15 shows that that there was some variation among the utilities as to the percentage of 2005 participants who were "extremely satisfied" with the program staff, but this variation was much less when overall satisfaction (either a 4 or 5 satisfaction rating) was measured. When comparing utilities on the basis of participant satisfaction with the program as a whole (Figure 5-16), there was less variation among the "extremely satisfied" group than there was when rating satisfaction with program staff. Overall program satisfaction ratings were very similar among the four utilities.

Figure 5-15
2005 Participating Property Managers/Owners
Satisfaction with Program Staff
by Utility



Note: Data source is KEMA survey conducted in June 2006.

Figure 5-16
2005 Participating Property Managers/Owners
Satisfaction with Program As a Whole
by Utility



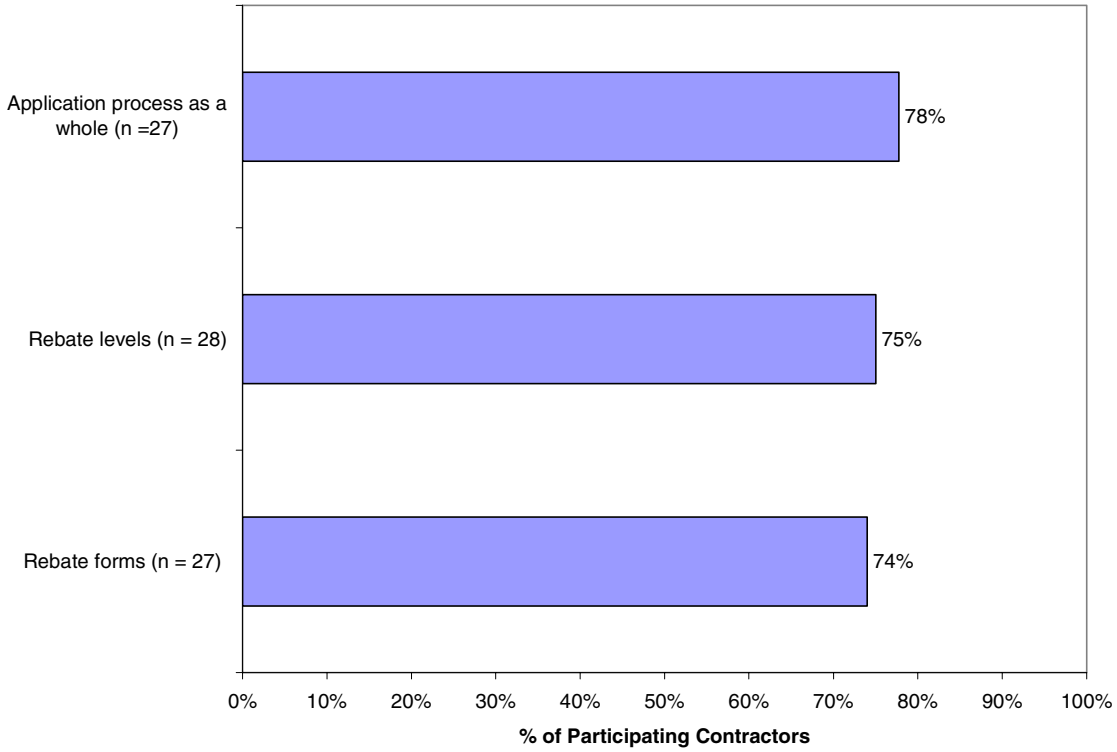
Note: Data source is KEMA survey conducted in June 2006.

As discussed in the Interim Report, this relatively high level of participant satisfaction is somewhat surprising considering a large proportion of the respondents are still not satisfied with the quality of the equipment or installations (Figure 5-10). One possible explanation is that the participating property managers/owners were grateful enough to be getting new lighting fixtures and other equipment at relatively low cost (or no cost in some cases), that they saw these benefits as outweighing any problems with substandard equipment or late rebate payments. Another possibility is that contractor responsiveness in responding to customer complaints has helped mollify program participants. Past program evaluation studies have also noted that satisfaction levels with programs as a whole are often higher than satisfaction with individual program attributes.

5.4.2 Participating Contractors

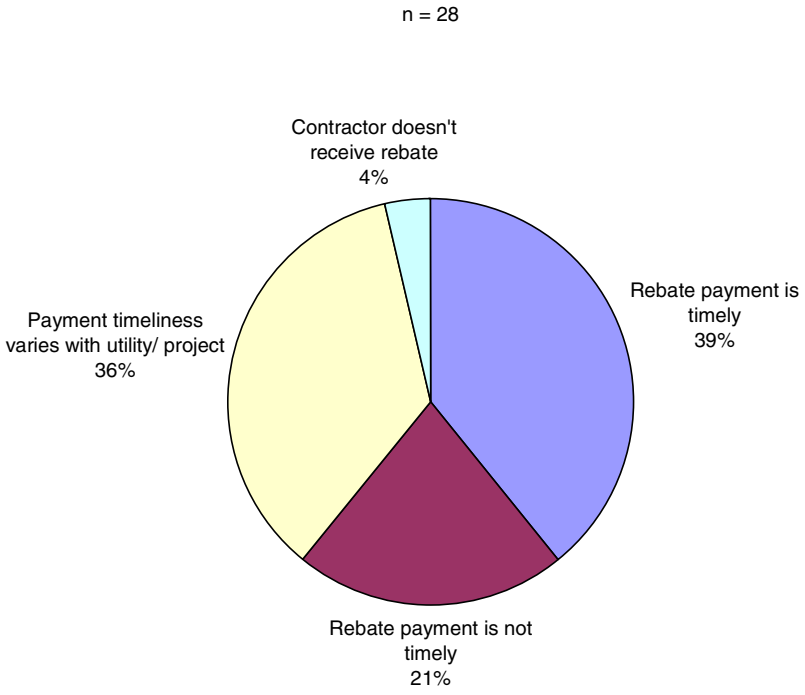
Contractor satisfaction with the program was very high. As first reported in the Interim Report, 85 percent of contractors said they were satisfied (4 or 5 on a five-point scale where 5 equals "Very satisfied") with the program. Satisfaction with the various program attributes was also high. Over three-quarters of the contractors were satisfied with the rebate levels and the rebate process (Figure 5-17). However, fewer than forty-percent of the contractors said that rebate payments were consistently made in a timely manner (Figure 5-18). Over two-thirds of the contractors were satisfied with the program staff and website (Figure 5-19).

Figure 5-17
Contractor Satisfaction with
Rebate Levels and the Rebate Process



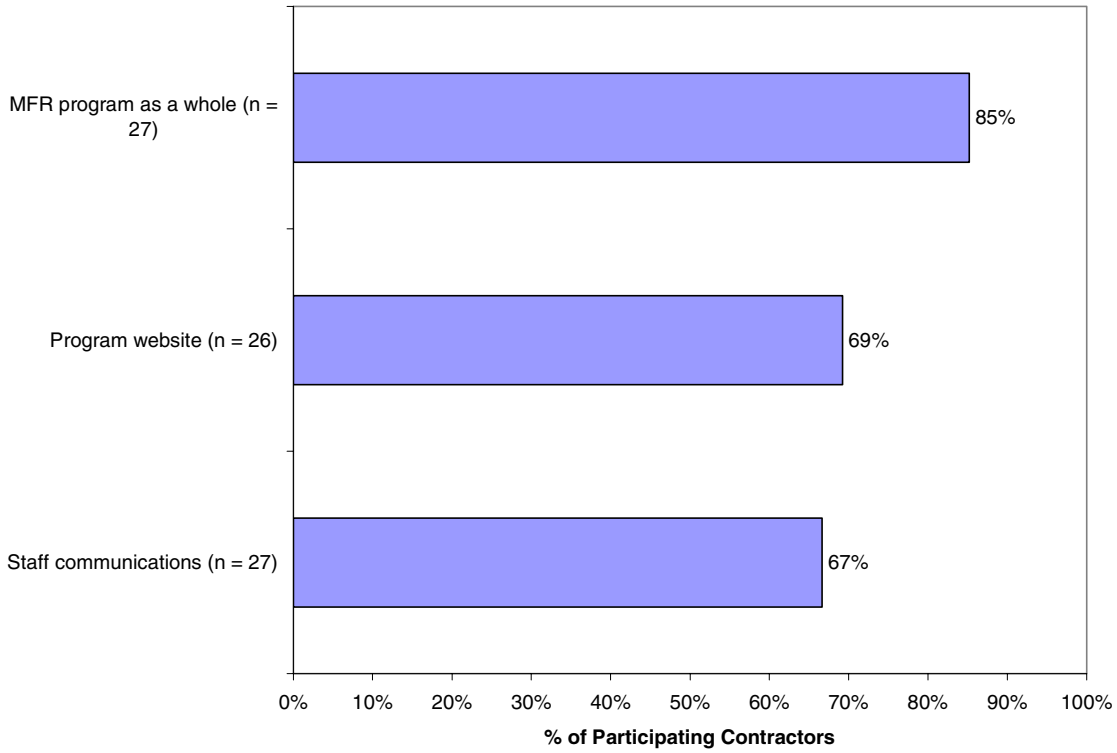
Note: Data source is KEMA survey conducted in May-July 2005.

Figure 5-18
Participating Contractor
Assessment of Rebate Payment Timeliness



Note: Data source is KEMA survey conducted in May-July 2005.

Figure 5-19
Contractor Satisfaction with
Staff Communications, the Program Website, and the Program As a Whole



Note: Data source is KEMA survey conducted in May-July 2005.

KEMA also asked the contractors about the program's system for reserving rebate funds. Most contractors were happy with the existing system. A couple of contractors did criticize the "first-come first served" method of rebate allocation practiced by most participating utilities. They said it was unfair to smaller contractors who could not line up or perform installation work as quickly, it encouraged fast and sloppy installation work, and it burdened program staff by making them process a lot of paperwork in a short amount of time. They preferred the SCE system, which breaks the rebate allocations into quarters and gives each contractor a certain amount of reserved rebate money.

The contractors were asked what they liked about the program. The most-liked program attributes were the ability of rebates to help drive sales, the energy savings that benefited tenants and utilities, and timeliness and efficiency in the administration of program processes (Table 5-8).

Table 5-8
What Participating Contractors
Like About the MFR Program

What Contractors Like About the Program	% of Participating Contractors (n = 27)
Rebates drive sales, give contractors business	37%
General, unspecified praise (e.g., "good program")	33%
Program is well-run, rebate process is timely, efficient	30%
Program helps save energy, benefiting tenants, utilities	30%
Simple, straightforward program design	19%
Utility participation gives credibility to EE measures being promoted	7%
Program reaches underserved market sector	7%
Program introduces contractors to new market sector	7%
Other (rebate payments are dependable, helps environment, program provides technical information, pilot duct testing program, et al.)	19%

Note: Totals may exceed 100% because multiple responses were allowed. Data source is KEMA survey conducted in May-July 2005.

Not all contractors were satisfied with the program and its processes.

- Contractors who were less than satisfied with the program websites (n = 8) said that the websites should have more information about rebate availability, should provide more precise program staff contact information, should allow rebate applications to be filled out on-line, and should provide more contractor-specific information;
- Contractors who were less than satisfied with the rebate application forms (n = 7) said that the form were too lengthy and repetitive, that the forms were not uniform across utilities, that the forms were too complicated and legalistic, that they could not fill out the form on-line, that they could not fill out the application in Microsoft Excel™ format, and that the form should make it clearer to property managers/owners that the follow-up inspections were mandatory; and
- Contractors who were less than satisfied with the rebate process as a whole (n = 6) mentioned delays in rebate payments and delays in the inspection process.

5.4.3 Participant Recommendations for Program Improvement

5.4.3.1 Participating property managers/owners

The 2005 participating property managers/owners were asked how the program could be improved. Fifty-eight percent of the respondents had no suggestions for improvement. The suggestions for improvement

were wide-ranging with only one suggestion – doing more marketing and education about the program -- being cited by more than 10 percent of respondents (see Table 5-9).

Table 5-9
2005 Participating Property Manager/Owner
Suggestions for Program Improvements

Suggestions for Improvement	% of 2005 Participating Property Managers/Owners Making Recommendation (n = 150)
Do more program marketing/education	13%
Make the paperwork simpler	6%
Offer larger rebates	5%
Offer more types of programs	4%
Get contractors/installers who do better work	3%
Explain program requirements better	3%
Improve equipment quality	3%
Make sure there are bulb replacements	3%
Other recommendations	3%
Don't know/ Don't have recommendations	58%
Refused	1%

Note: Totals may exceed 100% because multiple responses were allowed. Data source is KEMA survey conducted in June 2006.

5.4.3.2 Participating Contractors

KEMA also asked the participating contractors about how the program rebates could be improved. First we asked them whether there were any rebated measures for which the rebates were too low. Over half of the contractors cited at least one measure that they believed to have insufficient rebates (Table 5-10). The most-cited measures were exterior lighting and T5s/T8s with five contractors mentioning each of these. One contractor observed that MFR program rebates for exit signs were lower than those for Express Efficiency Program. Therefore he would try to qualify customers receiving exit sign retrofits for the Express Efficiency program instead of the MFR program.

Second we asked the contractors if there were any non-rebated measures for which the program should be offering rebates. The general consensus was that the program was covering all the important measures. Only five contractors (19 percent) suggested additional measures to rebate. The suggested measures included advanced thermostats with occupancy sensors, weather stripping, retrofit kits for flood lamps, air

conditioning controls, and duct testing and sealing. None of these measures was suggested by more than one contractor. One contractor also recommended that incentives be provided for contractors who do follow up measurement and verification for their installations. Finally KEMA asked the contractors whether they would be more active in the program than currently if rebates incentives were available all year round. All but one of the contractors said that they would be.

Table 5-10
Participating Contractors
Suggestions for Rebate Increases

Are there any rebates that you think are too low?	% of Participating Contractors (n = 27)
No	41%
Exterior lighting	19%
T5s/T8s	19%
Programmable thermostats	11%
Exit signs	7%
All measures	7%
Other measures (Energy Star lighting, hot water controllers, CACs, CFLs)	15%
Increase rebate funds in general	4%

Note: Totals may exceed 100% because multiple responses were allowed. Data source is KEMA survey conducted in May-July 2005.

Finally KEMA asked the contractors for suggestions on how the program could be improved. Twenty-two of the twenty-seven respondents had recommendations for improvement. Most of these recommendations concerned changes in rebate funding and rules. These recommendations included:

5.4.3.2.1 Rebate funding/rules recommendations

- *Increase rebate/program funding (10 contractors)* - This was by far the most cited recommendation. Contractors said that they could perform many more installations if the rebate funds lasted throughout the year.
- *Longer rebate reservation periods (2)* – One of the contractors preferred the SCE reservation system that rations the rebate funds over the course of the year and gives each contractor a certain amount of reserved rebate money.
- Higher rebate levels (1).
- Don't eliminate rebates for programmable thermostats (1).
- *Don't limit the number of CFLs that can be installed in a tenant unit (1).* One contractor thought that the current limit of eight CFLs per tenant unit was too restrictive. He said that since it costs so much to get access to a unit, one might as well get as much savings as possible.

- *Don't accept rebate applications for old installation projects on program start date (1).* One contractor claimed that many contractors complete projects before the start of the program and then claim this backlog of projects when the program opens. The contractor noted that this consumes much of the available rebate funds – which for most utilities are available on a first-come, first-served basis. Of course, from a program manager's perspective, these practices would also be of concern due to free ridership.

5.4.3.2.2 Contractor relations/communications

- Provide more information on program status (3 contractors) – Contractors said that it would be helpful to get more advanced notice of when the program starts and when rebate funds for certain measures are close to running out.
- *Give contractors support/recourse when property managers/owners are problematic (2)* – Contractors said that they lose money when rebates are not paid out because property managers/owners refuse to allow utility inspectors in or want their old lighting measures re-installed.
- *Provide contractors with information on underserved areas (1)* – One contractor said that it would helpful to have maps/information on eligible areas that have not had many projects financed by the program. Having this information would allow contractors to expand their service areas and target underserved areas.
- *Create a conflict resolution process (1)* – One contractor said that there should be a forum where disputes between utilities and contractors can be resolved. He recommended that a neutral third party such as the California Public Utilities Commission monitor this process.

5.4.3.2.3 Program administration/marketing recommendations

- Market the program more (2 contractors);
- Improve program administration (1);
- Improve rebate application forms (1);
- Train program staff to be more polite/professional (1);
- Pay rebates more quickly (1); and
- Conduct post-installation inspections more quickly (1).

5.5 Summary of Evaluation of Program Processes

5.5.1 Program Marketing Activities and Strategies

- Although prospecting by installation contractor is the main means of marketing the program, program managers mentioned other marketing efforts for the program including bill inserts, direct mail, email, advertisements and articles in multifamily trade journals, presentations to apartment associations, and the program websites.

- *Most utilities in the program have only used direct mail for marketing on a limited basis.* Because most of the participating utilities use a "first-come-first-served" method of distributing rebates, there is only a limited window of time for an effective direct mail campaign. Plus the inherent popularity of these rebates makes a costly direct mail campaign appear unnecessary. Therefore most utilities have focused their direct mail campaigns on promoting rebates for measures such as boiler controllers, water heater controllers and insulation, which tend to go less quickly.
- Current utility marketing efforts with multifamily trade associations are in large part designed to recruit more "self-initiators." These efforts should be encouraged. A greater diversity of installed measures and a greater likelihood for future energy efficiency projects are the perceived benefits of getting more self-initiators into the program vs. 'contractor-driven' participants. The evaluation of the 2004 and 2005 programs found no evidence of a difference between the contractor-driven participants and self-initiators in terms of their measure diversity. However, the survey of 2005 participating property managers/owners did find evidence that self-initiators are more likely to have plans for future energy efficiency projects. In addition, the marketing activities targeted at self initiators -- such as making presentations before apartment associations or paying for advertisements in multifamily trade publications -- would likely benefit a broader range of property managers/owners than just the self-initiators.
- The Program does not appear to be leveraging existing tracking databases to identify untapped energy efficiency opportunities from past participants. This "data-mining" has been identified as a "best practice" for multifamily energy efficiency program in a national study. The elimination of the programmable thermostat rebate will make it increasingly difficult for program managers to meet their energy savings goals. This makes alternative ways of finding new energy projects such as "data-mining" all the more necessary.

5.5.2 Sources of Program Awareness

- The installation contractor was, by far, the most-cited source of program information for both 2004 and 2005 participants as well as nonparticipants.
- The 2005 participating property managers/owners appear to be hearing about the program from a wider diversity of sources than their 2004 counterparts. The 2005 participants cited a wider variety of program information sources than the 2004 participants had. This likely reflects recent efforts by utilities to try to attract more "self-initiating" participants through outreach to apartment associations, as well as the word-of-mouth echo effects of these activities.
- Direct mail was the most-cited preferred source of program information for both 2004 and 2005 participating property managers.
- However, 2005 participants were more likely to prefer utility websites and much less likely to prefer bill inserts than the 2004 participants. This is further evidence of the growing comfort and familiarity of participating property managers with the Internet.
- Nonparticipating property managers favored utility direct mail and bills inserts as ways to get utility energy efficiency information.

5.5.3 Contractor Assessment of Program Marketing

- *Participating contractors gave a middling rating to the program on its marketing efforts.* About half of the contractors were less than satisfied with the program's marketing efforts. The average satisfaction score was 3.6 on a five-point scale. The typical comment of the less-satisfied contractors was that the property managers/owners they encounter have rarely heard of the program.
- Interestingly participating contractors who agreed that the program was not doing much marketing did not agree as to whether the program should be doing more marketing. While some contractors thought that more marketing would be beneficial, others thought that marketing should be the contractor's responsibility. Some marketers even admitted that they feared that more marketing of the program would make many property managers/owners self-sufficient.
- Contractors suggestions for improving program marketing including utility bill inserts, print ads, wider availability of program brochures, educational seminars for property managers/owners with contractors as guest speakers, allowing contractors to use utility letterhead, and the circulation of lists of qualified local contractors to property managers/owners.
- Nearly three-quarters of nonparticipating boiler/plumbing contractors preferred direct mail as the way to receive program information.
- Nonparticipating boiler/plumbing contractors simply getting more information about the program to the contractors would be the most effective recruitment strategy. In addition to direct mail, they mentioned telephone calls, emails, and advertisements at home improvement and hardware stores as ways to do this.

5.5.4 Program Participation Activities

- The large majority of the participating property managers/owners who are aware of their participation in the program and receiving rebates are filling out their own rebate forms.
- About half of the participation-aware participants that are not receiving rebates are still filling out the rebate application forms.
- There is no evidence that participants who are self-initiators contractor sources are more likely to fill out their own rebate applications or are more likely to call the program staff when they do. This suggests that recruiting more participants who are self-initiators would not create an undue work burden on program staff.
- Seventy-one percent of the participating contractors said that they fill out rebate applications on behalf of their customers.
- Participating contractors said that checking websites, receiving utility emails, and calling the utility were their most common means of monitoring program developments.
- Only one participating contractor said that it was difficult to find out which energy-efficient measures qualify for the program rebates.

- Half of the participating contractors said that the program had rejected at least some of their applications. Reasons for rejected applications included rebate monies running out, property managers/owners not allowing utilities to perform inspections, property managers/owners exceeding rebate eligibility limits, installing CFLs too soon after previous installation of CFLs, lighting measures no longer qualifying for Energy Star, and applications with incorrect information.

5.5.5 Quality Assurance

- Utilities participating in the program have taken a number of actions to improve the quality of equipment and installations rebated by the program. These include more frequent inspections of rebated projects, conducting post-installation customer satisfaction surveys, providing property managers/owners with manuals that help guide them in selecting contractors, requiring contractors to provide contact and warranty information for addressing post-installation problems, quickly responding to customer complaints and making contractors remedy the situation, and even gaining the authority to exclude noncompliant contractors from the program. However, no one utility does all these things to assure quality.
- *Some of the measures to insure quality assurance may not be cost-effective.* Some utilities are inspecting 100 percent of participant sites and one utility is calling back almost all of their participants. Yet it is not clear why such a high level of inspections or callbacks is necessary for the purposes of verification, deterrence, or information collection. Random samples of a much smaller percentage of sites or participants -- along with targeted inspections of new contractors, problem contractors, and very expensive measures -- would appear to be a more cost-effective approach.
- Evidence from the 2005 participating property managers/owners suggests that although quality control remains a concern, it does seem to have improved since the evaluation of the 2004 program.
  - The Interim Report had reported low levels of 2004 participant satisfaction with the quality of the installation and equipment for compact fluorescent lamps and programmable thermostats. The survey of 2005 participants, however, found significant improvement in these areas.
  - The level of 2005 participant satisfaction with other measures besides compact fluorescent lamps and programmable thermostats was fairly high.
  - 2005 participants were less likely to be dissatisfied with their energy-efficient equipment and installation contractors than their 2004 counterparts, especially concerning the installation contractors.
  - 2005 participants were more likely to have received information on manufacturer warranties than the 2004 participants.
- The most-cited reasons by 2005 participating property managers/owners for dissatisfaction were equipment breakdowns and poor-quality installations. The reasons for dissatisfaction did not vary by the type of measure to any significant degree.
- Average satisfaction ratings were higher for projects that were mainly the participating property manager/owner's ideas (self-initiators) as opposed to those that were mainly

contractor-driven. Much of this had to do with the fact that 50 percent of the contractor-driven projects involved compact fluorescent lamps while only 21 percent of the self-initiator projects did. Of course, the 2005 participants were also less likely to criticize a project that they had conceived.

- Participating contractors claim that they are taking actions to improve customer satisfaction with their equipment and installations.
  - Seventy-one percent of the contractors said that they leave product warranty information behind.
  - Eighty-one percent of the contractors who installed lighting measures said that they leave extra lamps behind as a standard practice.
  - Seventy-one percent of the contractors said that when customers are unhappy with the equipment they install or the installation itself, their standard procedure is to send someone out to fix the problem.
  - Over three quarters of the property managers/owners did say that their contractors were responsive to their questions and complaints

5.5.6 Satisfaction with Program Processes

- 2005 participants were very satisfied with rebate amounts, the timeliness of rebate payment, and rebate forms – with satisfaction levels in the 84 -94 percent range.
- The 2005 participating property managers/owners were much more likely than the 2004 participants to be satisfied with the timeliness of the rebate check and the rebate amount. Since most rebate levels remained the same between 2004 and 2005, it is difficult to explain why satisfaction with rebate amounts would have increased so much. One possibility is that if there was a higher share of self-initiators in the 2005 participant pool and this would translate into higher average participant knowledge of rebate levels and other project details. Therefore it would be less likely that participants would be disappointed because their contractors made unrealistic estimates of the rebate amounts.
- A large majority of the 2005 participants were satisfied with both the program staff (84 percent) and the program as a whole (87 percent).
- There was some variation among the utilities as to the percentage of 2005 participants who were “extremely satisfied” with the program staff, but this variation was much less when overall satisfaction (either a 4 or 5 satisfaction rating) was measured.
- When asked whether they would recommend the program to another property manager/owner, 93 percent said that they would.
- This relatively high level of participant satisfaction is somewhat surprising considering a large proportion of the respondents are still not satisfied with the quality of the equipment or installations. One possible explanation is that the participating property managers/owners were grateful enough to be getting new lighting fixtures and other equipment at relatively low cost (or no cost in some cases), that they saw these benefits as outweighing any problems with substandard equipment or late rebate payments. Another possibility is that contractor responsiveness in responding to customer complaints has helped mollify program participants. Past program evaluation studies

have also noted that satisfaction levels with programs as a whole are often higher than satisfaction with individual program attributes.

- Participating contractors were also very satisfied with the program as a whole and were satisfied with most program processes except the length of rebate payment.
  - Eighty-five percent were satisfied with the program as a whole.
  - Over three-quarters were satisfied with the rebate levels and the rebate process
  - Over two-thirds were satisfied with the program staff and website
  - Most contractors were happy with the existing rebate reservation system.
  - However, fewer than forty-percent of the contractors said that rebate payments were consistently made in a timely manner.

5.5.7 Participant Recommendations for Program Improvement

- Fifty-eight percent of the 2005 participating property managers/owners had no suggestions for improving the program.
- *Those who had suggestions for program improvement provided a very wide range of recommendations.* Doing more marketing and education about the program was the only recommendation cited by more than 10 percent of respondents.
- Over half of the participating contractors cited at least one measure that they believed to have insufficient rebates. The most-cited measures were exterior lighting and T5s/T8s.
- The general consensus of the participating contractors was that the program was offering rebates for all the important energy efficiency measures.
- All but one of the contractors said that they would be more active in the program than currently if rebates incentives were available all year round.
- *Twenty-two of the twenty-seven responding participating contractors had recommendations for improving the program.* Recommendations that were made by more than one contractor included increasing rebate/program funding, providing more information on program status, increasing rebate reservation periods, giving contractors support/recourse when property managers/owners are problematic, and doing more marketing of the program.

6. Impact Evaluation

6.1 Overview

Through providing rebates to qualifying properties, the program intended to achieve net savings of 54,954 MWh, 9,565 kW, and 4,377,233 therms associated with the installed measures' first year of operation. Table 6-1 shows the program's net savings goals by measure category, along with each measure category's expected contribution to total net savings for the first year of installed measure operation.

Table 6-1
Net Energy Savings Goals Associated with First Year of Installed Measure Operation, by Measure Category

	Program Net Goals				Percentage of Total Program Net Goals		
Measure Category	**Units**	**kW**	**kWh**	**Therms**	**kW**	**kWh**	**Therms**
Air Conditioners	1,850	89	352,634	19,669	0.9%	0.6%	0.4%
Boiler Controllers	2,006	-	-	1,703,203	-	-	38.9%
Boilers	518	-	-	599,593	-	-	13.7%
CFLs	347,703	3,164	26,979,830	-	33.1%	49.1%	-
Clothes Washers	1,702	29	149,425	98,912	0.3%	0.3%	2.3%
Dishwashers	192	1	4,165	2,799	0.0%	0.0%	0.1%
Faucet Aerators	2,200	4	17,328	4,993	0.0%	0.0%	0.1%
Furnaces	3,643	-	-	40,698	-	-	0.9%
Heat Pumps	10	16	8,909	-	0.2%	0.0%	-
High Performance Windows (square feet)	437,500	1,374	891,195	102,036	14.4%	1.6%	2.3%
Insulation (square feet)	702,000	856	593,864	68,504	8.9%	1.1%	1.6%
LED Exit Signs	2,930	100	821,462	-	1.0%	1.5%	-
Lighting Controls	360	5	31,664	-	0.1%	0.1%	-
Low-Flow Showerheads	12,012	51	236,878	73,360	0.5%	0.4%	1.7%
Programmable Thermostats	51,074	2,569	15,931,095	1,416,439	26.9%	29.0%	32.4%
T8s	94,131	1,303	8,905,265	-	13.6%	16.2%	-
Water Heaters	1,133	4	30,741	247,027	0.0%	0.1%	5.6%
Total	**1,660,964**	**9,565**	**54,954,453**	**4,377,233**	**100.0%**	**100.0%**	**100.0%**

The program ultimately claimed net energy savings of approximately 104,347,000 kWh, 17,500 kW and 4,235,000 therms associated with the installed measures' first year of operation. Table 6-2 shows the program's reported accomplishments by measure category, along with each measure category's reported contribution of energy savings. As shown, lighting measures and programmable thermostats ultimately accounted for most of the program's claimed electricity (both peak and energy) savings. Boiler controls and programmable thermostats contributed the most to the program's claimed gas savings.

Table 6-2
Program Reported Net Accomplishments Associated with First Year of Installed Measure Operation, by Measure Category

Measure Category	Program Reported Net Accomplishments				Percentage of Program Reported Accomplishments		
	Units	kW	kWh	Therms	kW	kWh	Therms
Evaporative Coolers	50	76	48,840	-	0.4%	0.0%	-
Air Conditioners	677	235	211,240	-	1.3%	0.2%	-
Boiler Controls	1,550	-	-	1,441,702	-	-	34.0%
Boilers	268	-	-	213,689	-	-	5.0%
Ceiling Fans with CFL	80	1	2,314	-	0.0%	0.0%	-
CFLs	877,638	7,717	64,376,472	-	44.0%	61.7%	-
Clothes Washers	373	2	28,334	18,443	0.0%	0.0%	0.4%
Dishwashers	995	5	30,777	14,142	0.0%	0.0%	0.3%
Duct Improvements	7,381	657	994,261	-	3.7%	1.0%	-
Faucet Aerators	3,881	5	30,599	8,781	0.0%	0.0%	0.2%
Furnaces	392	-	0	16,208	-	0.0%	0.4%
Heat Pumps	331	197	282,239	-	1.1%	0.3%	-
High Performance Windows (square feet)	328,092	868	605,268	54,143	5.0%	0.6%	1.3%
Insulation (square feet)	675,679	220	148,143	38,706	1.3%	0.1%	0.9%
LED Exit Signs	1,331	44	373,392	-	0.3%	0.4%	-
Lighting Controls	105	2	8,925	-	0.0%	0.0%	-
Low Flow Showerheads	2,504	7	49,500	15,339	0.0%	0.0%	0.4%
Pool Pumps	6	4	7,567	-	0.0%	0.0%	-
Programmable Thermostats	99,584	6,478	27,195,251	2,335,369	36.9%	26.1%	55.1%
T8s	90,622	1,018	7,931,260	-	5.8%	7.6%	-
Torchiers	8,208	-	2,016,213	-	-	1.9%	-
Water Heaters	947	-	6,792	78,686	-	0.0%	1.9%
Total	**2,100,694**	**17,535**	**104,347,387**	**4,235,207**	**100.0%**	**100.0%**	**100.0%**

The program's reported net energy savings accomplishments represent 190 percent of its energy savings goals (kWh), 183 percent of its peak demand savings goals (kW), and 97 percent of its gas savings goals (therms). Table 6-3 shows reported accomplishments as a percentage of goals by measure category. The program greatly exceeded its goals for heat pumps, dishwashers, and CFLs. The program also exceeded its goals for programmable thermostats and faucet aerators.

Table 6-3
Program Reported Net Accomplishments Associated with First Year of Installed Measure Operation as a Percentage of Net Savings Goals, by Measure Category

Measure Category	Program Reported Net Accomplishments as Percentage of Program Net Goals			
	Units	kW	kWh	Therms
Air Conditioners	36.6%	265.3%	59.9%	-
Boiler Controllers	77.3%	-	-	84.6%
Boilers	51.7%	-	-	35.6%
CFLs	252.4%	243.9%	238.6%	-
Clothes Washer	21.9%	5.3%	19.0%	18.6%
Dishwashers	518.2%	737.5%	738.9%	505.2%
Faucet Aerators	176.4%	125.0%	176.6%	175.9%
Furnace	10.8%	-	-	39.8%
Heat Pumps	3310.0%	1210.7%	3168.1%	-
High Performance Windows (square feet)	75.0%	63.2%	67.9%	53.1%
Insulation (square feet)	96.3%	25.8%	24.9%	56.5%
LED Exit Sign	45.4%	44.0%	45.5%	-
Lighting Controllers	29.2%	36.5%	28.2%	-
Low-Flow Showerhead	20.8%	14.0%	20.9%	20.9%
Programmable Thermostat	195.0%	252.1%	170.7%	164.9%
T8s	96.3%	78.1%	89.1%	-
Water Heaters	83.6%	-	22.1%	31.9%
Ceiling Fans with CFL*	-	-	-	-
Duct Improvements*	-	-	-	-
Evaporative Coolers*	-	-	-	-
Pool Pumps*	-	-	-	-
Torchiers*	-	-	-	-
Total	**126.5%**	**183.3%**	**189.9%**	**96.8%**

*The program did not have goals associated with these measures.

We conducted on-site surveys to estimate gross savings for three measure categories: CFLs, programmable thermostats (p-stats), and other equipment. A separate analysis was conducted by our subcontractor, Itron, to estimate gross boiler control impacts. Refer to Appendix D for a report on boiler control analysis methods and results. Participant surveys were conducted as part of the market assessment in order to estimate net to gross ratios for CFLs, p-stats and boiler controls.

6.2 Gross Savings Methodology

To calculate gross savings estimates for measures installed in 2004 and 2005, KEMA conducted onsite surveys in two phases. Phase 1 was conducted during the summer of 2005 and consisted of 96 sites that installed measures during the 2004 program year. Phase 2 was conducted during the summer of 2006 and

consisted of 120 sites that installed measures during the 2004 and 2005 program years. Table 6-4 shows the breakdown of sites by measure and the quantities verified.

Table 6-4
Distribution of Sites across Measures, Phases, and Program Year

	Phase 1			Phase 2						Total		
	Program Year 2004			Program Year 2004			Program Year 2005					
Measure Category	# Sites Surveyed	# Measures Inspected	# Measures Verified	# Sites Surveyed	# Measures Inspected	# Measures Verified	# Sites Surveyed	# Measures Inspected	# Measures Verified	# Sites Surveyed	# Measures Inspected	# Measures Verified
CFLs	36	2,512	2,505	4	48	48	48	1,475	1,116	88	4,035	3,669
T8s	5*	506*	506	-	-	-	8	82	82	8	587	587
Programmable Thermostats	34	349	279	15	185	175	43	557	539	93	1,091	993
Other Equipment	32	-	-	-	-	-	23	-	-	55	-	-
Boiler/Water Heater	10	27	27	-	-	-	5	6	6	15	33	33
Air conditioner	1	11	11	-	-	-	2	8	8	3	19	19
Clothes washer	2	6	6	-	-	-	6	10	10	8	16	16
Hot water heater	-	-	-	-	-	-	1	1	1	1	1	1
Dishwasher	3	3	3	-	-	-	1	3	3	4	6	6
Windows (square feet)	6	103,994	103,994	-	-	-	8	6,159	6,159	14	110,153	110,153
Insulation (square feet)	1	5,376	5,376	-	-	-	-	-	-	1	5,376	5,376
Low-Flow Showerheads	4	8	8	-	-	-	-	-	-	4	8	8
Total	**96****	**-**	**-**	**15****	**-**	**-**	**105****	**-**	**-**	**216****	**-**	**-**

*In Phase 1, T8 sites were considered part of the Other Equipment measure category.

** The sum of the number of sites in the Table does not match the total number of sites completed because some sites had more than one measure.

6.2.1 Sampling

The surveys were proportionally allocated for 3 measure categories including CFLs, programmable thermostats, and other equipment. There was very little overlap between measure categories as few sites had measures that qualified them for more than one category. When those sites were encountered, however, we verified all of the measures installed at the site and not only the ones related to its measure category. As a result, a total of 294 measure categories were verified in 216 site visits.

Greater detail on the sampling methods can be found in Appendix A.

6.2.2 Analysis

Results from the two onsite phases and two program years were combined and simple stratification weights were applied to produce overall verification and realization rates. Weights were also applied to each site based on its proportion of energy savings.

6.2.2.1 CFLs

A total of 4,035 bulbs were inspected over the course of the two phases of on-site visits. Results from both program years and phases were combined to yield one overall installation rate for the program for this measure category.

The parameters that determine per unit savings (for CFLs that were verified to be installed) include hours of use and delta watts. For hours of use, we recorded the room where each CFL was installed and applied a look-up value based on results from the California CFL Metering Study[36]. This study included almost 400 sites and nearly 1,000 CFLs with monitoring of each CFL covering 6 months and up to 1 year. While multi-family homes make up less than one-quarter of the sample, the study concluded that differences in usage of compact fluorescent lamps (CFLs) in single-family and multi-family homes are not statistically significant. The study found that the variation in hours of use was most significantly related to the space type. We assumed that participating multi-family properties are no different from the population of multi-family properties with regard to lighting usage. As such, the CFL Metering Study results may be assumed to be representative of residential lighting usage in general, and may be applied to this evaluation.

The maximum kW savings were determined by subtracting the new lamp wattage from the previous lamp wattage, both determined from the onsite survey data. If the onsite data was insufficient (i.e. the tenant could not identify the previous lamp wattage) the KEMA used an assignment procedure to estimate the incandescent lamp wattage based on the installed CFL wattage. Table 6-5 shows the incandescent wattages that correspond to various CFL wattages.

Table 6-5
Corresponding CFL and Incandescent Bulb Wattages

CFL Wattage	Incandescent Wattage
5	25
7-11	40
13 - 17	60
18 - 21	75
23 - 27	100
28 - 30	110

[36] KEMA, Inc., 2005. "CFL Metering Study: Final Report." Prepared for Pacific Gas & Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company. February 2005.

We used the CFL Metering Study to determine peak kW savings. The study reported a coincidence factor by room type that represents the percentage of lamps on during the peak period[37] in each room type. We used the distribution of CFLs by room type to determine an overall coincidence factor for the sample and applied that to the average sample kW to produce the peak kW savings.

Table 6-6 below shows the lookup values for hours of use and coincidence factors by room type based on the CFL Metering Study.

Table 6-6
Hours of Use and Coincidence Factor for CFLs by Room Type

Room Type	Lookup Value for Hours of Use	Coincidence Factor for Peak kW
Bedroom	1.6	5.5%
Bathroom	1.5	6.5%
Family room	2.5	6.6%
Halls/entry	1.6	3.3%
Kitchen	3.5	12.3%
Living room	3.3	9.0%
Outdoor	3.1	0.0%
Other room	1.9	11.2%
Total		

6.2.2.2 T8s

During Phase 1, 506 T8 fixtures were inspected, and data were collected for verification rates only. During Phase 2, 82 T8 fixtures were inspected and data were collected for both verification and savings estimation.

For T8s that were installed and verified, the parameters that determine per unit savings include hours of use and delta watts. For fixtures installed in tenant spaces, we determined hours of use by using the California CFL Metering Study[38] based on the room in which the fixtures were installed.[39] For common spaces, the hours of use were based on information from the site contact.

[37] For purposes of this report, the peak period is defined as a non-holiday summer weekday between the hours of 11 am and 7 pm.
[38] KEMA, Inc., 2005. Ibid.
[39] We compared the CFL Metering Study results to a sample of metered data for T8 fixtures in residential homes from the Tacoma Public Utilities (TPU) Baseline Residential Lighting Energy Use Study (1996). The TPU study had comparable operating hours for fluorescent lights in kitchens but very different hours for bathroom fixtures. However, the TPU study only monitored 15 bathroom fixtures and 2 of those fixtures produced 'outlier' data points. As a result, we opted to use the CFL hours of use from the CFL Metering Study, which had much higher sample sizes.

We used the Standard Performance Contracting lighting table to develop pre- and post-installation wattage estimates by measure description.[40] Both cases (pre- and post-) were verified during the onsite visit by the site contact or tenant. In all cases, the 'standard' replacement was made; for example, a 4' 4-lamp T8 fixture was installed in place of a 4' 4-lamp T12 fixture or a 2' 2-lamp T8 fixture was installed in place of a 2' 2-lamp T12 fixture. Table 6-7 shows the average delta watts resulting from the installation of a verified T8 by measure description as determined from the Standard Performance Contracting lighting table. All of the surveyed T8 fixtures were located indoors, so no distinction was made between interior and exterior wattages.

As with CFLs, the CFL Metering Study was used to determine coincidence factors by room type. The coincidence factors were multiplied by the delta watts for each fixture to determine the peak kW.

Table 6-7
Average Delta Watts of Verified T8s by Measure Description

Measure	Average Delta Watts (kW)
2' 1-lamp T8s	0.0080
2' 2-lamp T8s	0.0230
3' 1-lamp T8s	0.0200
3' 2-lamp T8s	0.0350
4' 1-lamp T8s	0.0300
4' 2-lamp T8s	0.0157
4' 3-lamp T8s	0.0310
4' 4-lamp T8s	0.0360
8' 2-lamp T8s	0.0190

6.2.2.3 Programmable Thermostats

During Phase 1, we inspected a total of 349 programmable thermostats, collecting data that was ultimately used to estimate verification ratios only[41]. During Phase 2, we inspected a total of 742 programmable thermostats, collecting both verification and usage data (via a tenant survey). Table 6-8 shows the breakdown of Phase 1, Phase 2 2004, and Phase 2 2005 sites with their corresponding survey and unit counts.

Table 6-8
Breakdown of P-Stat Site and Survey Completions

[40] Alternative Energy Systems Consulting, Inc. , 2000. Ibid.
[41] We attempted to collect data during Phase 1 that would allow us to estimate the energy savings for each installed p-stat in addition to verifying installation. Over the course of the surveys, it became clear that the data we were attempting to collect could not be reliably provided by the tenant for a number of reasons, including poor memory and language barriers. The resulting Phase 2 study was created using the lessons learned from Phase 1 and took a different, more general approach to determining energy savings.

Survey Category	Phase 1	Phase 2 2004 Sites	Phase 2 2005 Sites	Total
Sampled p-stat sites	34	15	43	**93**
Inspected p-stats	349	185	557	**1,091**
Verified p-stats	279	175	539	**993**
Completed p-stat surveys	0	175	521	**696**

For Phase 2, we modified and augmented the p-stat analysis from Phase 1 to include energy savings adjustments based on tenant behavioral changes. We developed a new behavioral survey that was delivered to one tenant for each verified p-stat. Since this analysis was more comprehensive than the Phase 1 savings analysis, we used only Phase 2 tenant survey data for measured savings estimates. The parameters that determine per unit savings (for thermostats that were verified to be installed) were based on a behavioral survey delivered to one tenant for each verified thermostat. The main objective was to determine the behavioral change of the tenant since the installation of the thermostat. Based on literature review of previous studies on thermostat impacts, we anticipated that a significant portion of tenants would not be using the automatic setback and set forward features of the thermostat. Therefore, the onsite data collection attempted to answer the following questions:

- Is the programmable thermostat installed?
- Was there a programmable thermostat before?
- If the programmable features are being utilized, what are the current settings?
- Does the occupant override the current thermostat settings?
- What was the thermostat behavior prior to installation of the p-stat?

We verified installation and determined the current settings of the thermostat by visual inspection onsite. For each unit in which the thermostats were installed, programmed, and not overridden more than once per week, we interviewed the tenant to determine whether usage patterns had changed since the installation of the new thermostat. A savings proportion was determined based on the tenant responses and applied to the program's claimed per unit savings.

6.3 Gross Savings Results

Results from the impact evaluation are discussed below by measure category: CFLs (combines results for compact fluorescent lamps and compact fluorescent fixtures unless noted), T8s, programmable thermostats, and other equipment. (Recall that gross savings methods and results for boiler controls are discussed in Appendix D. However, boiler control gross and net savings results are reported in the summary tables at the end of this section.) All of the reported percentages and results are weighted to the population level.

6.3.1 CFLs

6.3.1.1 Verification

The overall program installation rate for CFLs for the 2004-2005 program is estimated at 89.0 percent (n=4,035). Of the bulbs that were no longer installed, nearly 50 percent had been removed and 30 percent were never installed.

6.3.1.2 Per Unit Savings for Verified Measures

Table 6-9 below shows the distribution of verified CFLs by room type, along with the corresponding hours of use and coincidence factor for each room type. The average hours of use for the sample was 2.8 hours per day based on this method. The average sample delta watts was 51W.

Table 6-9
Distribution of Verified CFLs by Room Type

Room Type	Lookup Value for Hours of Use	Coincidence Factor for Peak kW	Verified CFLs	
			Number	Percent of Total
Bedroom	1.6	5.5%	515	14%
Bathroom	1.5	6.5%	628	17%
Family room	2.5	6.6%	270	7%
Halls/entry	1.6	3.3%	810	22%
Kitchen	3.5	12.3%	479	13%
Living room	3.3	9.0%	80	2%
Outdoor*	3.1	0.0%	322	9%
Other room	1.9	11.2%	439	12%
Common**	11.3	100.0%	84	2%
Total			**3,627*** **	**100%**

* Outdoor without controls
**Common area operation hours based on information reported by the site contact. Also includes exterior tenant fixtures with controls (where lookup value of 3.1 was not used – where hours of use was recorded based on controls or tenant interview.)
*** Total is less than 3,669 due to missing room type information for 42 verified CFLs.

As an example, the energy savings calculated for a 14 W CFL replacing a 60 W incandescent in a tenant kitchen is as follows:

$$\frac{3.5 * 365 * (60-14)}{1{,}000} = 58.8 \text{ kWh}$$

The analysis produced an overall average energy savings per CFL of 41.9 kWh, while the program's average claimed energy savings was 82.4 kWh. The difference in energy savings estimates is directly attributable to assumed hours of use. Prior to the completion of the California CFL Metering Study[42], the

[42] KEMA, Inc., 2005. Ibid.

hours of CFL operation assumed by IOU residential programs were too high[43], resulting in savings estimates that were also too high. It should be noted that the operating hours assumptions used by the IOUs were based on the most updated data available at the time of their program planning.

The overall coincidence factor for CFLs was 8.6% and the overall average demand savings per CFL was 4.4 W, while the program's average claimed demand savings was 9.9 W. As with the energy savings, the IOUs used the most available information when developing their savings claims, which happened to include inaccurate (or at least outdated) CFL usage data.

We analyzed the survey results based on whether the CFLs were located indoors or outdoors. Table 6-10 shows the number of sites and corresponding energy savings and delta watts per unit (for Phase 2 only[44]). The table also shows the verification rate and the average number of CFLs installed at each site. Outdoor CFLs have greater energy savings than indoor CFLs. This is because outdoor CFLs have higher operating hours than indoor CFLs, both in tenant spaces and common spaces. Outdoor CFLs in tenant spaces operate for an average of 3.1 hr/day, while many outdoor CFLs in common spaces operate for an average of 12 hr/day. The verification rate and delta watts were also higher for outdoor CFLs, but there were fewer installed per site and fewer sites with outdoor installations.

Table 6-10
Distribution of CFLs by Location – Phase 2 Sites

Location	Site Quantity	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	n
Indoor	51	35.5	49.8	73%	945
Outdoor	29	77.5	52.9	87%	219
Total	**52***	**41.9**	**49.7**	**76%**	**1,164**

* The sum of the sites in the table is more than the total because some sites had lamps indoors and outdoors.

We also analyzed the survey results based on whether the installed CFL was identified as a lamp or a fixture. Table 6-11 shows the number of sites and corresponding energy savings and delta watts per unit (for Phase 2 only). The table also shows the verification rate and the average number of CFLs installed at each site. Fixture installations have greater energy savings and delta watts and also a higher verification rate. Fixtures are also installed at more sites than lamps, though the number of lamps installed per site is double the number of fixtures.

[43] We were unable to determine the exact hours of use assumed by the program based on the tracking and reporting data that was obtained during the evaluation.
[44] We added a new battery to the on-site survey for Phase 2, which sought to determine various characteristics about the property.

Table 6-11
Distribution of CFLs by Type – Phase 2 Sites

CFL Type	Site Quantity	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	n
Fixture	44	53.0	62.1	83%	721
Lamp	22	29.7	40.5	77%	443
Total	**52***	**41.9**	**49.7**	**76%**	**1,164**

* The sum of the sites in the table is more than the total because some sites had more than one CFL type.

We asked respondents to identify whether the electric service at their sites was individually metered or master metered. Table 6-12 shows the number of sites and corresponding energy savings and delta watts per unit (for Phase 2 only). The table also shows the verification rate and the average number of CFLs installed at each site. Only 2 of the sites receiving CFLs were master metered. Master metered sites have a much higher verification rate and energy savings than individually metered sites, but also fewer CFLs installed per site.

Table 6-12
Distribution of CFLs by Meter Category – Phase 2 Sites

Meter Category	Site Quantity	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	n
Individual	45	43.0	50.1	77%	1,022
Master	2	52.7	54.7	98%	52
Missing/Don't Know	5	31.4	46.1	60%	90
Total	**52**	**41.9**	**49.7**	**76%**	**1,164**

Table 6-13 shows that the proportion of outdoor lamps and fixtures is higher for the master metered sites in the sample. Given the data in Table 5-8, which shows that outdoor CFLs have a higher energy savings than indoor CFLs, the distribution of CFLs by location explains the difference in energy savings between individual and master metered sites.

Table 6-13
Location of CFLs by Meter Category – Phase 2 Sites

Meter Category	Location	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	% of n in Meter Category	n
Individual	Indoor	31.54	44.1	71%	83%	845
	Outdoor	119.81	58.6	91%	17%	177
Master	Indoor	37.7	56.1	93%	37%	19
	Outdoor	54.6	47.0	100%	63%	33
Missing/Don't Know	Indoor	36.5	59.5	74%	90%	81
	Outdoor	33.8	28.5	50%	10%	9
Total		**41.9**	**49.7**	**76%**	**100%**	**1,164**

We also asked respondents to identify the person that initiated the CFL installation. Table 6-14 shows that most of the survey respondents could not identify the project initiator but, of those that could, the property manager had the largest impact in terms of overall CFLs installed and initiated an equal number of projects as did contractors. Based on the lack of data, there is no way to tell whether type of initiator influenced verification or energy savings results.

Table 6-14
Distribution of CFLs by Project Initiator – Phase 2 Sites

Project Initiator	Site Quantity	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	n
Contractor	7	38.6	52.2	79%	158
Property Manager	7	34.8	41.4	79%	245
Other	5	39.9	56.7	85%	173
Don't Know	28	56.1	55.8	72%	498
Missing	5	31.4	46.1	60%	90
Total	**52**	**41.9**	**49.7**	**76%**	**1,164**

6.3.2 T8s

6.3.2.1 Verification

The overall program installation rate for T8s for the 2004-2005 program is estimated at 100 percent (n=587).

6.3.2.2 Per Unit Savings for Verified Measures

Table 6-15 below shows the distribution of verified T8s by room type, along with their hours of use and coincidence factor (based on room type from the CFL Metering Study). The average hours of use for the sample was 3.4 hours per day based on this method. The average delta watts was 18.7 W.

Table 6-15
Distribution of T8s by Hours of Use – Phase 2 Sites

Room Type	Lookup Value for Hours of Use	Coincidence Factor for Peak kW	Verified T8s	
			Number	Percent of Total
Bathroom	1.5	6.5%	12	15%
Kitchen	3.5	12.3%	65	79%
Common	8.2	100.0%	5	6%
Total			**82**	**100%**

As an example, a 4-foot 2-lamp T12 fixture replaced with a 4-foot 2-lamp T8 fixture and electronic ballast will produce an estimated 0.0157 kW demand savings. If such a fixture were installed in a tenant kitchen, the resulting energy savings calculation would be:

$$\frac{3.5 * 365 * 15.7}{1{,}000} = 20.1 \text{ kWh}$$

The analysis produced an average energy savings per T8 fixture of 23.9 kWh, while the program's claimed average energy savings per T8 was 98.3 kWh. The analysis produced an average demand savings of 2.8 W. The program's average claimed demand savings per fixture was 12.6 W. Again, as with CFLs, the primary reason for the difference between ex ante and ex post savings is that updated usage data (from the CFL Metering Study) was found to be lower than previously assumed.

We asked respondents to identify whether the electric service at their sites was individually metered or master metered. All of the T8 sites surveyed were individually metered.

We also asked respondents to identify the person that initiated the CFL installation. Table 6-16 shows that most of the survey respondents could not identify the project initiator but, of those that could, the "Other" category had the largest impact in terms of number of T8s installed per site and initiated an equal number of projects as did contractors.

Table 6-16
Distribution of T8s by Project Initiator – Phase 2 Sites

Project Initiator	Site Quantity	Energy Savings (kWh/unit)	Delta Watts (W/unit)	Verification Rate	n
Contractor	2	36.5	30.8	100%	9
Other	2	23.2	16.0	100%	24
Don't Know	4	18.3	15.0	100%	49
Total	**8**	**23.9**	**18.7**	**100%**	**82**

6.3.3 Programmable Thermostats

6.3.3.1 Verification

The overall verification rate estimate for the 2004-2005 program is 97.2% (n=1,091)[45]. P-stats were removed because the tenant did not want one or was unable to work the new thermostat.

6.3.3.2 Per Unit Savings for Verified Measures

The results of the behavioral survey support our initial hypothesis (Table 6-17). Of the 696 survey respondents that received verified thermostats, 17.2% did not have their p-stat programmed, 12.4% had a p-stat before the new one was installed, and 69.1% either overrode their p-stat settings 2 or more times per week or had turned off the p-stat. Only 9 respondents, or 1.3%, gave responses that might result in savings as a result of the thermostat installation.

Table 6-17
Survey Findings by Percentage of Respondents – Phase 2 Sites

Survey Finding	Percentage of P-stats Inspected[46]
Pstat not programmed	16.2%
Had pstat before	11.6%
Override > 1/week	64.8%
Pstat not installed	3.8%
New tenant/tenant not home	2.4%
Received savings	1.2%
Total	**100.0%**
n	**742**

Table 6-18 shows the average energy savings per verified p-stat by utility. Only p-stats installed in SDG&E service territory received any savings. In fact, 5 of the 9 tenants that gave responses that might result in energy savings were from only 2 properties (2 sites).

[45] Combined result of Phase 1 and Phase 2.
[46] Results from Phase 2 sites only.

Table 6-18
Average Per Unit Verified Savings by Utility

Utility	Verified kWh Savings	Verified Therm Savings	n (verified)
PG&E	0.0	0.0	94
SCE	0.0	0.0	225
SCG	0.0	0.0	103
SDG&E	23.3	0.3	292
Program Total	**8.8**	**0.1**	**714**

The two sites that produced multiple units with possible energy savings do not have anything in common other than the fact that they are both individually metered. They are located in different areas and owned by different companies. They did not share the same installation contractor. The contractors that installed the two projects participated in multiple other projects in the San Diego area; including 3 that were inspected during our onsite visits. None of those other sites produced units with possible energy savings. There does not appear to be any identifiable pattern in the utility or onsite data to indicate why those sites were more successful at producing energy savings than others.

We asked respondents[47] to identify whether the gas and electric service at their sites is individually metered or master metered. Table 6-19 shows the number of sites and corresponding number of p-stats for each category. The majority of p-stats were installed at sites that have both gas and electric service individually metered. The table also shows the corresponding installation rate for each meter category. There is no statistical difference in installation rate between the three groups.[48]

Table 6-19
Distribution of P-stats Installed by Meter Category

Electric Meter	Gas Meter	Site Quantity	Pstat Quantity		Verification Rate
			Inspected	Verified	
Individual	Individual	51	628	605	98%
Individual	Master	3	58	55	94%
Master	Master	1	8	8	100%
Don't Know		1	20	20	100%
Missing		2	28	26	92%
Total		**58**	**742**	**714**	**97%**

We also asked respondents to identify the person that initiated the energy efficiency project. Table 6-20 shows that most of the site contacts could not identify the project initiator but, of those that could, the property manager had the largest impact in terms of overall p-stats installed. However, contractors

[47] We first attempted to contact property managers or official representatives (owners, maintenance staff, etc.) to obtain information on site metering and project initiator. In the absence of information from an official representative we relied on data from the tenants.
[48] Ex-post savings estimates were too small and sporadic to provide meaningful results during the comparison analysis. Therefore, the verification rate was used as an indication of measure participation and retention.

initiated more projects. This would appear to indicate that property managers are the major influence at larger sites, but that contractors are a major influence at smaller sites. Maintenance staff was only influential at 2 of the sites that reported initiator information. The installation rate at each site is also reported, but there is no statistical difference between the initiator groups.

Table 6-20
Distribution of P-stats by Project Initiator

Initiator	Site Quantity	P-stat Quantity		Verification Rate
		Inspected	Verified	
Contractor	12	173	170	98%
Property Manager	10	135	132	96%
Maintenance Staff	2	40	40	100%
Other	3	33	32	97%
Don't Know	29	333	314	98%
Missing	2	28	26	92%
Total	**58**	**742**	**714**	**97%**

6.3.4 Other Equipment

6.3.4.1 Verification

We were able to verify that all of the reported equipment was installed in both phases for a verification rate of 100%. The sample quantity for each measure is found in Table 6-21.

Table 6-21
Sample Quantity for Other Equipment Category

Measure	Verified Quantity	n
Boiler/Water Heater	33	33
Air conditioner	19	19
Clothes washer	16	16
Hot water heater	1	1
Dishwasher	6	6
Windows (sq ft)	110,153	110,153
Insulation (sq ft)	5,376	5,376
Low-Flow Showerheads	8	8

6.3.4.2 Installation by Meter Category and Initiator

Table 6-22 shows the distribution of "other" measures that were inspected by meter category. Most of the boilers were installed at master-metered natural gas facilities, but most of the clothes washers and all of the air conditioners, hot water heaters, and dishwashers were installed at individually metered facilities. The window installations were nearly equally divided between fully individually metered sites and sites with at least some master metering.

Table 6-22
Distribution of Other Equipment by Meter Category – Phase 2 Only

Measure	Electric Meter	Gas Meter	Verified Quantity
Boiler	Individual	Individual	1
	Individual	Master	5
Air conditioner	Individual	Individual	8
Clothes washer	Individual	Individual	7
	Master	Master	2
Hot water heater	Individual	Individual	1
LED exit sign	Individual	Individual	3
Dishwasher	Individual	Individual	3
Windows	Individual	Individual	1357
	Individual	Master	728
	Master	Individual	543

All is not exactly as it seems, however. For example, all of the air conditioners were installed by one building owner in buildings with central cooling systems, paid by the site, though the units are individually metered. All but one of the clothes washers are installed in buildings with central hot water systems. Of the window installations, 607 sq ft are installed in sites with central heat and 370 sq ft are installed in sites with central cooling.

Table 6-23 shows the distribution of "other" measures that were inspected by project initiator. For the most part, the data are inconclusive. Too many of the respondents were unable to identify the project initiator. For the most part, the Other initiator identified below was the property owner. Those that could identify the initiator for the most part indicated that the property owner initiated the project.

Table 6-23
Distribution of Other Equipment by Project Initiator – Phase 2 Only

Measure	Initiator	Verified Quantity
Boiler	Property Manager	2
	Other	1
	Don't Know	3
Air conditioner	Don't Know	8
Clothes washer	Property Manager	2
	Other	3
	Don't Know	5
Hot water heater	Other	1
Dishwasher	Property Manager	3
Windows	Property Manager	607
	Contractor	399
	Other	1,428
	Don't Know	593
	Missing	3,132

6.4 Effective Useful Life (EUL)

KEMA examined the effective useful life (EUL) assumptions for all measures in each utility's reporting workbook and compared program EULs with those specified in Table 4.1 of the California Public Utilities Commission's Energy Efficiency Policy Manual.[49] The reported EUL values matched those in the Policy Manual for each measure both listed in the Manual and included in the program. For measures that did not appear in the Policy Manual (e.g., pool pumps), KEMA compared these with available estimates from the 2005 DEER study[50] or relied upon KEMA engineers to assess the accuracy of the program's assumptions. Program EULs in these cases were all found to be realistic in comparison with useful life assumptions in relevant literature. All of the EULs reported by the program were thus used in the impact evaluation analyses.

6.5 Net-to-Gross Analysis

KEMA calculated program attribution factors (a.k.a. net-to-gross ratios) for the program's three largest sources of energy savings – boiler controls, CFLs, and programmable thermostats. Table 6-24 shows the program attribution factors for these three measures. These factors represent the percentage of verified gross savings that can be attributed to the program rebates after adjusting for free-ridership effects including partial free ridership and delayed free ridership. These program attribution factors are comparable to the default net-to-gross factors currently being used by the programs. Currently, PG&E, SDG&E, and SCG use 0.89 as their net-to-gross ratio for all measures. SCE uses a net-to-gross ratio of 0.89 for ENERGY STAR split system air conditioners, ENERGY STAR programmable thermostats, high-efficiency exit signs, occupancy sensors, and photocells while using a net-to-gross ratio of 0.80 for all other measures.

Table 6-24
Program Attribution Factors for Key Rebated Measures

Rebated Measure	Attribution Factor
Boiler controls (n=20)	80%
CFLs (n=47)	76%
P-stats (n=45)	88%

6.6 Gross and Net Savings Results

Based on the methods described above, in Section 5 and in the boiler control analysis report (Appendix D), KEMA determined gross and net demand savings (kW), energy savings (kWh), and therm savings across the program's five measure categories: CFLs, T8s, programmable thermostats, boiler controls and "other" equipment. KEMA's results (ex post) were compared with program-reported savings (ex ante) to yield gross and net realization rates. These results are reported below by measure category and at the program level.

[49] California Public Utilities Commission, 2003. Ibid.
[50] Itron, Inc.; JJ Hirsh & Associates; Synergy Consulting; and Quantum, Inc., 2005. Ibid.

6.6.1 CFLs

The program claimed savings for 877,638 CFLs.

6.6.1.1 Gross Savings

The program reported gross demand savings associated with the first year of installed CFL operation of 8,670 kW and gross energy savings of 72,333,114 kWh (Table 6-25). The evaluation verified gross savings was 89 percent of these claims.

Measured evaluation savings were 3,437 kW and 32,727,999 kWh, generating gross measured savings realization rates of 40 percent for demand savings and 45 percent for energy savings attributed to CFLs. The low realization rate for energy and demand savings is attributable to the per unit savings assumptions used by the program. Prior to the completion of the California CFL Metering Study,[51] the hours of CFL operation assumed by IOU residential programs were too high.

Table 6-25
CFL Gross Savings (First Year of Installed Measure Operation)

CFLs	Gross		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	8,670	72,333,114	-
Ex Post	3,437	32,727,999	-
Gross Realization Rate	**40%**	**45%**	**-**

6.6.1.2 Net Savings

Program-reported net demand savings associated with the first year of installed CFL operation is 7,717 kW and energy savings are 64,376,472 kWh (Table 6-26). KEMA's evaluation yielded 2,681 kW and 25,527,839 kWh in CFL savings for the program, generating net realization rates of 35 percent for demand savings and 40 percent for energy savings attributed to CFLs.

Table 6-26
CFL Net Savings (First Year of Installed Measure Operation)

CFLs	Net		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	7,717	64,376,472	-
Ex Post	2,681	25,527,839	-
Net Realization Rate	**35%**	**40%**	**-**

[51] KEMA, Inc., 2005. Ibid.

6.6.2 T8s

The program claimed savings for 90,622 T8s installed.

6.6.2.1 Gross Savings

The program reported demand savings associated with the first year of T8 installation of 1,144 kW and gross energy savings of 8,911,528 kWh (Table 6-27). The evaluation verified gross savings was 100 percent of these claims.

Measured evaluation savings were 254 kW and 2,165,866 kWh, generating measured savings gross realization rates of 22 percent for demand savings and 24 percent for energy savings attributed to T8s. The difference in realization rate is due to the difference in operating hours and coincidence factors assumed by the program.

Table 6-27
T8 Gross Savings (First Year of Installed Measure Operation)

T8s	Gross		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	1,144	8,911,528	-
Ex Post	254	2,165,866	-
Gross Realization Rate	**22%**	**24%**	**-**

6.6.2.2 Net Savings

The program reported net demand savings for T8s of 1,018 kW and net energy savings of 7,931,260 kWh associated with the first year of installed measure operation (Table 6-28). KEMA's evaluation yielded 226 kW and 1,927,621 kWh in T8 savings for the program, generating net realization rates of 22 percent for net demand savings and 24 percent for net energy savings attributed to T8s.

Table 6-28
T8 Net Savings (First Year of Installed Measure Operation)

T8s	Net		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	1,018	7,931,260	-
Ex Post	226	1,927,621	-
Net Realization Rate	**22%**	**24%**	**-**

6.6.3 Programmable Thermostats

The program claimed savings for 99,584 programmable thermostats.

6.6.3.1 Gross Savings

The program reported savings for programmable thermostats of 7,278 kW, 30,556,462 kWh, and 2,624,010 therms associated with the first year of thermostat operation. The evaluation verified gross savings was 97 percent of these claims.

Measured evaluation savings were 203 kW in electric demand savings; 851,802 kWh in electric energy savings; and 9,680 therms in gas savings, generating a measured savings gross realization rate of 3 percent for electric demand and energy savings and less than 1 percent for gas savings (Table 6-29). The low realization rate is attributable to the fact that few tenants use the programmable features of the thermostat. The program has removed this measure from their program for the 2006-2007 program years.

Table 6-29
Programmable Thermostat Gross Savings (First Year of Installed Measure Operation)

	Gross		
P-stats	**Demand (kW) Savings**	**Energy (kWh) Savings**	**Therm Savings**
Ex Ante	7,278	30,556,462	2,624,010
Ex Post	203	851,802	9,680
Gross Realization Rate	**3%**	**3%**	**<1%**

6.6.3.2 Net Savings

The program reported savings for programmable thermostats of 6,478 kW, 27,195,251 kWh, and 2,335,369 therms for the first year of installed measure operation. KEMA's evaluation yielded 160 kW in electric demand savings, 672,923 kWh in electric energy savings, and 7,647 therms in gas savings; generating a net realization rate of 2 percent for electric demand and energy savings and less than 1 percent for gas savings (Table 6-30).

Table 6-30
Programmable Thermostat Net Savings (First Year of Installed Measure Operation)

	Net		
P-stats	**Demand (kW) Savings**	**Energy (kWh) Savings**	**Therm Savings**
Ex Ante	6,478	27,195,251	2,335,369
Ex Post	160	672,923	7,647
Net Realization Rate	**2%**	**2%**	**<1%**

6.6.4 Boiler controls

The program claimed savings for 1,550 boiler controls.

6.6.4.1 Gross Savings

The program reported savings for boiler controls of 1,619,890 therms associated with the first year of thermostat operation. Evaluation savings were 194,387 therms in gas savings, generating a measured savings gross realization rate of 12 percent for gas savings (Table 6-31). The low realization rate is attributable to the fact that savings claims are based on overstated baseline estimates and theoretical savings estimates that are not being realized by the program.

Table 6-31
Boiler Controls Gross Savings (First Year of Installed Measure Operation)

	Gross		
Boiler Controls	**Demand (kW) Savings**	**Energy (kWh) Savings**	**Therm Savings**
Ex Ante	-	-	1,619,890
Ex Post	-	-	194,387
Gross Realization Rate	**-**	**-**	**12%**

6.6.4.2 Net Savings

The program reported savings for boiler controls of 1,441,702 therms for the first year of installed measure operation. The evaluation yielded 161,341 therms in gas savings; generating a net realization rate of 11 percent for gas savings (Table 6-32).

Table 6-32
Boiler Controls Net Savings (First Year of Installed Measure Operation)

	Net		
Boiler Controls	**Demand (kW) Savings**	**Energy (kWh) Savings**	**Therm Savings**
Ex Ante	-	-	1,441,702
Ex Post	-	-	161,341
Net Realization Rate	**-**	**-**	**11%**

6.6.5 Other Equipment

The program claimed savings for a number of other measures, including dishwashers, clothes washers, air conditioners, and LED exit signs. A complete listing of measures can be found at the beginning of Section 5.

6.6.5.1 Gross Savings

The program projected gross demand savings for the remaining measures of 2,620 kW, 5,453,173 kWh, and 517,329 therms over the first year of installed measure operation (Table 6-33). The evaluation verified gross savings was 100 percent of these claims.

Measured evaluation savings were 2,620 kW, 5,453,173 kWh, and 517,329 therms for equipment, generating measured savings gross realization rates of 100 percent for demand savings, electric energy savings, and gas savings. The 100 percent realization rate is a reflection of the verification rate of the category. No additional energy savings verification was conducted.

Table 6-33
Other Equipment Gross Savings (First Year of Installed Measure Operation)

Other Equipment	Gross		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	2,620	5,453,173	517,329
Ex Post	2,620	5,453,173	517,329
Gross Realization Rate	**100%**	**100%**	**100%**

6.6.5.2 Net Savings

The program projected net demand savings for the remaining measures of 2,323 kW, 4,844,405 kWh, and 458,137 therms over the first year of installed measure operation (Table 6-34). KEMA's evaluation yielded 2,323 kW, 4,844,405 kWh, and 458,137 therms, generating net realization rates of 100 percent for demand savings, electric energy savings, and gas savings.

Table 6-34
Other Equipment Net Savings (First Year of Installed Measure Operation)

Other Equipment	Net		
	Demand (kW) Savings	Energy (kWh) Savings	Therm Savings
Ex Ante	2,323	4,844,405	458,137
Ex Post	2,323	4,844,405	458,137
Net Realization Rate	**100%**	**100%**	**100%**

6.6.6 Summary

Table 6-35 shows the program's gross verified savings (reflecting evaluation verification results, excluding measurement results) by measure category and overall. As shown, the program's verified savings exceeded its goals, and is over 90 percent of its reported accomplishments.

Table 6-35
Gross Verified Savings by Measure Category

Measure Category	Percentage of Gross Savings Goals			Percentage of Gross Savings Reported Accomplishments		
	kW	kWh	therm	kW	kWh	therm
Other Equipment	94%	173%	37%	100%	100%	100%
T8s	78%	89%	-	100%	100%	-
Programmable Thermostats	240%	163%	158%	97%	97%	97%
CFLs	217%	212%	-	89%	89%	-
Boiler Controls	-	-	85%	-	-	100%
Total	173%	176%	95%	94%	92%	98%

Table 6-36 shows the program's measured savings and realization rates. As shown, gross measured kWh savings were approximately 41 million kWh ("ex post" column), for a gross realization rate of 35 percent across the program for the first year of installed measure operation. The program realized approximately 32 percent of its reported 104 million net kWh savings.

Table 6-36
Program Net and Gross Energy Savings (kWh)
Associated with First Year of Installed Measure Operation

Measure Category	Gross kWh			Net kWh		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
CFLs	72,333,114	32,727,999	45%	64,376,472	25,527,839	40%
T8s	8,911,528	2,165,866	24%	7,931,260	1,927,621	24%
Programmable thermostats	30,556,462	851,802	3%	27,195,251	672,923	2%
Other Equipment	5,453,173	5,453,173	100%	4,844,405	4,844,405	100%
Total	**117,254,277**	**41,198,839**	**35%**	**104,347,387**	**32,972,788**	**32%**

As shown in Table 6-37, the program realized 33 percent of its reported gross demand savings associated with the first year of installed measure operation (approximately 6.5 of 19.7 MW), and 31 percent of projected net demand savings (5.4 of 17.5 MW). CFLs accounted for the largest proportion of demand savings.

Table 6-37
Program Net and Gross Demand Savings (kW)
Associated with First Year of Installed Measure Operation

Measure Category	Gross kW			Net kW		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
CFLs	8,670	3,437	40%	7,717	2,681	35%
T8s	1,144	254	22%	1,018	226	22%
Programmable thermostats	7,278	203	3%	6,478	160	2%
Other Equipment	2,620	2,620	100%	2,323	2,323	100%
Total	**19,712**	**6,513**	**33%**	**17,535**	**5,390**	**31%**

KEMA verified gross gas savings for the program of over 0.7 million therms for the first year of installed measure operation, approximately 15 percent of the program's reported gross savings of 4.8 million therms (Table 6-38). The program reported net gas savings of 4.2 million therms for the first year of installed measure operation, and KEMA's evaluation results showed net gas savings of over 0.6 million during the same period for a net realization rate of 15 percent for gas savings.

Table 6-38
Program Natural Gas Savings (Therms)
Associated with First Year of Installed Measure Operation

Measure Category	Gross Therms			Net Therms		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
CFLs	0	0	-	0	0	-
T8s	0	0	-	0	0	-
Programmable thermostats	2,624,010	9,680	<1%	2,335,369	7,647	<1%
Other Equipment	517,329	517,329	100%	458,137	458,137	100%
Boiler Controls	1,619,890	194,387	12%	1,441,702	161,341	11%
Total	**4,761,229**	**721,396**	**15%**	**4,235,208**	**627,125**	**15%**

Tables 6-39 through 6-41 show the same information from above but instead of by measure by utility. There is little variation in realization rates by utility except for SCG electric and demand savings. SCG claimed electric (kWh) savings for p-stats and electric and demand (kW) savings for attic and wall insulation (other measures).

Table 6-39
Program Net and Gross Energy Savings (kWh) by Utility
Associated with First Year of Installed Measure Operation

Measure Category	Gross kWh			Net kWh		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
PG&E	24,150,118	10,035,902	42%	21,488,110	8,026,380	37%
SCE	50,850,400	22,096,278	43%	45,256,856	17,815,614	39%
SCG	17,199,700	573,359	3%	15,307,218	462,098	3%
SDG&E	25,054,059	8,493,300	34%	22,295,203	6,668,697	30%
TOTAL	117,254,277	41,198,839	35%	104,347,387	32,972,788	32%

Table 6-40
Program Net and Gross Demand Savings (kW) by Utility
Associated with First Year of Installed Measure Operation

Measure Category	Gross kW			Net kW		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
PG&E	8,127	2,431	30%	7,224	2,054	28%
SCE	7,777	2,904	37%	6,922	2,394	35%
SCG	132	132	100%	117	117	100%
SDG&E	3,678	1,046	28%	3,273	825	25%
TOTAL	19,712	6,513	33%	17,535	5,390	31%

Table 6-41
Program Net and Gross Natural Savings (therms) by Utility
Associated with First Year of Installed Measure Operation

Measure Category	Gross therms			Net therms		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
PG&E	1,782,678	318,226	18%	1,586,583	277,246	17%
SCE						
SCG	2,111,240	316,040	15%	1,878,239	277,397	15%
SDG&E	867,311	87,130	10%	770,385	72,481	9%
TOTAL	4,761,229	721,396	15%	4,235,208	627,125	15%

6.7 Lifetime Savings

Tables 6-42 through 6-45 show the program savings over the lifetime of the measures installed by utility. These data were compiled by combining gross program projected savings (goals – not reported), net evaluation results (ex post) with effective useful life estimates for each measure. 2004 savings reflect only the measures that were installed in that calendar year, while 2005 savings reflect measures installed during 2004 or 2005.

Table 6-42
Program Savings – PG&E

Year	Calendar Year	MWh Savings		Peak MW Savings*		Therm Savings	
		Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]	Ex ante Gross Program-Projected[1]	Ex post Evaluation Projected[2]	Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]
1	2004	8,763	2,638	4.270	0.773	813,067	92,829
2	2005	24,150	8,026	8.127	2.054	1,782,678	277,246
3	2006	23,858	7,923	8.090	2.043	1,782,678	277,246
4	2007	23,409	7,765	8.035	2.026	1,782,678	277,246
5	2008	23,409	7,765	8.035	2.026	1,782,678	277,246
6	2009	23,408	7,765	8.035	2.026	1,782,597	277,174
7	2010	23,401	7,758	8.033	2.024	1,777,818	272,921
8	2011	23,401	7,758	8.033	2.024	1,777,818	272,921
9	2012	20,348	6,681	7.654	1.907	1,777,818	272,921
10	2013	16,712	5,394	7.225	1.774	1,777,818	272,921
11	2014	16,672	5,359	7.219	1.769	1,766,080	262,473
12	2015	14,717	5,274	4.255	1.697	1,231,687	248,107
13	2016	13,794	5,254	2.824	1.666	979,845	247,373
14	2017	13,793	5,253	2.823	1.665	979,605	247,159
15	2018	13,765	5,229	2.819	1.661	964,239	233,483
16	2019	13,756	5,221	2.805	1.649	749,717	212,117
17	2020	10,169	3,742	1.986	1.149	173,893	154,765
18	2021	612	544	0.951	0.846	173,893	154,765
19	2022	612	544	0.951	0.846	173,893	154,765
20	2023	612	544	0.951	0.846	173,893	154,765
Total	**2004-2023**	309,360	106,437			24,204,394	4,640,441

* Definition of Peak MW as used in this evaluation is coincident peak demand.

1 Gross Program-Projected savings are those savings projected by the program before NTG adjustments.

2 Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

Table 6-43
Program Savings – SCE

Year	Calendar Year	MWh Savings		Peak MW Savings*		Therm Savings	
		Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]	Ex ante Gross Program-Projected[1]	Ex post Evaluation Projected[2]	Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]
1	2004	24,748	8,980	3.469	1.098	-	-
2	2005	50,850	17,816	7.777	2.394	-	-
3	2006	50,850	17,816	7.777	2.394	-	-
4	2007	50,850	17,816	7.777	2.394	-	-
5	2008	50,850	17,816	7.777	2.394	-	-
6	2009	50,850	17,816	7.777	2.394	-	-
7	2010	50,850	17,816	7.777	2.394	-	-
8	2011	50,850	17,816	7.777	2.394	-	-
9	2012	37,447	13,085	6.375	1.960	-	-
10	2013	25,084	8,127	5.052	1.551	-	-
11	2014	23,924	7,095	5.052	1.551	-	-
12	2015	22,288	7,057	4.384	1.536	-	-
13	2016	19,439	6,994	3.219	1.510	-	-
14	2017	19,439	6,994	3.219	1.510	-	-
15	2018	19,433	6,988	3.219	1.510	-	-
16	2019	19,309	6,877	3.138	1.438	-	-
17	2020	11,243	4,128	2.084	1.095	-	-
18	2021	1,243	1,106	0.860	0.765	-	-
19	2022	824	734	0.584	0.520	-	-
20	2023	125	112	0.122	0.109	-	-
Total	**2004-2023**	580,498	202,985			-	-

* Definition of Peak MW as used in this evaluation is coincident peak demand.

1 Gross Program-Projected savings are those savings projected by the program before NTG adjustments.

2 Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

Table 6-44
Program Savings – SCG

Year	Calendar Year	MWh Savings		Peak MW Savings*		Therm Savings	
		Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]	Ex ante Gross Program-Projected[1]	Ex post Evaluation Projected[2]	Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]
1	2004	7,103	219	0.099	0.088	891,616	120,570
2	2005	17,200	462	0.132	0.117	2,111,240	277,397
3	2006	17,200	462	0.132	0.117	2,111,240	277,397
4	2007	17,200	462	0.132	0.117	2,111,240	277,397
5	2008	17,200	462	0.132	0.117	2,006,994	184,619
6	2009	17,200	462	0.132	0.117	1,862,652	56,154
7	2010	17,200	462	0.132	0.117	1,862,652	56,154
8	2011	17,200	462	0.132	0.117	1,862,652	56,154
9	2012	17,200	462	0.132	0.117	1,862,652	56,154
10	2013	17,200	462	0.132	0.117	1,862,652	56,154
11	2014	17,196	459	0.132	0.117	1,858,903	53,155
12	2015	17,194	458	0.132	0.117	1,854,157	49,358
13	2016	10,164	303	0.132	0.117	1,242,845	47,576
14	2017	91	81	0.132	0.117	366,930	45,024
15	2018	91	81	0.132	0.117	366,930	45,024
16	2019	91	81	0.132	0.117	200,447	27,199
17	2020	91	81	0.132	0.117	8,184	7,283
18	2021	91	81	0.132	0.117	8,184	7,283
19	2022	91	81	0.132	0.117	8,184	7,283
20	2023	91	81	0.132	0.117	8,184	7,283
Total	**2004-2023**	207,090	6,164			24,468,539	1,714,621

* Definition of Peak MW as used in this evaluation is coincident peak demand.

1 Gross Program-Projected savings are those savings projected by the program before NTG adjustments.

2 Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

Table 6-45
Program Savings – SDG&E

Year	Calendar Year	MWh Savings		Peak MW Savings*		Therm Savings	
		Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]	Ex ante Gross Program-Projected[1]	Ex post Evaluation Projected[2]	Ex ante Gross Program-Projected[1]	Ex post Net Evaluation Confirmed[2]
1	2004	9,528	2,793	1.383	0.350	456,267	50,670
2	2005	25,054	6,669	3.678	0.825	867,311	72,481
3	2006	25,054	6,669	3.678	0.825	867,311	72,481
4	2007	25,054	6,669	3.678	0.825	867,311	72,481
5	2008	25,054	6,669	3.678	0.825	867,311	72,481
6	2009	25,054	6,669	3.678	0.825	867,311	72,481
7	2010	25,054	6,669	3.678	0.825	867,311	72,481
8	2011	25,054	6,669	3.678	0.825	867,311	72,481
9	2012	19,402	4,673	2.870	0.575	867,311	72,481
10	2013	11,755	1,974	1.812	0.248	867,311	72,481
11	2014	11,730	1,955	1.811	0.247	853,625	61,516
12	2015	10,055	1,914	1.523	0.240	750,971	58,508
13	2016	5,585	1,815	0.753	0.223	485,238	57,734
14	2017	5,585	1,815	0.753	0.223	485,238	57,734
15	2018	5,585	1,815	0.753	0.223	485,238	57,734
16	2019	5,582	1,813	0.751	0.221	145,691	21,680
17	2020	3,418	1,087	0.480	0.143	7,529	6,701
18	2021	22	20	0.022	0.019	7,529	6,701
19	2022	22	20	0.022	0.019	7,529	6,701
20	2023	22	20	0.022	0.019	7,529	6,701
Total	**2004-2023**	263,670	68,395			11,498,177	1,044,708

* Definition of Peak MW as used in this evaluation is coincident peak demand.

1 Gross Program-Projected savings are those savings projected by the program before NTG adjustments.

2 Net Evaluation Confirmed savings are those documented via the evaluation and include the evaluation contractor's NTG adjustments.

6.8 Cost-Effectiveness

Tables 6-46 through 6-49 show the total resource cost (TRC) test results based on evaluation results for each utility, as compared to program goals and reported accomplishments. As shown, TRC ratios based on evaluation results are less than 1.0 for all utilities but SCE, which is 1.4.

Table 6-46
Total Resource Cost – PG&E

Category	Evaluation Results	Program Reported	Program Projected
Costs	$ 7,322,162	$ 6,573,575	$ 9,308,808
Benefits	$ 6,769,102	$ 16,134,109	$ 16,623,251
Net Benefits	$ (553,060)	$ 9,560,535	$ 7,314,443
Ratio	0.9245	2.4544	1.7858
Levelized Cost - Electric	$ 0.1452	$ 0.0579	$ 0.0820
Levelized Cost - Gas	$ 1.1288	$ 0.4178	$ 0.5916

Table 6-47
Total Resource Cost – SCE

Category	Evaluation Results	Program Reported	Program Projected
Costs	$ 7,036,814	$ 2,782,281	$ 3,140,814
Benefits	$ 9,726,537	$ 7,496,470	$ 6,695,462
Net Benefits	$ 2,689,723	$ 4,714,189	$ 3,554,647
Ratio	1.3822	2.6944	2.1318
Levelized Cost - Electric	$ 0.2089	$ 0.0299	$ 0.0338
Levelized Cost - Gas	-	-	-

Table 6-48
Total Resource Cost – SCG

Category	Evaluation Results	Program Reported	Program Projected
Costs	$ 5,352,913	$ 5,708,692	$ 6,523,132
Benefits	$ 908,686	$ 16,146,322	$ 14,837,064
Net Benefits	$ (4,444,227)	$ 10,437,630	$ 8,313,932
Ratio	0.1698	2.8284	2.2745
Levelized Cost - Electric	$ 0.0497	$ 0.0531	$ 0.0606
Levelized Cost - Gas	$ 0.3775	$ 0.4026	$ 0.4600

Table 6-49
Total Resource Cost – SDG&E

Category	Evaluation Results	Program Reported	Program Projected
Costs	$ 4,777,717	$ 3,722,905	$ 4,616,948
Benefits	$ 3,693,565	$ 9,095,154	$ 7,215,327
Net Benefits	$ (1,084,152)	$ 5,372,250	$ 2,598,379
Ratio	0.7731	2.4430	1.5628
Levelized Cost - Electric	$ 0.0659	$ 0.0514	$ 0.0637
Levelized Cost - Gas	$ 1.2989	$ 1.0121	$ 1.2552

Tables 6-50 through 6-53 show the participant test results based on evaluation results for each utility, as compared to program goals and reported accomplishments. As shown, participant ratios based on evaluation results range between 1 and 4.

Table 6-50
Participant Test – PG&E

Category	Evaluation Results	Program Reported	Program Projected
Costs	$7,796,551	$6,335,000	$7,141,402
Benefits	$23,112,118	$43,076,940	$43,870,263
Net Benefits	$15,315,567	$36,741,940	$36,728,861
Ratio	2.9644	6.7998	6.1431

Table 6-51
Participant Test – SCE

Category	Evaluation Results	Program Reported	Program Projected
Costs	$7,568,703	$2,184,966	$2,023,984
Benefits	$29,198,183	$21,367,298	$19,382,343
Net Benefits	$21,629,480	$19,182,332	$17,358,359
Ratio	3.8578	9.7792	9.5763

Table 6-52
Participant Test – SCG

Category	Evaluation Results	Program Reported	Program Projected
Costs	$5,355,094	$5,427,842	$5,916,466
Benefits	$5,101,372	$23,080,054	$22,589,990
Net Benefits	($253,721)	$17,652,212	$16,673,524
Ratio	0.9526	4.2522	3.8182

Table 6-53
Participant Test – SDG&E

Category	Evaluation Results	Program Reported	Program Projected
Costs	$5,441,415	$3,745,189	$4,269,448
Benefits	$15,206,985	$30,455,236	$24,362,214
Net Benefits	$9,765,570	$26,710,047	$20,092,767
Ratio	2.7947	8.1318	5.7062