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Evaluation of the 2004-2005 Nonresidential Audit and PG&E Local Program

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Executive Summary

This document presents the Statewide Evaluation of the Nonresidential Audit Program and PG&E Local Program for Program Years 2004-2005. The Executive Summary provides a summary of key findings and recommendations.

Key Impact Findings

The cumulative total ex-post net evaluation confirmed program MWh, MW and Therm savings for the 20 years extending from 2004 through 2023 are summarized in the table below for the Statewide Nonresidential Audit Program and the PG&E Local Program. Methods used to derive program adjusted gross impacts include telephone surveys, engineering analysis and SAE billing analysis. Free ridership is estimated using self-report techniques consistent with those used in the PY2004/2005 Express Efficiency Evaluation.

Table 1-1: Twenty Year Cumulative Net Impact Results

Program	Calendar Years	IOU	Ex-Post Net Evaluation Confirmed Program MWh Savings	Ex-Post Evaluation Projected Peak MW Savings (**)	Ex-Post Net Evaluation Confirmed Program Therm Savings
Statewide Nonresidential Audit Program, PY 2004/2005	2004-2023	SCE	150,509	65.5	36,972,993
	2004-2023	PG&E	67,146	42.9	22,243,904
	2004-2023	SDG&E	38,516	16.9	3,980,686
	2004-2023	SCG	54,844	27.2	9,409,588
	2004-2023	ALL	311,015	152.5	72,607,171
Local Program	2004-2023	PG&E	4,007	1.2	186,674

**Definition of Peak MW as used in this evaluation: These are either consistent the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.
MW hours in this table are the sum of annual MW savings, and do not represent demand savings realized at any one time over this period.

The most salient finding of this Study is that Audit program net impacts originating from non-rebated measures do not begin to approach the true value of the Audit program. This effect is particularly dramatic for larger customers, where informed customers, who are likely required to spend more dollars per retrofit opportunity, are unlikely to forego available program incentive dollars. The Audit program seeks to inform customers not only of retrofit opportunities, but also of incentive programs available to lower first costs to the customer. From this we conclude that cross-program evaluation is essential to understanding the true contribution of the Audit program and to valuing program achievements.

Table 1-1 below shows cross-program total and per-unit first year net impact associated with Audit and Local Program participation, broken into rebated and non-rebated measures. The exhibit shows that less than 20 percent of the NRA cross-program total net impact arise from non-rebated measures; this figure is less than 5 percent for the Local Program.

Table 1-1: Summary of Cross-Program Total NRA and Local Program First Year Impact, Rebated and Non-Rebated Sources

Description	On-Site Audits: Very Small/Small	On-Site Audits: Medium/Large	Remote Audits	Local Program
NON-REBATED NET IMPACTS				
Statewide Non-Rebated Net Impacts, Total				
kWh	8,517,184	6,625,979	7,566,447	305,123
kW	4,107	1,849	4,382	81
Therms	775,911	2,385,762	1,434,255	10,892
Statewide Non-Rebated Net Impacts, Per-Unit				
kWh	404	1,444	213	390
kW	0.2	0.4	0.1	0.1
Therms	37	520	40	14
Statewide Non-Rebated Net-to-Gross Ratios				
kWh	40%	34%	24%	12%
Therms	20%	30%	13%	6%
REBATED NET IMPACTS				
Statewide Rebated Net Impacts, Total				
kWh	7,852,929	76,941,209	6,101,803	5,331,803
Therms	345,781	865,449	864,509	-101
Statewide Rebated Net Impacts, Per-Unit				
kWh	373	16,769	171	6,809
Therms	16	189	24	0
CROSS-PROGRAM TOTAL (REBATED AND NON-REBAED) NET IMPACTS				
Statewide Rebated and Non-Rebated Net Impacts, Total				
kWh	16,370,113	83,567,188	19,605,536	5,636,926
Therms	1,121,692	3,251,211	2,298,764	10,791
Statewide Rebated and Non-Rebated Net Impacts, Per-Unit				
Total Per-Unit kWh	777	18,213	384	7,199
Total Per-Unit Therms	53	709	65	14

In addition to rebated actions contributing the majority of Audit cross-program total net impacts (and therefore cannot be claimed by the Audit program) an examination of net-to-gross results reveal that the Audit is a greater motivating force and more “necessary” in motivating customers to adopt rebated equipment than non-rebated equipment. This is demonstrated in the notably higher net-to-gross ratios estimated for rebated measures versus non-rebated segments.

Key Impact Recommendations

The first recommendation is that future Evaluation efforts report and detail impacts of measures from rebated *and* non-rebated equipment, remaining diligent in distinguishing the two. Measures reported as rebated during surveys should be well documented, including gathering the source of rebate, source of awareness of the rebate program, and implementing survey batteries supporting a self-report based attribution and free ridership analysis similar to the one implemented in this studies' Cross Program survey[1].

As part of the assessment of *incentive* program net-impacts and net-to-gross ratios, provisions should be made for Audit program participants. For customers that had an Audit prior to incentive program participation, the net-to-gross ratio estimation should take into account effects of both programs.

Key Process Findings and Recommendations

We recommend future Audit Evaluation Studies investigate the reasons for efficient measure installation outside the rebate programs by Audit participants. Installations outside the rebate programs implies customers either are not aware of the incentive, which is important feedback to the Audit program, or perceive incentive participation as not worthwhile (important feedback to the incentive program.)

Among NRA participants there is room for improvement in raising awareness of the incentive programs. Increasing the presence of incentive program collateral, with logos or website addresses printed on Audit program materials would help and is recommended.

Continuation and expansion of the follow-up program efforts is another recommended program enhancement, with a focus on the Very Small/Small customer segment. Follow-up calls render customers more likely to implement recommendations from the Audit. This positive effect is most pronounced for very small customers. Follow-up calls are appreciated by nearly all customers, suggesting they are a boon to program satisfaction in general.

Key Tracking System Assessment Findings and Recommendations

The IOU's continue to exhibit improvements in the content of tracking systems, though there is need for further improvements in various segments. We recommend a continued monitoring and evaluation of tracking system content, accuracy and accessibility.

Further, for the more complex on-site audits, we recommend the development of a comprehensive (electronic) database of audit recommendations and associated ex-ante impact estimates. This would allow for greater evaluation accuracy and the flexibility for

[1] A self-report battery consistent with major commercial or mass market protocols for self-report based free ridership assessment.

more complex analysis characterizing program impacts, and recommendation "realization rates".

Key Long Term Assessment Findings and Recommendations

The most striking finding from the Long-Term Assessment is the importance of lighting measures to the success of the NRA program. Lighting measures had the highest adoption rates. Lighting adoptions were the most influenced by the audit and had the highest level of recall. The percentage of customers planning to adopt energy efficient lighting was more than twice as high among Audit participants as nonparticipants.

The emphasis on lighting in audit recommendations and adoptions lead to a recommendation to diversify report recommendations to better reflect customer propensity to adopt, and to monitor audit efficacy by end-use with a view to resolving the issue of whether lighting recommendation are inherently more effective than recommendations in other end-uses.

The Audit program would benefit from targeting small customers for more frequent audits – Study results clearly show a significant initial increase in adoptions for small customers, but also a rapid subsequent decline. Promotion of more frequent audits and, if necessary, a change in program requirements to allow more frequent on-site audits would be appropriate for all customers, but is particularly important for very small and small customers.

2

Introduction

The 2004/2005 Statewide Nonresidential Audit Program Evaluation presented in this report offers both retrospective examination and prospective guidance in maximizing the value of the current Nonresidential Audit Program for all stakeholders. The program itself provides free energy management services and information to nonresidential customers using a survey of customers' energy using equipment, resulting in a report that provides recommendations for energy conservation practices and energy efficiency equipment or measure upgrades. This program is being offered by each of four California Investor Owned Utilities (IOUs), Pacific Gas and Electric (PG&E), Southern California Edison (SCE), the Southern California Gas Company (SCG) and San Diego Gas and Electric (SDG&E).

This section provides an overview of the audit program, program logic models, an introduction to the evaluation objectives and scope of work, and a brief outline of the remainder of the report. An overview of the Audit Program is presented next.

2.1 Overview of the Audit Program

The Statewide Nonresidential Audit (Audit) program is a key component in an integrated energy efficiency infrastructure in California providing essential analysis of customer end-use systems, conservation and energy efficiency opportunities, and economic information for customers to make investment decisions. The program provides direct support for and coordination with the IOUs' incentive programs.

The Audit program provides comprehensive, unbiased information to guide customers' energy decisions. The energy audits and information services provide no-cost and low-cost recommendations leading customers to invest further in energy efficiency. The audits help customers assess energy efficiency opportunities and link them to IOUs Express Efficiency and Standard Performance Contract programs. In this way, the program successfully addresses the market barriers of both awareness and affordability.

Customer-specific building information including equipment and its operation is first gathered using online, CD-ROM, telephone, mail or on-site surveys. This data is in turn used to make energy conservation recommendations for each customer, culminating in the preparation of a tailored report (or list of recommendations) for each participant. The ensuing reports outline or refer to potential energy and dollar savings, and provide information about utility incentive programs.

Energy efficiency recommendations can be classified into two distinct groups: low cost/no cost behavioral measures ("Practices") and equipment ("Measures") that require a substantial capital investment. In some instances the Measure recommendations are later installed using further assistance from a rebate program, such as the Express Efficiency or Standard Performance Contract programs. For this reason, the Audit program is considered a "feeder" program, providing an important marketing service for other incentive programs.

It is best to regard the entire portfolio of energy efficiency programs as an integrated set of energy efficiency services, with each program seeking to serve the diverse needs of the nonresidential population. A corollary is found within the Audit program where an array of delivery mechanisms or channels are offered in an effort to ensure that Audit services are available to a wide audience of nonresidential participants. Table 2-1 below shows which type of Energy Audit that customers may benefit from the most:

Table 2-1: A Portfolio of Delivery Mechanisms to Meet the Needs of Different Sized Customers

Customer Size	Mail	CD ROM	Online	Phone	On Site
Very Small	●	●	●	●	●
Small	●	●	●	●	●
Medium		●	●		●
Large					●

Although several of the programs delivery channels are geared to meeting the needs of a given customer size segment, customers are allowed to participate in any of the delivery channels they choose. Each of the five surveys available within the statewide portfolio of Nonresidential Audits is described below in Table 2-2.

Table 2-2: Nonresidential Audit Delivery Channel Descriptions

Delivery	Description
On-Site Survey	On-site surveys are traditionally targeted to medium and large customers, particularly in segments offering substantial energy impact such as Industrial facilities. Though medium and large customers are targeted due to the relatively high cost of on-site services, small customers who request an on-site survey are accommodated. PG&E even offers a quick checklist audit directed to small customers. Efforts aimed at smaller customers are mainly in response to CPUC goals surrounding outreach with hard-to-reach (HTR) customer classes.
Mail Survey	Direct-mail surveys are designed for small business customers who do not necessarily want or need an on-site survey. These surveys take about 15 minutes to complete. Once the utility vendor receives the completed survey in the mail, a software program compiles and analyzes the customers' responses to the energy survey. The customer then receives a detailed report filled with suggestions on how to lower costs related to energy, solid waste, and water.
Telephone Survey	The utility or their vendor offers commercial customers telephone energy surveys as an alternative to mail surveys or on-site surveys. Trained energy specialists guide customers in answering questions pertaining to energy-consuming equipment and usage patterns. The collected information is then used to generate a report, which is then mailed to the customer and includes suggestions on how to lower energy costs.
Online Survey	To readily reach customers with internet access and provide a survey approach that each customer can access according to their own schedule, an online tool is available. Information regarding energy use and energy using equipment is entered by the customer during a visit to a utility website, and a printable list of recommendations is generated instantly.
CD-ROM Survey	Similar to the online survey, but for those customers without internet access, an interactive CD-ROM tool is also available.

The mail, phone, online and CD-ROM delivery channels are largely uniform, while the on-site surveys being offered across the state vary markedly with regard to the expertise of the auditors, the emphasis on customization, and the emphasis of measure recommendations.

Local Program Description

The Local Program is also a nonresidential audit program. It is offered by PG&E, and funded with Procurement dollars. The focus of this program is on medium and large commercial customers. The Local Program provides all audits through the on-site delivery channel. There are two types of audits offered through the Local Program, Integrated "BEST" (Business Energy Survey Tool) audits and Large Company Consultant Audits.

Most of the Program Years2004/2005 Local Program audits (95 percent) were the Integrated BEST audit. The BEST audit includes analysis of energy efficiency, demand response and self-generation program participation opportunities. Customers must have between 200 and 500 kW to participate and may do so once per year per physical address. The Large

Consultant Audits are offered only to customers with at least 500 kW demand or 250,000 therms per year consumption. Customers that receive this Large Consultant on-site audit will be given savings and payback period calculations as well as information about other programs that offer financial incentives for installing energy efficient equipment. In addition, customers will receive a customized report outlining the benefits of the recommendations provided in the on-site audit report. The report focus is on specific measures and technologies that delivery immediate, long term and peak demand savings.

2.2 Evaluation Overview and Objectives

This section provides an overview of the study approach, followed by a more detailed explanation of each study component, supporting data sources and data collection.

This Study is more comprehensive than any previous statewide Audit Program Evaluation and is designed to assess an array of impact-related, process-related, and cross-program objectives. As in the past, the over-arching goal is to provide guidance to optimize program value for stakeholders. There are five main study components, each with their own set of key objectives, and all designed to support the primary study objective of providing corrective and constructive program feedback.

Throughout this Study the data collection and analysis activities will by partitioned by customer size, which has been demonstrated in numerous industry studies to be a strong indicator of customer decision making surrounding energy efficiency and the relevance of many technology choices affecting energy efficiency. Specifically small and very small customers in the under 100 kW/50,000 therm per year class and medium and large customers that exceed those thresholds are segmented in all analysis activities, leading to size-based program recommendations that address behavioral and technological differences. In addition, a sub-segment of the medium and large customer samples are reserved for an assessment of the PG&E Local Program audits, allowing separation of findings for this unique audit delivery channel that was funded with procurement dollars. Special consideration are given throughout the Study to developing findings and recommendations specific to the Local Program. The five major components are listed below, along with a brief summary of analyses performed.

- ***Tracking System Assessment***. The Tracking System Assessment addresses a variety of Evaluation objectives, and lays the foundation for primary data collection efforts. Essentially, the Tracking System Assessment leverages all relevant and available IOU tracking, marketing, follow up and customer information system data to support and enhance the 2004/2005 NRA Study.

- ***Impact Assessment.*** The primary objective of the Impact Assessment is to document kW, kWh and therm savings that result from participation in the Audit Programs. As a secondary objective, the Impact Assessment examines the content and efficacy of audit recommendations in an updated ”Gap Analysis” similar to that conducted for the Program Year 2002 Evaluation. The Impact Assessment approach implemented for the 2004/2005 Evaluation provides a thorough and quantitative investigation of both gross and net program impacts. The bulk of the gross and net impact analysis occurs in conjunction with the Cross Program Assessment, as described in more detail in Section 1.6.

- ***Long Term Assessment***. The Long Term Assessment documents program benefits that occur over a four to five-year period following Audit participation. The Assessment draws on a significant volume of survey data collected as part of the 2002, 2003 and 2004/2005 program year EM&V Studies. Panel data were constructed by re-contacting 2002 and 2003 participants surveyed as part of past program year evaluations.

- ***Process Assessment*** The Process Assessment explores issues related to the program process, including program procedures, delivery, marketing, training, and coordination, as well as the overall effectiveness of these efforts. This Study builds upon previous NRA Evaluations, including the most recent 2003 evaluation. From this base, the Process Assessment follows up on issues and recommendations previously identified, and also explores new areas of interest to the program teams (e.g., new marketing efforts, innovative auditing approaches). We commence with a review of process recommendations arising from previous evaluations, as well as the status of these recommendations and any related effects that may have been observed in the program. We also review more recent experiences, including any changes in the various programs, auditing approaches, organizational structures, linkages with other programs, etc.

- ***Cross Program Assessment.*** The Cross Program Assessment investigates and attempts to quantify the role of the NRA program in the statewide portfolio of nonresidential programs, and in particular, the contribution of NRA to net rebate program impacts. Statistical choice modeling and self-report methods are implemented in this analysis, as well as the documentation of patterns in cross program participation accomplished through historical tracking system comparisons. Results of the Cross Program Tracking System Assessment are presented in Chapter 4, Tracking System Assessment, and Chapter 5, the Impact Assessment.

Table 2-3 below outlines the “taxonomy” of the Study, which identifies the planned data collection and serves as the structure used in the remainder of this section. The Study has five primary components: a Tracking System Assessment, an Impact Analysis, a Long-Term Assessment, a Process Assessment, and a Cross Program Assessment. In support of these Study components, the data collection plan calls for eight distinct primary data collection elements. Table 2-3 identifies the relationship between the study components and the primary data collection. Contributions from secondary data sources are also specified.

Table 2-3: Overview of the Evaluation Approach

	Existing Data Sources					Data Collection							
Study Objectives	Program Tracking Data and Previous EM&V Survey Data	Program Tracking Data and Previous EM&V Survey Data	Program Tracking Data	Program Tracking Data	Audit Tools, Reports, Incentive Applications, Training Materials and Other Materials	Participant Long-Term Survey	Participant Gross and Net Impact Survey	Medium /Large Participant Gross and Net Impact Follow-up Phone /On-Sites	Participant Process Survey	Cross Program Survey	"How to Do an Audit" Instructor and Student Process Surveys	Non-participant Survey	PM Interviews
Program Year	**2002**	**2003**	**2004**	**2005**	**2004-2005**	**2002**	**2003-2004**	**2003-2004**	**2005**	**2003-2005**	**2006**	**-**	**2005-2006**
Survey Completes	-	-	-	-	-	400	800	50-100	400	200	14	1500	10
Tracking System Assessment													
Verify program audit completes			●	●	●								
Assess tracking system content			●	●									
Assess follow-up system content and frequency			●	●									
Complete participation matrices and sample designs	●	●	●	●									
Examine marketing effectiveness by delivery approach			●	●	●								
Impact Assessment													
Estimate Small/Very Small customer gross kW/kWh and therm savings		●	●		●		●					●	
Estimate Small/Very Small customer net kW/kWh and therm savings		●	●		●		●					●	
Estimate Medium/Large customer gross kW/kWh and therm savings		●	●		●		●	●				●	
Estimate Medium/Large customer net kW/kWh and therm savings		●	●		●		●	●				●	
Complete measure recommendation gap analysis			●	●			●						
Long-Term Assessment													
Document persistence of audit-based market effects	●	●	●			●	●	●				●	
Examine participant adoption rates as a function of time elapsed since the audit	●	●	●			●	●	●				●	
Process Assessment													
Examine program awareness/sources of awareness						●			●			●	
Measure participant energy efficiency intentions and knowledge						●			●			●	
Assess participant satisfaction									●		●		
Estimate effectiveness of audit follow-up initiatives									●				●
Assess program marketing, delivery and training			●	●	●				●		●		●
Follow-up on previous EM&V delivery recommendations			●	●	●				●		●		●
Examine program effectiveness using logic models					●						●		●
Conduct audit practices assessment					●				●		●		●
Examine cross-program influence of audits	●	●	●	●	●	●			●	●		●	●
Cross Program Assessment													
Tracking System Assessment	●	●	●	●									
Cross Program Gross and Net Impact Asessment		●	●				●	●		●		●	

^ Includes Standard Performance Contracting,

Previous EM&V Studies of the NRA program have found that adoptions resulting from Audit Program participation may occur after a substantial lag, particularly for measures that require larger capital outlay and/or are more complex to install. In addition, the educational aspect of the Audit Program persists over time, and documenting these market effects is an important part of NRA program evaluation. Thus, our data collection strategy maximizes the use of previously collected survey data and reaches participants spanning Program Years 2002 through 2005. The 2002 and 2003 Program Year participant surveys conducted for this Study involves re-contacting participants surveyed for the 2002 and 2003 EM&V Studies. The resulting panel data has great value in creating a better understanding of how customer behavior is affected by the audit over time. It provides detailed and accurate data on energy efficiency adoptions, behaviors and attitudinal changes at different intervals since the time of the audit.

2.3 Evaluation Preface

This Audit program evaluation contends with measurement difficulties that are unique to information, marketing and outreach program evaluations. To begin with, program impacts are a function of the measures that are installed by program participants, whether or not those installations are the result of a given customers' audit, whether or not rebates are also a factor, and when each installation occurs. At the start of the evaluation process, none of these components is known. These basic difficulties are compounded by tracking data that, while much improved, is not complete in providing account numbers, contact information and audit recommendations for each participant. The need to leverage, stratify and estimate is considerable.

Moreover, the techniques and results of this Audit program impact evaluation are not comparable with those of an incentive program impact evaluation. In particular, the Audit program has no well defined or well understood ex-ante estimates of energy impact. Moreover, any such statistic could not be thought of as analogous to the ex-ante impact of a piece of equipment. This arises from the fundamental disconnect between the delivery of the audit and the resulting installation of equipment. The audit also serves to inform participants of energy efficiency opportunities, including those where incentives are available, thus influencing the success of rebate program performance "indirectly."

Differences between incentive program and Audit program definitions of gross impacts also confound the net-to-gross ratio estimation and interpretation. Traditionally this ratio is indicative of program success and usefulness. In this evaluation it measures the degree to which the Audit was the motivating force behind all the efficient adoptions in the participating population. A low net-to-gross ratio indicates that there is efficient activity in the participating population that does not arise from audit participation. This does not necessarily demonstrate low program efficacy, though it does provide a relative measurement of the "need" for the audit in a participating segment.

3

Methods

This chapter documents the methods applied to analyze the efficacy, performance and energy impact of the 2004/2005 Statewide Nonresidential Audit Program. This chapter begins with an overview of data collection activities, followed by sampling strategies, sample dispositions and weighting schemes.

3.1 Data Collection

This section details the data collection objectives, sample designs, dispositions and analysis weighting schemes. In support of the study objectives Itron conducted 8 distinct surveys. Five of these are participant telephone surveys, one is a nonparticipant telephone survey, and the last two are in-depth interviews.

The sample frame and number of completed surveys are shown below in Table 3-1. This is followed by a brief discussion of how the sample sizes are justified by expected relative precision around the surveys' key objective results.

Table 3-1: Data Collection Overview

Data Collection Task	Sample Frame	Sample Size
Participant Process Survey	PY 2005 NRA and Local Program Utiliity Tracking Data	401
Participant Gross and Net Impact Survey	PY 2003/2004 NRA and Local Program Utiliity Tracking Data	796
Participant Long Term Survey	Previous NRA Survey Completes and PY 2002 Utility Tracking Data	400
Nonparticipant Survey	Utility Customer Information System	1,587
Cross Program Participant Impact Survey	PY 2003 and PY 2004 NRA, Express Efficiency and SPC Utility Tracking Data	209
PM and implementation Staff Interviews	Population of PM and key implementation staff	10
"How to do an Audit" instructor and Student Interviews	Utility Seminar teachers and students	14

3.1.1 Sample Design

Process Survey Sample Designs and Dispositions

The process survey includes Program Year (PY) 2005 NRA participants, as well as PG&E Local Program participants. Separate sample designs are constructed by program (NRA versus Local Program), and for NRA participants by size ('Small/Very Small' versus 'Medium/Large'). A total of 400 surveys were completed to support the process analysis objectives. This survey sample size was chosen to support the reasonable expectation of a 10 percent relative precision at the 90% confidence interval[2].

Process Survey – Local Program. The PG&E Local program had 459 participants during program year 2005, and there are a total of 377 unique phone numbers associated with these participants. The goal for this survey was as stated in the research plan was 40 participant surveys; thirty-eight are actually completed.

Process Survey – Small and Very Small Customer. Table 3-2 below summarizes the process survey sample design for the small and very small customer segment, where a total of 260 surveys are complete. The third column in the Table shows the total number of PY 2005 tracking records found in the tracking databases[3]. The fourth column shows a representative sample, which is proportional to the tracking record distribution. The fifth column shows the number of unique phone numbers available for the survey, which constrains some cells quite severely such as online and PG&E's mail audit. Some adjusting was done to accommodate the availability of phone numbers, staying true where possible to the delivery mechanism distribution. The final sample design is shown in column 6. Finally, column 7 shows the final sample disposition, which is consistent with the design. There was some difficulty meeting the CD ROM quota[4]. This issue is discussed in greater detail in Section 3.2.6 Final Impact Calculations.

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[2] The number of categorical responses offered to survey respondents generally ranges from 3 to 10. Thus, assuming a multinomial distribution, a sample size of 400 is expected to yield a margin of error within 0.4 at the 90% confidence interval. This margin of error corresponds to a 10 percent relative precision or better for scores with a mean of 4 and over on a 10 point scale, and at least an 8 percent relative precision for a 3 point scale with a mean of 1 or higher.

[3] This includes some customers with unknown size estimated to be small or very small based on the distribution of customers of known size. Where possible, survey completes with customers of known size were prioritized.

[4] In brief, about 70 percent of the CDROM participants we spoke to on the phone that recalled having received the disk reported that they did not install or run the software.

Table 3-2: Process Survey Sample Design Program Year 2005 Small and Very Small Customers

Utility	Audit Type	Tracking System Records^	Representative Sample	Phone Numbers	Sample Design	Survey Completes
PGE	On-Site	4,129	39	3,041	39	44
	Phone	1,052	10	814	13	13
	Mail	1,034	10	1	0	0
	Online	1,230	11	0	0	0
	CD ROM	2,264	21	1,674	25	25
SCE	On-Site	4,473	42	3,149	44	48
	Phone	751	7	634	9	9
	Mail	1	0	1	0	0
	Online	257	2	8	0	0
	CD ROM	949	9	297	11	5
SCG	On-Site	452	4	230	6	6
	Phone	18	0	12	0	0
	Mail	6,605	62	5,119	80	83
	Online	182	2	0	0	0
	CD ROM	4	0	3	0	0
SDG&E	On-Site	484	5	279	7	8
	Phone	1,680	16	1,370	18	18
	Mail	1,783	17	34	4	1
	Online	209	2	3	0	0
	CD ROM	263	2	195	4	0
Statewide	On-Site	9,537	89	6,699	96	106
	Phone	3,500	33	2,830	40	40
	Mail	9,423	88	5,155	84	84
	Online	1,878	18	11	0	0
	CD ROM	3,480	33	2,169	40	30
Total		27,819	260	16,864	260	260

^Includes some points of unknown size estimated to be small or very small based on the distribution of points with known size.

Process Survey – Medium and Large Customer. Table 3-3 below summarizes the process survey sample design for the medium and large customer segment. The third column in the Table shows the number of PY 2005 records found in the tracking database. The fourth column shows a sample design which is proportional to the tracking record distribution. Please notice that the proportional distribution includes only 20 points that are not from the on site delivery channel. Larger, more complex sites do not typically lend themselves to audits through the other channels. Although it may be possible to achieve 20 surveys with CD ROM and phone participants, the results would be marginally meaningful and relatively unimportant to the Program overall. Therefore the final sample design is constrained to on site audits only and is proportional to the distribution within this delivery mechanism across the four utilities. Contact information is readily available for this segment, and the sample disposition meets or exceeds the design in every cell.

Table 3-3: Process Survey Sample Design Program Year 2005 Medium and Large Customers

Utilitly	Audit Type	Tracking System Records^	Representative Sample	Phone Numbers	Sample Design	Survey Completes
PGE	**On-Site**	437	16	226	18	18
	Phone	109	4	67		
	Mail	0	0	0		
	Online	0	0	0		
	CD ROM	348	12	159		
SCE	**On-Site**	1,445	52	689	66	68
	Phone	19	0	0		
	Mail	0	0	0		
	Online	3	0	2		
	CD ROM	6	0	1		
SCG	**On-Site**	155	6	86	7	8
	Phone	1	0	1		
	Mail	17	1	11		
	Online	46	2	0		
	CD ROM	0	0	0		
SDG&E	**On-Site**	176	6	88	9	9
	Phone	23	1	3		
	Mail	0	0	0		
	Online	0	0	0		
	CD ROM	11	0	6		
Statewide	**On-Site**	**2,214**	**80**	**1,089**	**100**	**103**
	Phone	153	5	71		
	Mail	17	1	11		
	Online	49	2	2		
	CD ROM	365	12	166		
Total		2,797	100	1,339	100	103

^Includes some points of unknown size estimated to be medium or large based on the distribution within the delivery channel of points with known size.

Impact Surveys Sample Designs and Dispositions

The original goal for this survey was 800 total survey completes, of which 140 would be Medium/Large customers and 660 would be Very Small/Small customers. These sample sizes were selected for several reasons. First, the Medium/Large sample size near-saturates the available Medium/Large sample. For Very Small/Small customers, the sample size provides for an expected relative precision around the SAE billing analysis result of about 25 percent[5].

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[5] A similar SAE billing analysis was conducted for Audit participants by Quantum Consulting for the "Impact Evaluation of PG&E's 1996 Commercial Sector Energy Management Services Program." This Study conducted 903 interviews to capture 346 measure adopters. These 346 participant adopters supported an

The impact survey includes program years 2003 and 2004 Audit Program participants, as well as PG&E Local Program participants. Similar to the process sample design, separate sample designs are constructed by program and for Audit Program participants by size segment.

It has been well-documented in previous NRA Evaluation reports that larger customers take more time to act upon audit recommendations than smaller customers. Smaller customers tend to have simpler facilities and receive recommendations that are easier to implement. For these reasons they tend act more quickly on audit recommendations. Consistent with this theory, the Medium/Large customer impact surveys are conducted with PY 2003 participants and the Small/Very Small customer impact surveys are conducted with PY 2004 participants.

Impact Survey – Local Program. The PG&E Local Program is targeted to larger customers. Thus, for reasons discussed above we would have preferred to survey PY 2003 participants for the impact study. However, the Local Program began in 2004, and therefore we focus on the PY 2004 participant population. There are 304 PY 2004 Local Program participants, and 228 unique phone numbers. A canvass of available sample was successful in meeting the planned target of 40 completes.

Impact Survey – Very Small and Small Customer. Table 3-4 below summarizes the impact survey sample design and disposition for the Very Small/ Small customer segment, where a total of 655 surveys are complete. The third column in the Table shows an estimate of the total number of PY 2004 small and very small customer tracking records found in the tracking databases. The fourth column shows a "representative sample" which is almost a proportional sample, with one adjustment. The proportional sample would result in 34 online completes, which is too small to provide an interesting result for this delivery mechanism. As a result, the online quota was boosted to 50. This was done by lowering the on site survey quota, where the planned sampling is the largest. The fifth column shows the number of unique phone numbers available for the survey, which constrains some cells quite severely. Some adjusting was done to accommodate the availability of phone numbers,

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estimate of participant realization rates with relative precision of 23 percent. Recent Evaluation studies of the Statewide Nonresidential Audit program indicate that approximately 45 percent of participants will report lighting, HVAC or other measure adoptions occurring post-audit . If the same adoption rates are applied to the 2004 program year, a sample of 660 Small/Very Small participants would be required to achieve a relative precision of 25 percent. The final expected relative precision is expected to be 20 percent due to the supplemental cross program survey. See section 3.2.3 SAE Billing Regression Analysis for a discussion of actual billing analysis results.

staying true where possible to the delivery mechanism distribution. The final sample design is shown in column 6. Column 7 shows the sample disposition. Again, there was some difficulty meeting the CD ROM quota. Of the planned 94 completes, 48 were accomplished. These points were re-allocated to other cells in a manner generally consistent with the sample design[6].

Table 3-4: Impact Survey Sample Design and Disposition Program Year 2004 Small and Very Small Customers

Utility	Audit Type	Tracking System Records^	Representative Sample	Phone Numbers	Sample Design	Survey Completes
PGE	On-Site	4,721	105	4,480	105	116
	Phone	1,613	38	852	38	42
	Mail	1,608	38	7	0	0
	Online	580	22	15	2	1
	CD ROM	2,641	63	1,643	63	37
SCE	On-Site	4,910	109	3,911	110	118
	Phone	737	18	786	18	19
	Mail	115	3	106	11	11
	Online	142	5	86	12	8
	CD ROM	416	10	422	10	5
SCG	On-Site	1,442	32	823	32	33
	Phone	998	24	562	24	27
	Mail	3,459	82	2,630	110	120
	Online	398	15	246	33	33
	CD ROM	506	12	338	12	2
SDG&E	On-Site	1,017	23	750	23	25
	Phone	1,663	39	1,542	39	44
	Mail	239	6	83	7	7
	Online	183	7	29	3	3
	CD ROM	410	10	457	10	4
Statewide	On-Site	12,091	268	9,964	268	292
	Phone	5,011	119	3,742	119	132
	Mail	5,421	129	2,826	128	138
	Online	1,303	50	376	50	45
	CD ROM	3,973	94	2,860	94	48
Total		27,798	660	19,768	660	655

^Includes some points of unknown size estimated to be small or very small based on the distribution within the delivery channel of points with known size.

Impact Survey – Medium and Large customers. Table 3-5 below summarizes the impact survey sample design and disposition for the Medium/Large customer segment, where a total of 100 surveys are complete. The third column shows the total number of PY 2003 medium

[6] For a more detailed discussion of the difficulties completing CD ROM surveys, please see Section 3.2.6 Final Impact Calculations.

and large customer tracking system records. The fourth column shows a "representative sample" which is nearly 75 percent on-site audit participants.

The medium and large customers are best suited to the on-site delivery channel, and the bulk of the participation is within this delivery channel. Therefore the final sample design is constrained to the on-site audit delivery mechanism only and is proportional to the distribution within this delivery mechanism across the four utilities. The sample disposition meets or exceeds the sample design quota in each cell.

Table 3-5: Impact Survey Sample Design and Disposition Program Year 2003 Medium and Large Customers

Utilitly	Audit Type	Tracking System Records^	Representative Sample	Phone Numbers	Sample Design	Survey Completes
PGE	On-Site	485	15	301	20	21
	Phone	152	5	41		
	Mail	0	0	0		
	Online	0	0	0		
	CD ROM	219	7	126		
SCE	On-Site	1,521	47	722	63	63
	Phone	13	0	7		
	Mail	48	1	4		
	Online	160	5	25		
	CD ROM	37	1	20		
SCG	On-Site	262	8	164	11	11
	Phone	19	1	16		
	Mail	3	0	3		
	Online	0	0	0		
	CD ROM	52	2	0		
SDG&E	On-Site	144	4	75	6	6
	Phone	38	1	25		
	Mail	0	0	0		
	Online	0	0	0		
	CD ROM	110	3	0		
Statewide	On-Site	2,412	74	1,262	100	101
	Phone	223	7	89		
	Mail	51	2	7		
	Online	160	5	25		
	CD ROM	418	13	146		
Total		3,264	100	1,529	100	101

^Includes some points of unknown size estimated to be medium or large based on the distribution within the delivery channel of points with known size.

3.1.2 Long Term Participant Survey

A goal of 400 survey completes was set for Long Term participant survey, based on an expected margin of error within 10 percent for multinomial distributions and 8 percent for binary distributions[7]. This survey focuses on the population of participants for which Audit Program participant surveys were completed in past evaluation studies. The goal is to build panel data from those data to analyze the impacts and market effects of the audit over time. There are a total of 401 survey completes, of which 305 are completed with previously surveyed participants. Despite our best efforts, 400 surveys could not be completed with the available sample of past survey completes.

The total available sample from previous evaluation survey completes, as well as the number of Long Term Survey completes that were achieved is summarized in Table 3-6 below.

Table 3-6: Long Term Survey Sample Summary and Disposition for Customers Surveyed for Previous NRA Evaluations

Utility	Audit Type	PY 2002 Participants						PY 2003 Participants		Total	
		Md/Lg Impact and Process Survey (Completed in 2004)		Process Survey (Completed in 2003)		Impact Survey (Completed in 2003)		Impact and Process (Completed in 2004)			
		Available Sample	Survey Completes	Available Sample	Survey Completes	Available Sample	Survey Completes	Available Sample	Survey Completes	Available Sample	Survey Completes
PGE	On-Site	12	3	74	17	53	13	18	8	157	41
	Phone	0	0	101	30	87	14	18	4	206	48
	Mail	0	0	104	27	78	15	23	8	205	50
	Online	0	0	0	0	0	0	0	0	0	0
	CD ROM	0	0	14	5	28	0	26	8	68	13
SCE	On-Site	72	20	88	13	114	15	27	3	301	51
	Phone	0	0	6	1	5	1	1	0	12	2
	Mail	0	0	0	0	0	0	9	3	9	3
	Online	0	0	10	0	11	0	33	14	54	14
	CD ROM	0	0	2	1	3	0	1	0	6	1
SCG	On-Site	0	0	44	13	70	12	4	0	118	25
	Phone	0	0	3	0	3	1	12	2	18	3
	Mail	0	0	9	2	7	2	11	5	27	9
	Online	0	0	0	0	0	0	38	13	38	13
	CD ROM	0	0	0	0	1	0	1	1	2	1
SDG&E	On-Site	0	0	37	10	37	6	4	3	78	19
	Phone	0	0	0	0	0	0	19	8	19	8
	Mail	0	0	8	0	3	0	8	3	19	3
	Online	0	0	0	0	0	0	0	0	0	0
	CD ROM	0	0	0	0	0	0	6	1	6	1
Statewide	On-Site	84	23	243	53	274	46	53	14	654	136
	Phone	0	0	110	31	95	16	50	14	255	61
	Mail	0	0	121	29	88	17	51	19	260	65
	Online	0	0	10	0	11	0	71	27	92	27
	CD ROM	0	0	16	6	32	0	34	10	82	16
Total		84	23	500	119	500	79	259	84	1,343	305

[7] The Long Term Survey has multiple objectives, the most important of which include measure and practice adoption rates, and energy efficiency knowledge and awareness. These distributions can be approximated with binomial or multinomial distributions. Similar to the process survey, a sample of 400 will provide a margin of error within 0.4. Binary distributions, applicable to adoption rates, have an expected relative precision within 8 percent.

The remaining 96 points are completed with participants that had not been surveyed as part of previous evaluations. These are completed with PY 2002 medium and large participants. Audit impacts are expected to have a more drawn out effect among the medium and large participants relative to the very small and small participants. For this reason we prioritized the Medium/Large PY 2002 sample over the Small/Very Small PY 2002 participants. Table 3-7 below shows the distribution of the available Medium/Large PY2002 participant sample, as well as the number of completed surveys.

Table 3-7: Long Term Survey Sample Design and Disposition for remaining Program Year 2002 Participants

Utilitly	Audit Type	Available Medium/Large Sample	Survey Completes
PGE	On-Site	110	8
	Phone	53	3
	Mail	50	5
	Online	0	0
	CD ROM	36	0
SCE	On-Site	509	49
	Phone	0	0
	Mail	0	0
	Online	0	0
	CD ROM	3	0
SCG	On-Site	256	29
	Phone	0	0
	Mail	3	0
	Online	0	0
	CD ROM	0	0
SDG&E	On-Site	11	1
	Phone	0	0
	Mail	1	1
	Online	0	0
	CD ROM	0	0
Statewide	On-Site	886	87
	Phone	53	3
	Mail	54	6
	Online	0	0
	CD ROM	39	0
Total		1032	96

3.1.3 Cross Program Participant Survey Sample Design and Disposition

The Cross-Program participant survey includes Audit Program participants in program years 2003 and 2004 that participated in Express Efficiency or SPC at some point after the Audit. The sample selects Medium and Large cross program participants from Audit Program Year 2003. Similarly, Very Small and Small customer cross program participants are selected from Audit program year 2004. This provides for the additional time necessary for larger customers to implement recommended measures, and is consistent with the impact survey sampling approach discussed above.

The original goal for this survey was set to 200 total survey completes. This sample size was selected in order to improve the expected relative precision around the expected SAE billing analysis results from 25 percent to 20 percent[8]. Further, it promised an expected maximum relative precision around self-reported Cross-Program attribution results of approximately 10 percent (this assumes self-reported attribution is captured in a 10 point scale with a mean of 4 or higher, and the least favorable distribution of results.)

As shown above, 209 surveys are completed with cross program participants. Of these 209, 160 are very small/small customers, and the remaining 49 are medium/large customers. The universe of eligible Cross Program participants was small enough to require a census of available points in order to achieve these survey goals. Eligibility was defined as having valid participation dates in both the Audit and rebate program (Express Efficiency or SPC) tracking systems. In addition, rebate program participation was required to have occurred after the date of Audit participation. Of course, customer contact information was also required. Table 3-8 below summarizes the universe of available very small/small cross program participants, as well as the sample disposition by utility and audit type.

[8] See Section 3.2.3 SAE Billing Regression Analysis Results for a detailed discussion of this analysis task and related findings.

Table 3-8: Very Small/Small Company Cross Program Participant Sample Disposition. Audit Program Year 2004, Express Efficiency Program Years 2004 – 2005

Utility	Audit Type	Available Sample	Survey Completes
PGE	On-Site	459	115
	Phone	109	13
	Mail	0	0
	Online	0	0
	CD ROM	105	3
SCE	On-Site	63	14
	Phone	0	0
	Mail	2	0
	Online	0	0
	CD ROM	2	1
SCG	On-Site	73	5
	Phone	9	1
	Mail	20	1
	Online	0	0
	CD ROM	0	0
SDG&E	On-Site	24	7
	Phone	7	0
	Mail	0	0
	Online	0	0
	CD ROM	0	0
Statewide	On-Site	619	141
	Phone	125	14
	Mail	22	1
	Online	0	0
	CD ROM	107	4
Total		873	160

The very small and small cross program participants that were surveyed for this evaluation have a measure distribution that is similar to the universe of cross program participants. Table 3-9 below summarizes the measures adopted through Express Efficiency by the eligible universe of very small and small cross program participants. The measure distribution of the 160 very small and small cross program participants that were surveyed is shown on the right side for comparison.

The majority of measures installed by very small and small cross program participants through the Express Efficiency program are in the lighting end use. Lighting makes up over 70 percent of the measures installed through Express Efficiency by this group of Audit participants.

Table 3-9: Audit Program Year 2004/ Express Program Years 2004 and 2005, Very Small and Small Customer, Cross Program Participant Express Measures

Measure Description	Eligible Universe		Survey Completes	
	Count	Percent	Count	Percent
Lighting				
Compact Fluorescent Lamps	495	38%	90	36%
LED Exit Sign	185	14%	42	17%
T-8 Lamps with Electronic Ballast	93	7%	19	8%
Wall box Occupancy Sensors	74	6%	16	6%
Flourescent Fixture Delamp	37	3%	13	5%
High Bay T-5 Fixtures	17	1%	3	1%
Electronic Ballast	15	1%	5	2%
Other Occupancy Sensors	12	1%	0	0%
Other Lighting	9	1%	2	1%
Total Lighting	937	71%	190	77%
Cooling				
Programmable Thermostats	118	9%	27	11%
Packaged Air Conditioner	46	4%	8	3%
Packaged Terminal Air Conditioner	30	2%	5	2%
Reflective Window Film	15	1%	4	2%
Cool (White or Reflective) Roof Surface	4	0%	1	0%
Other Cooling	6	0%	0	0%
Total Cooling	219	17%	45	18%
Gas				
Clothes Washer	76	6%	6	2%
Boiler (water)	10	1%	1	0%
Instantaneous Water Heater - Gas	10	1%	0	0%
Gas Storage Water Heater	8	1%	0	0%
Other Gas	9	1%	1	0%
Total Gas	113	9%	8	3%
Other				
Motors	8	1%	1	0%
Anti-Condensate Heater Controls for Refrigeration Display	7	1%	1	0%
New Refrigeration Case With Doors	5	0%	0	0%
Other Refrigeration	12	1%	2	1%
Other	10	1%	1	0%
Total Other	42	3%	5	2%
Total Measures	1,311	100%	248	100%

Table 3-10 below summarizes the audit type and utility service territory distribution of the available universe of medium and large cross program participants. The distribution of the 49 Medium/Large cross program participants that were surveyed is also shown below. As designed, all survey completes are with participants in the on-site audit delivery channel.

Table 3-10: Medium/Large Company Cross Program Participant Sample Disposition. Audit Program Year 2003, Express Efficiency and SPC Program Years 2003 – 2005

		Cross Program Participants			
		Audit/ Express Efficiency		Audit/SPC	
Utilitly	Audit Type	Available Sample	Survey Completes	Available Sample	Survey Completes
PGE	On-Site	89	12	14	3
	Phone	18	0	2	0
	Mail	0	0	0	0
	Online	0	0	0	0
	CD ROM	28	0	3	0
SCE	On-Site	145	21	103	13
	Phone	1	0	0	0
	Mail	1	0	0	0
	Online	2	0	1	0
	CD ROM	0	0	1	0
SCG	On-Site	30	3	0	0
	Phone	0	0	0	0
	Mail	0	0	0	0
	Online	0	0	0	0
	CD ROM	0	0	0	0
SDG&E	On-Site	14	1	4	1
	Phone	0	0	0	0
	Mail	0	0	0	0
	Online	0	0	0	0
	CD ROM	0	0	0	0
Statewide	On-Site	278	37	121	17
	Phone	19	0	2	0
	Mail	1	0	0	0
	Online	2	0	1	0
	CD ROM	28	0	4	0
Total		328	37	128	17

The following two tables describe the measure distribution of the eligible population and of the surveyed population of medium and large cross program participants. Table 3-11 below shows the medium and large cross program participant measures adopted through the Express Efficiency program. Similar to the very small and small customers, the majority of measures are in the lighting end-use. However, the medium and large customers are less concentrated in lighting, with over 40 percent of measures in the cooling, gas and other categories.

Table 3-11: Audit Program Year 2003/ Express Program Years 2003-2005, Medium and Large Customer, Cross Program Participant Express Measures

Measure Description	Eligible Universe		Survey Completes	
	Count	Percent	Count	Percent
Lighting				
Compact Fluorescent Lamps	85	15%	5	8%
T-8 Lamps with Electronic Ballast	69	12%	11	19%
LED Exit Sign	66	11%	9	15%
Flourescent Fixture Delamp	31	5%	4	7%
High Bay T-5 Fixtures	23	4%	5	8%
Wall box Occupancy Sensors	22	4%	0	0%
Other Occupancy Sensors	24	4%	3	5%
Electronic Ballast	6	1%	0	0%
Other Lighting	8	1%	2	3%
Total Lighting	334	58%	39	66%
Cooling				
Packaged Air Conditioner	62	11%	4	7%
Programmable Thermostats	22	4%	5	8%
Packaged Terminal Air Conditioner	5	1%	1	2%
Reflective Window Film	6	1%	0	0%
Variable Speed Drive on Air Handler Unit (for H	4	1%	1	2%
Other Cooling	3	1%	0	0%
Total Cooling	102	18%	11	19%
Gas				
Greenhouse Heat Curtain	11	2%	0	0%
Insulation (Pipe or Water Heater Tank)	9	2%	1	2%
Process Boiler	7	1%	0	0%
Infrared Film for Greenhouses	5	1%	1	2%
Boiler (water)	4	1%	1	2%
Other Gas	5	1%	1	2%
Total Gas	41	7%	4	7%
Other				
Motor	78	14%	4	7%
Other Refrigeration	7	1%	0	0%
Vending Machine Controller	6	1%	1	2%
Strip Curtains for Walk-ins	3	1%	0	0%
Other	3	1%	0	0%
Total Other	97	17%	5	8%
Total	574	100%	59	100%

Table 3-12 below shows the measure distribution of the eligible universe of medium and large Audit-SPC cross program participants, as well as those that were surveyed.

Table 3-12: Audit Program Year 2003/ SPC Program Years 2003-2005, Medium and Large Customer, Cross Program Participant SPC Measures

Measure Description	Eligible Universe		Survey Completes	
	Count	Percent	Count	Percent
Lighting				
Fluorescent Lighting Retrofit	21	9%	2	6%
Occupancy Sensors	20	9%	4	11%
Interior High Bay T-5 or T-8 Linear Fluorescent Fixtures	18	8%	2	6%
LED Exit Signs	12	5%	3	9%
T-8 or T-5 Lamps and Electronic Ballasts	15	7%	4	11%
Energy Management System for Lighting	10	4%	0	0%
Compact Fluorescent Lamps	8	4%	1	3%
Lighting Controls	5	2%	0	0%
Fluorescent Fixture Delamping, 4 foot	5	2%	1	3%
High Intensity Discharge Lighting System Retrofit	4	2%	1	3%
Other Lighting	8	4%	2	6%
Total Lighting	126	56%	20	57%
Cooling				
Cool Roof	1	0%	0	0%
HVAC equipment	3	1%	2	6%
Total Cooling	6	3%	2	6%
Gas				
Boiler Economizer	1	0%	0	0%
Total Gas	1	0%	0	0%
Process				
Adjustable Speed Drive	31	14%	0	0%
Process Equipment	21	9%	7	20%
Air Compressor System	15	7%	2	6%
Motors upgrade for Process system	8	4%	1	3%
Process Cooling	5	2%	1	3%
Injection Molding	2	1%	0	0%
Total Process	82	36%	11	31%
Other				
Controls	9	4%	1	3%
Commercial Washer Upgrage	1	0%	0	0%
Total Other	10	4%	1	3%
Total	225	100%	35	100%

3.1.4 Nonparticipant Sample Design and Disposition

The nonparticipant survey serves as the comparison group for the impact and process analyses. However, because the net-to-gross and billing analyses require a meticulously matched control group, the nonparticipant sample is constructed to mimic the participant Impact survey completes. Weights are constructed to facilitate the comparison of nonparticipants to the participant process survey results. The nonparticipant survey mimics the participant survey completes by IOU service territory, 4-digit NAICS[9] code and customer size. For manageability, survey quotas were set based on 2-digit NAICS code, IOU service territory and customer size.

Consistent with the distribution of planned participant impact surveys, the nonparticipant sample was designed to include 75 nonparticipant customers that mimic the Local Program participant sample distribution, 188 that mimic the PY 2003 Medium/Large sample and 1,238 that mimic the PY 2004 Small/Very Small sample. The total completes exceed plans by 87 points. Table 3-13 below shows the distribution of the nonparticipant survey completes by IOU service territory and customer size.

Table 3-13: Nonparticipant Survey Disposition, by Utility Service Territory and Customer Size

Utility	Customer Size	Survey Completes	Percent of Total
PG&E	Large	100	6.3%
	Medium	68	4.3%
	Small	90	5.7%
	Very Small	406	25.6%
	Total PG&E	664	41.8%
SCE	Large	83	5.2%
	Medium	59	3.7%
	Small	154	9.7%
	Very Small	112	7.1%
	Total SCE	408	25.7%
SCG	Large	5	0.3%
	Medium	17	1.1%
	Small	101	6.4%
	Very Small	242	15.3%
	Total SCG	365	23.0%
SDG&E	Large	6	0.4%
	Medium	9	0.6%
	Small	28	1.8%
	Very Small	107	6.7%
	Total SDG&E	150	9.5%
Statewide	Large	194	12.2%
	Medium	153	9.6%
	Small	373	23.5%
	Very Small	867	54.6%
	Total Statewide	1,587	100.0%

[9] For medium and large customers there was insufficient sample to support a matched distribution by 4-digit NAICS code. For these customers, matching was done at the 2-digit NAICS level instead.

Table 3-14 below shows the distribution of the nonparticipant survey completes by 2-digit NAICS code. The nonparticipant sample was designed to mimic the participant population by IOU service territory, and then within each service territory. The PY 2004 participant population distribution is also shown in the table, illustrating the success of the sampling strategy in creating a nonparticipant sample similar to the participant population.

Table 3-14: Nonparticipant Survey Disposition, by Two-Digit NAICS Code

Two-Digit NAICS Code	Sector Description	Survey Completes	Nonparticipant Sample Percent Distribution	PY 2004 Participant Population Percent Distribution
Land				
11	Agriculture, Forestry, Fishing and Hunting	27	1.7%	1.1%
Infrastructure				
22	Utilities	20	1.3%	0.7%
23	Construction	22	1.4%	1.3%
Manufacturing				
31	Manufacturing, from agricultural products	33	2.1%	1.6%
32	Manufacturing, from non-agricultural, non-metallic materials	70	4.4%	2.0%
33	Manufacturing, from metallic materials	84	5.3%	3.5%
Trade				
42	Wholesale Trade	61	3.8%	2.6%
44 - 45	Retail Trade	258	16.3%	17.7%
Transportation and Warehousing				
48	Transportation and Warehousing, air, land, sea transport and transit	6	0.4%	0.6%
49	Transportation and Warehousing, postal & courier services, warehousing	22	1.4%	0.8%
Information and Services				
51	Information	15	1.0%	1.1%
52	Finance and Insurance	47	3.0%	3.7%
53	Real Estate and Rental and Leasing	73	4.6%	5.1%
54	Professional, Scientific, and Technical Services	60	3.8%	3.1%
55	Management of Companies and Enterprises	11	0.7%	0.5%
56	Administrative, Support, Waste Management, and Remediation Services	46	2.9%	1.7%
Social Services				
61	Educational Services	59	3.7%	2.6%
62	Health Care and Social Assistance	96	6.1%	6.9%
Arts and Entertainment, Hospitality				
71	Arts, Entertainment, and Recreation	52	3.3%	2.1%
72	Accommodation and Food Services	233	14.7%	23.2%
Other Services and Government				
81	Other Services (except Public Administration)	278	17.5%	17.1%
92	Public Administration	14	0.9%	0.8%
	Total	1,587	100.0%	99.8%

3.1.5 Sample Weight Development

This section presents the development of analysis weights to ensure that the results presented reflect observed participation patterns. Participant impact surveys are weighted to represent the 2004/2005 Nonresidential Audit Program participant population.

Table 3-15 below shows the distribution of the participant population, sample design and survey completes by the key segments that were selected for the application of weights.

Segmentation include two categories of customer size, very small/small and medium/large. Delivery mechanism is a second layer of segmentation, under which, for the on-site delivery method the segment is further broken down by IOU service territory. This is because the Audit program is more substantively different across IOUs for the on-site delivery channel. Cross program participants are separated out into their own segment because they were significantly over-sampled and are assigned a relative weight designed to maintain an accurate overall representation of the participant population.

Segment weights are assigned based on the number of survey completes and the number of participants in the program years 2004-2005 tracking systems. More specifically, the weight assigned to each segment is equal to the ratio of the number of tracking records to the number of survey completes.

Table 3-15: Participant Impact Survey Sample Weights

Customer Size	Participant Segment		PY 2004/2005 Tracking Records	Sample Design	Survey Completes	Weight
Very Small/Small	On-Site	PG&E	8,316	116	116	71.7
		SCE	8,719	118	118	73.9
		SCG	1,797	33	33	54.4
		SDG&E	930	25	25	37.2
	Phone		8,396	132	132	63.6
	Mail		14,767	138	138	100.0
	Online		3,001	45	45	66.7
	CD ROM		7,299	48	48	100.0
	Cross Program		1,665	150	160	10.4
Medium/Large	On-Site	PG&E	694	21	21	33.0
		SCE	2,669	63	63	42.4
		SCG	455	11	11	41.4
		SDG&E	258	6	6	43.1
	Cross Program (On-Site only)		512	50	49	10.4

Process survey sample weights are shown in Table 3-16 below. The approach used to develop these weights is analogous to the impact sample weights. The segmentation is also similar, except that there is no cross program segment. Cross program participants were not oversampled in this survey, but are drawn randomly and proportionally. Therefore no cross program weight correction factor is necessary. The participant 2004/2005 tracking records serve as the model for the weights. Weights are set equal to the ratio of the number of tracking records to the number of survey completes in each segment.

Table 3-16: Process Survey Sample Weights

Customer Size	Participant Segment		Total 0405 Tracking Records	Sample Design	Survey Completes	Weight
Very Small/Small	On-Site	PG&E	8,839	39	44	200.9
		SCE	9,383	42	48	195.5
		SCG	1,895	6	6	315.8
		SDG&E	962	8	8	120.2
	Phone		8,540	42	40	213.5
	Mail		14,799	84	84	176.2
	Online		1,192	0	0	0.0
	CD ROM		7,470	40	30	249.0
Medium/ Large	On-Site	PG&E	778	18	25	31.1
		SCE	3,035	68	68	44.6
		SCG	495	8	8	61.9
		SDG&E	280	9	9	31.2

3.2 Impact Assessment Approach

This section presents the impact approach applied to estimate Nonresidential Audit program impacts for lighting, cooling, gas appliances, process improvements and other[10] measures, surrounding equipment adopted by participants over the analysis period[11]. The results derived using the approach outlined in this section are presented in Chapter 5 Impact Assessment. The gross impacts presented reflect (self-reported) customer energy efficiency actions taken during the analysis period and not associated with a rebate. Because the survey was completed during the spring of 2007, the actions taken reflect, on average, about a three-year period following the audit for very small and small participants, and about four years for medium and large participants. The larger lag between audit and survey for the larger participants is by design, allowing additional time for customers to install more complex cooling measures, as well as process systems updates among industrial participants.

The Impact Assessment approach includes an engineering analysis, an SAE[12] billing analysis, follow-up evaluations conducted by a professional engineer, self-report and logit

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[10] The Other end-use refers to equipment changes/additions *not* categorized as indoor lighting, cooling, gas appliances, manufacturing process improvements or low cost/no cost behavioral changes.

[11] For very small and small customers the analysis period is January 2004 through March 2007. For medium and large customers, the analysis period is January 2003 through May 2007.

[12] Statistically Adjusted Engineering

model-based net-to-gross evaluation and program attribution analysis. Each of these is discussed below in relation to their contribution to the Impact Assessment objectives.

Gross and Net Impact analysis techniques vary by customer size, using somewhat different strategies for Medium/Large customers than for Small /Very Small customers.

In general the gross impact approach applied is founded on a simple engineering deemed savings model for most measures, using DEER database results where available, and a variety of other approaches and sources including IOU Workpapers, IOU filings and simple engineering models.

Data sources contributing to the Small/Very Small Impact Assessment alone include the following primary survey efforts: a 655-point sample of Program year (PY) 2004 participants, a 160-point sample of NRA participants in PY2004 that participated in Express Efficiency at some point after the Audit, and a 1,240-point nonparticipant survey. Customer billing data and weather data are also used in support of the Small/Very Small company Impact Assessment.

Data sources contributing to the Medium/Large Impact Assessment alone include the following primary survey efforts: a 100-point sample of PY 2003 participants, a 40-point sample of PY 2004 Local Program participants, a 50-point sample of NRA participants in PY2003 that participated in Express Efficiency or SPC at some point after the Audit, and a 347-point nonparticipant survey.

Very Small and Small Customer Gross Impact Approach Estimation

This section provides an overview of the approach to estimating gross impacts for the very small and small customers (less than 100 kW/ 50,000 therms per year.) This gross impact analysis attempts to measure the energy impacts accrued through the adoption of efficient measures[13]. The approach entails the following:

- Document equipment adoptions that participants take and, where possible, assess whether or not those are efficient actions. Conduct follow-up interviews/data collection where warranted to support an engineering-based estimate of program impacts and savings.

[13] In addition to estimating impacts by customer size and delivery channel, measure life and incremental cost data are also assembled for all equipment adoptions based on deemed data sources and other available literature/program sources.

- Complete an engineering analysis of measure adoption data, leveraging available deemed savings values and Express Efficiency and/or, if relevant, SPC tracking/application data. This step results in unadjusted gross kW/kWh and therm impacts for each self-reported participant adoption. These results are analogous to those provided in the PY2002 and PY2003 evaluations. In addition to program impacts, unadjusted engineering-based savings estimates are also generated, yielding the expected savings in a customers' utility bill, reflecting the removal of in-situ equipment, rather than a traditional code- or market-based baseline.

- Unadjusted electric energy impact estimates based on an engineering/deemed savings approach are then refined using a statistically adjusted engineering (SAE) billing model approach.

- Final kW[14] impact estimates are based on the engineering and deemed savings methods alone. Deemed savings were obtained, where possible, from the 2003 Database of Energy Efficiency Resources (DEER).

The unadjusted engineering-based gross impact approach implemented was to first establish whether or not each self-reported measure was a high efficiency or standard efficiency action, and then reclassify each high efficiency action into a predefined DEER category, Workpaper measure (such as Express Efficiency program measure) or other analytic option. The advantage to mapping measures is that it allows for the use of accepted impact forecasting methods, based on DEER, past evaluations and as documented in Advice Filing documents, program Workpapers and proposals submitted to the CPUC.

For small and very small participants, gross unadjusted impact estimates were further refined through the application of SAE model results, where warranted. An attempt was made to quantify impacts for the 'other' end-use measure category and energy efficiency conservation practices using the SAE billing model, although no engineering estimates were attempted due to insufficient information describing the specific actions taken—for example equipment efficiency and capacity.

Medium/Large Customers (Greater than 100 kW/50,000 therms per year.) A somewhat different approach is used to estimate gross impacts for Medium/Large customers relative to the Very Small/Small customer approach discussed above. Medium/Large customers are likely to undergo expansions, contractions and other year-to-year productivity changes that

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[14] Though no SAE billing regression analysis was performed for therm impacts, the SAE realization rate derived for cooling impacts is extended to therms for reasons described in more detail later in this chapter (Section 3.2.3 SAE Billing Regression Analysis).

substantially affect customer utility bills and reduce the likelihood that the SAE model will successfully converge on the correct impact result. Thus, for Medium/Large companies the final step in the Gross Impact approach is a rigorous follow-up effort by a professional engineer, where warranted. Medium/large customers reporting measure adoptions in the participant survey, principally for process/other end-use measures, underwent a more detailed gross impact assessment. This follow up investigation was specifically concentrated among relatively complex measure adoptions falling under the process and 'other' end-use categories, where a deemed savings approach is thought to be less effective. Furthermore, follow-up efforts were concentrated among customers reporting measure adoptions with a preponderance of evidence supporting program net benefits (based on self-reported net-to-gross questions). Follow-up activities are especially needed to inform modeling methods and inputs for measures where deemed savings approaches are not available and to serve as verification for key deemed saving inputs. For each site selected for follow up, Itron dispatched a senior engineer to verify the savings of measures identified in the telephone surveys.

For medium and large participants, impacts were calculated using deemed savings and simple engineering models for the lighting, cooling and gas appliance end uses[15]. The engineering models applied to estimate impacts for the process and other end-use measures consisted of simple engineering models, including the application of the 2004/2005 SPC calculator.

***Final Results*.** All evaluations of resource programs are required to provide first year kWh and therm impacts and kW impacts along with annual energy impacts for years 1 through the year of the longest-lived measure. These estimates are based on an assessment of measure lifetimes for this program. Effective useful life (EUL) by measure was obtained from the Energy Policy Manual. Although this program is not a resource program, kWh, therm and kW impacts are calculated for all measures installed by participants that are not also rebated, whether through the Express and SPC programs or through self-reported rebates obtained by surveyed participants. This ensures that there is no double-counting of impacts between the audit claimed savings and those of the IOU rebate programs. To facilitate impact comparisons across programs, results are presented using the prescribed Excel® spreadsheets. These tables are presented for the combined Statewide NRA and Local Programs in Section 5.2, and also by IOU service territory in the Attachment to this report.

[15] More detailed follow-up analysis by a senior engineer was applied for several lighting and cooling measures where reliable estimates could not be obtained elsewhere. These included daylighting and EMS measures adopted by very small/small customers and medium/large customers.

3.2.2 Unadjusted Engineering-Based Gross Impact Analysis

Unadjusted engineering-based gross impact analyses were carried out in a series of discrete steps, beginning with an analysis of survey self-reports regarding energy efficiency actions taken since the time of the audit and program-related data that are available (tracking systems and hard copy surveys). Program data were then used in conjunction with existing deemed savings impact methods, where available, to determine participant-specific estimates of measure impacts. Hard copy surveys obtained for identified adopters were also examined as a potential impact source and used in conjunction with telephone survey records to determine impacts on a case-by-case basis. Serving as an input to the SAE model, customer- and measure-specific estimates of annual energy savings were also derived, where "savings" differ from impacts in that they reflect the difference in energy use compared with the in-situ removed equipment rather than a code- or market-based baseline condition.

Unlike program impact calculation procedures used for retrofit programs, the Audit program impact calculations require additional information regarding the scope of measures adopted, where tracking systems for Express Efficiency, for example, have ample data to support an independent calculation of impacts. In the case of this Audit evaluation, additional information comes from the telephone survey, based on probes of customer measure and practice actions (following the program audit). As mentioned above, 810 PY2004 Participant Impact surveys were completed with small and very small customers and 150 Participant Impact surveys were completed with medium and large NRA customers, as well as 40 Participant Impact surveys with medium and large Local Program participants. Surveys were used to inform the evaluation regarding post-audit measure implementation.

Unadjusted gross impacts—kW, kWh and therms—were estimated, where possible, using the impact calculation methods described above, for every measure adoption identified in the telephone survey sample. Refer to the sections below for information concerning the range of impacts applied for specific measure adoptions by end-use.

Unadjusted Engineering-Based Lighting End-Use Impact Estimates.

The unadjusted engineering-based lighting impact estimates applied are based on DEER where available and secondarily upon various IOU sources, including Workpapers and program plans that were filed with the CPUC.

A summary of per-unit impact estimates, derived largely from deemed savings sources, are presented in Table 3-17 for high efficiency measures that were adopted by Audit participants. Per-unit estimates were used in conjunction with telephone survey data to determine individual customer kW, kWh and therm impacts for participants that reported adopting those measures. For most of the "common" measures included in this table, a range of resulting impacts are presented, per fixed unit, as individual customer results are a function of building type.

Unadjusted Engineering-Based Cooling End-Use Impact Estimates

Unadjusted engineering-based cooling impact estimates are based on largely on DEER and various IOU deemed savings products, including Workpapers and program filings. A summary of per-unit cooling impacts is presented in Table 3-18 for measures that were adopted by Audit participants, according self-reports from the surveys. For most of the measures included in this table, a range of resulting impacts are presented, per fixed unit, as individual customer results are a function of climate/region, building type and vintage.

It should be noted that for certain cooling measures, telephone survey data collection was found to be a poor medium for obtaining detailed equipment specifications, especially the efficiency level of the equipment installed. For example, for split and packaged air conditioners and heat pumps an attempt was made to obtain equipment make and model data using a follow-up mail survey[16] . However, the response to this follow-up survey was very poor, even after offering a small incentive to complete the paperwork. For this reason, the impact calculations assumed that all split and packaged equipment that were adopted by participants were high efficiency – for example, SEER 14 for equipment less than 65,000 Btuh. It is therefore anticipated that the unadjusted cooling impacts are overstated by some unknown amount, assuming that a substantial fraction of the equipment installed are most comparable to baseline technologies, in conformance with Title 24 standards. This finding highlights the importance of the downstream SAE analysis, providing a true-up of the impacts based on observed variation in customer bills – pre- vs. post-installation. This finding also highlights the need in future studies to obtain hard data on equipment efficiency levels, with consideration of on-site follow-up to obtain equipment specifications.

[16] With make and model in hand it is then possible to perform lookups on equipment efficiency using on-line resources and manufacturer product specifications.

Table 3-17: Range of Per-Unit Impacts for Lighting Measures, Presented In Conjunction with Other Cost-Effectiveness Inputs

Lighting Technology Description	Units	Per-Unit Summer Demand Impact (W)	Per-Unit Annual Energy Impact (kWh)	Per-Unit Annual Natural Gas Impact (therms)	Per-Unit Equipment Cost ($)	Per-Unit Incremental Cost ($)	Per-Unit Installed Cost ($)	EE Policy Manal EUL (years)	Estimate Source
Daylighting	site	980 to 4250	4416 to 10089	0	DNC*	DNC*	DNC*	16	Customized engineering calculation
LED exit sign	lamp	42	351	0	31.52	0.00	65.44	16	DEER
Install reflectors/fluorescent lamp removed	Fixture	20 to 26	71 to 121	0	3.08	0.00	25.71	16	DEER
18 Watt CFL	lamp	29 to 60	94 to 588	0	6.37	5.77	9.54	8	DEER
2' T8/T5	lamp	9.42 to 11.11	58.19 to 73.88	0 to -0.027	NA**	10.50	NA**	16	PG&E Workpapers, Study 404A
4' T8/T5	lamp	6.2 to 12.57	29.67 to 80.6	0 to -0.0292	12.70	4.49	NA**	16	PG&E Workpapers, Study 404A
8' T8/T5	lamp	8.59 to 11.52	48.6 to 67.17	0 to -0.0039	NA**	32.50	NA**	16	PG&E Workpapers, Study 404A
Electronic ballast	ballast	5 to 11	17 to 103	0	23.42	4.19	0.00	16	DEER
175W PS Metal Halide	Fixture	0	349 to 1189	0	129.01	0.00	196.86	16	DEER
Occupancy sensors	sensors	176	214	0	42.28	0.00	77.28	8	DEER
Photocells	photocells	0	106	0	12.06	0.00	59.81	8	DEER
Time clock	time clocks	0	474	0	123.01	0.00	239.89	8	DEER

* Did not collect.
** Not available.

Table 3-18: Range of Per-Unit Impacts for the Cooling End-Use, Presented In Conjunction with Other Cost-Effectiveness Inputs

Cooling Technology Description	Units	Per-Unit Summer Demand Impact (Watts)	Per-Unit Annual Energy Impact (kWh)	Per-Unit Annual Natural Gas Impact (therm)	Per-Unit Equipment Cost ($)	Per-Unit Incremental Cost ($)	Per-Unit Installed Cost ($)	EE Policy Manal EUL (years)	Estimate Source
Energy Management System	site	0	10k to 161k	57 to 2024	DNC*	DNC*	DNC*	15	Customized engineering calculation
Direct evaporative cooler	tons	650 to 1040	727 to 1677	0	NA**	NA**	127.00	15	2006/2008 PG&E Workpapers, page 33
Hot Water Heat Recovery	site	0	0	403	DNC*	DNC*	DNC*	NA**	Customized engineering calculation
Setback programmable thermostat	1000 sqft	0	0	0	82.50	49.70	174.80	11	DEER
Packaged or Split System AC or HP	ton	14.89 to 207.12	21.25 to 197.02	0 to 0.0024	642 to 1075	93 to 209	817 to 1455	15	DEER
Time clocks	1000 sqft	0	0	0	162.10	0.00	266.10	10	DEER
Cooling Tower	1000 sqft	223	343	0	NA**	110.00	NA**	15	1996 PG&E Workpapers, REO Program, page NRR-207
Duct Repair	site	1010	889	0	NA**	NA**	NA**	NA**	2006/2008 PG&E Workpapers, page 64
Exhaust Fan	horsepower	160	1,191	0	NA**	1650.00	NA**	15***	SCE 2004/5 Express Program Proposal
Economizer	ton	0	150	0	NA**	85.00	NA**	8***	SCE 2004/5 Express Program Proposal
Packaged Terminal AC or HP	ton	18.71 to 169.89	1.16 to 356.87	0	555 to 1544	92 to 282	667 to 1947	15	DEER
Water chiller	tons	36.6 to 79.8	64 to 130	0	333 to 372	26 to 66	0.00	20	DEER
Adjustable speed drive	ton	0	900	0	NA**	430.00	NA**	15	2006/2008 PG&E Workpapers

* Did not collect.

** Not available.

*** Estimated life not available in EE Policy Manual, so alternate source reported here.

Unadjusted Engineering-Based Natural Gas Appliance Impact Estimates

Unadjusted engineering-based gas appliance impact estimates are based largely on DEER and various IOU deemed savings products, including Workpapers and program filings. A summary of per-unit natural gas impacts is presented in Table 3-19 for measures that were adopted by Audit participants, according self-reports from the surveys. For most of the measures included in this table, a range of resulting impacts are presented, per fixed unit, as individual customer results are a function of climate/region, building type and vintage.

Table 3-19: Range of Per-Unit Impacts for Natural Gas Appliances, Presented In Conjunction with Other Cost-Effectiveness Inputs

Gas Appliance Technology Description	Units	Per-Unit Annual Natural Gas Impact (therms)	Per-Unit Equipment Cost ($)	Per-Unit Incremental Cost ($)	Per-Unit Installed Cost ($)	EE Policy Manal EUL (years)	Estimate Source
Boiler	MMBtu input	2.2871	NA**	2.17	NA**	20	2006/2008 PG&E Workpapers
Furnace, 94 AFUE	1000 sqft	19 to 3606	0.00	0.00	0.00	20	DEER
Water heater, 0.594 EF	1000 sqft	24 to 2573	550.95	175.30	0.00	15	DEER
Griddle, 20 kBtu/hr	griddle	21900	3860.67	2102.31	0.00	12	DEER
Fryer, 15 kBtu/hr	fryer	43800	4103.15	2582.54	0.00	12	DEER
Gas booster for dishwasher	dishwasher	14	DNC*	DNC*	DNC*	5	Customized engineering calculation

* Did not collect.
** Not available.

Similar to what was reported above for cooling measures, telephone survey data collection was also found to be a poor medium for obtaining detailed equipment specifications for natural gas appliances, especially the efficiency level of the equipment installed. For this reason, for certain appliances, the impact calculations assumed that all gas equipment adopted by participants were high efficiency – for example, 94 AFUE for gas furnaces. It is therefore anticipated that the unadjusted gas appliance impacts are overstated by some unknown amount, assuming that a substantial fraction of the equipment installed are most comparable to baseline technologies, in conformance with Title 24 standards. As mentioned for cooling equipment, this finding highlights the importance of the need in future studies to obtain hard data on equipment efficiency levels.

Unadjusted Engineering-Based Process and Other Equipment Impact Estimates

As discussed above, for medium and large participants, unadjusted engineering-based impact estimates were only estimated for the process and other equipment adoptions where ample evidence indicated that those adoptions were influenced by the audit, and therefore that net benefits exist. In the majority of the cases, the audits were found to have little to no influence over participant decisions to install process and other technologies, as it appears that non-energy benefits and other business interests drive decision making for equipment, such as the need to produce product in a manufacturing setting.

3.2.3 SAE Billing Regression Analysis

This section documents the detailed analytical steps undertaken in the billing regression analysis of Pacific Gas and Electric Company's (PG&E's), Southern California Edison's (SCE's) and San Diego Gas and Electric Company's (SDG&E's) 2004-2005 Nonresidential Audit (NRA) Program. The section begins with a discussion of the analysis periods and data sources used in the billing regression model. Then, the results of the data censoring that was applied to the analysis sample are provided. Next, the gross billing analysis regression model specification and SAE coefficients are presented, along with the relative precision calculations.

Overview

The objective of the billing analysis is to determine the first-year program energy impacts for measures installed after customers' undergo an audit. This objective is further divisible into post-audit measures installed under the Express Efficiency Program and measures installed outside existing utility rebate programs. The key objective of this analysis is to determine the first-year energy impacts for measures installed outside Express. The energy savings from the installation of these measures is not otherwise accounted for in existing energy efficiency programs.

Following an audit, customers can choose to do nothing, install measures under the Express Efficiency Program and receive a rebate, or install measures outside the Express Efficiency Program and not receive a rebate. A statistical analysis is employed to model the differences of customers' energy usage between pre- and post-installation periods using actual customer billing data. The model is specified using the billing data and independent variables gathered in the telephone survey that explain changes in customers' energy usage, including the engineering estimates of energy impact due to measures installed outside Express and the Express energy impacts for measures installed within the Express Efficiency Program.

The results of the billing regression analysis are estimated as ratios, termed "SAE coefficients," of realized impacts to the engineering impact estimates. These realized impacts represent the fraction of engineering estimates actually "observed" or "detected" in the statistical analysis of the billing data. The SAE coefficients estimated for non-Express installations are relative to the results of the evaluation-based engineering estimates, not the utility ex ante estimates. The SAE coefficients estimated for Express installations are relative to the utility ex ante impact estimates. This distinction is important, as the SAE coefficients for the non-Express installations are then used to estimate gross ex post program impacts for the NRA program. The ex post program impacts for the Express program will be determined in a separate evaluation of the 2004-2005 Express Program.

As discussed in detail below, the billing regression analysis was conducted on a sample of telephone surveyed participants and non-participants-. Because many NRA participants installed measures under multiple end uses, one integrated billing analysis approach was used to model both the Lighting and HVAC end uses. This section of the report presents the analysis findings for both end uses – as each was an essential input to the overall model used.

Data Sources for the Billing Analysis

The billing regression analysis for NRA uses data from several different data sources: NRA program tracking databases from PG&E, SCE, and SDG&E, Express Efficiency program tracking databases from the three electric utilities, their billing databases, telephone survey data, the engineering estimates of NRA non-Express changes in usage between the pre- and post-installation periods, and weather data from Weatherbank. A summary of the data elements used in the regression analysis are presented below.

Program Tracking Data

The participant tracking system for NRA contains information about program application, while the Express Efficiency tracking data contains program application information, rebate and technical information about installed measures, rebate amounts, install date, and ex ante energy savings estimates.

Billing Data

The three electric utilities provided billing data for each account at the participant and non-participant facilities. The account level data was rolled up into site level consumptions. The billing data had bill read dates from January 2003 through August 2007.

The billing data was reviewed at the account and site level. The review identified sites with anomalous billing data at the account and site level. Anomalous bills were examined to determine our ability to roll up the account level bills to the site level.

Another data quality analysis compared annual consumption to annual estimated savings. This made it possible to identify discrepancies between actual consumption and expected savings for each site. Large estimated savings relative to site level bills may indicate that it was not possible to adequately roll up the account level bills into a site or that the ex ante savings are high.

Weather Data

Actual daily heating and cooling degree days were obtained at the start of the project for 20 weather stations within California. The weather data were associated with consumption based on the monthly read dates found in the billing data. Once the appropriate degree days were identified for each billing month of consumption, there were summed to a monthly value and further summed to a yearly value.

Telephone Survey Data

As described earlier in this Chapter, telephone surveys were completed for a sample of NRA participants and non-participants. The data collected in the telephone survey supplies information on energy-related changes at each site for the billing period covered by the billing regression. Site level changes included changes in equipment, remodeling, changes in employment and changes in square footage. If a site reported changes in equipment, they were queried about the timing of the equipment changes.

The telephone survey data was merged with the program tracking, billing and weather data. The ability to merge the survey data with available billing data limits the size of the population available for analysis.

Savings Impacts and Engineering Estimates of Savings

Utility claimed ex ante savings estimates were used for the Express Efficiency installations while engineering estimates of savings were used for the NRA measures installed outside of the Express Program. For NRA participants, Express and non-Express installations were treated differently due to the availability of savings impacts for the Express installations. For those participants who installed measures within the Express program, their NRA information was merged with their Express tracking data, and their Express ex-ante impact estimates were retained.

For NRA participants who installed measures outside the Express program, there are no tracking system based ex-ante estimates of impact. Engineering estimates of savings and impact were derived for these installations. The engineering estimates of savings were calculated based on expected changes in energy consumption from the pre-installation technology to the post-installation technology. For some technologies, such as Central A/Cs installed by NRA participants outside Express, these savings estimates will differ from the Express impact estimates. This is due to the 'impacts' being calculated relative to a baseline efficiency, compared to the 'savings' estimates, which are based on a pre-existing unit's efficiency. For example, many CAC's existing efficiency had a SEER rating much lower than the Express program baseline assumption. Consequently, the savings estimate for NRA, non-Express CAC installations may be higher than the Express CAC installation impacts. The Engineering Analysis presented earlier discusses the calculation of the savings estimates used in the billing analysis in greater detail.

Data Aggregation

The billing analysis was performed at the site level, necessitating an aggregation of the account level billing data to a unique site. Therefore, all account level billing data had to be aggregated up to the site level. Customer Information System data were used to determine the complete set of accounts associated with a site. Only those sites that had populated bills for all associated accounts in a given period were approved for aggregation.

Once the billing data were aggregated to the site level, the billing data, tracking data, and phone survey data were merged. During this aggregation process, care was taken to ensure that the Express impacts and the non-Express savings estimates were carefully labeled and assigned at the site level. The Express impacts and the non-Express savings estimates were kept separate, allowing the analysis to separately examine the impacts and savings estimates.

The merging of the survey, tracking and billing data led to the development of the site level analysis dataset. Table 3-20 provides information on the site level analysis dataset, including available sample sizes by utility and participant status. NRA participants are approximately 38% of the pre-censored sample frame.

Table 3-20: Pre-Censoring Survey Sample Frame

	PG&E	SCE	SDG&E	Total
Participants	324	145	80	549
Non-Participants	496	266	135	897
Total	**820**	**411**	**215**	**1446**

Analysis Period

When a statistically adjusted engineering billing analysis is used to model the change of consumption attributable to program measures, the first step is to isolate the pre- and post-installation periods so that the impact of the installed measures can be verified. The NRA audit program ran during program years 2004 and 2005. NRA participants surveyed for in support of this billing analysis received audits during 2004. Measure installations could occur in any period after the customer's audit. The Express installations by NRA participants were tracked for the 2004 and 2005 program years.

Billing data were obtained from January 2003 through August 2007, though periods toward the end of this time frame are sparsely populated. Given the timing of the program, the team chose January 2003-December 2003 as the pre-installation period. This choice ensured that the pre-period occurred prior to the first NRA audit. The post period was chosen to be January 2006 through December 2006. Choosing January 2006 through December 2006 period as the post period led to a larger sample size than would have been available if the post period was defined as May 2006 through June 2007. The NRA customers analyzed in the billing model were small and very small customers, these customers may be more likely to move or close shop, leading to difficulties associated with attempting to find a year of pre and post bills over a four year time frame. Choosing the earlier post-period worked to maximize the size of the sample available for the billing analysis.

There are no program installations that occurred prior to or during the pre-installation period. For installations that occurred after the post-installation period, all impacts are set to zero. For installations that occurred during the post-installation period, the engineering impacts are only aggregated over the months for which there is impact that should be realized.

The survey participants and non-participants listed in Table 3-20 were merged with the billing pre and post period data. Only those surveys with 12 months of pre and post period bills were included in the sample frame presented in Table 3-21. The application of this minimum requirement led to approximately a 22% reduction in the available survey points, a 17.5% reduction in the sample size for NRA participants and a 24% reduction in the available sample size for non-participants.

Table 3-21: Bill Censored Sample Frame

	PG&E	SCE	SDG&E	Total
Participants	263	123	67	453
Non-Participants	379	180	120	679
Total	642	303	187	1132

Data Censoring

Two types of data survey censoring screens were applied to the billing analysis sample frame to remove customers. First, those that did not know if they installed measures or not were removed from the sample. This reduced the sample by 49 sites, including19 NRA participants and 30 non-participant sites. Second, sites that did not know what type of measures were installed or which year the measures were installed were also removed from the sample. This led to the elimination of an additional 101 sites, 54 NRA participant sites and 47 non-participant sites. The two survey censoring led to a 13% reduction in the sample size relative to the sample presented above in Table 3-21.

A limited number of additional sites were eliminated from the billing analysis frame. These sites were eliminated because they experienced significant changes at the site that could impact the realization rate such that the rate would not truly reflect the impact of the high efficiency measure installation. More specifically, sites that replaced electric equipment with gas equipment (2 sites) were removed from the sample. Sites with statistically adjusted engineering estimates that exceeded 35% of their usage (36 sites) were removed from the billing analysis. It is likely that the site aggregation of bills was incomplete for these sites or that the equipment that was purchased was for more than one location. Sites with more than a 300% increase in usage between 2003 and 2006 or whose usage fell to only 30% of the pre period usage (44 sites) were eliminated. These sites obviously underwent a fundamental change in their electricity usage, and the explanation of this change is outside the scope of this analysis. Sites were eliminated if they added lighting or cooling measures that were believed to add to the sites electricity usage (24 sites). Sites with large changes in the number of employees and those that stated that they had experienced an employment change of over 10% but they could not indicate how large the employee change was were also eliminated (17 sites).

Sites were also eliminated from the billing regression database if they were schools or universities. It is likely that the SAE estimates of cooling savings for these sites are incorrect given their lower level of usage during the summer. Eliminating schools and universities reduced the sample by an additional 32 sites.

Table 3-22 presents the number of participant and non-participant sites analyzed in the SAE billing regression analysis. The sites eliminated due to site specific changes that could have influenced the realization rates led to a 16% reduction in the sample size relative to the survey censoring database.

Table 3-22: Billing Regression Database

	PG&E	SCE	SDG&E	Total
Participants	157	92	54	303
Non-Participants	289	140	96	525
Total	446	232	150	828

Model Specification

The billing regression analysis for the Nonresidential Audit Program Evaluation used two different multivariate regression models under an integrated framework of providing unbiased and robust model estimates in the commercial sector. The key feature of the approach is that it employs a simultaneous equation approach to account for both the year-to-year and cross-sectional variation in a manner that consistently and efficiently isolates program impacts.

A baseline model is initially estimated using only the nonparticipant group. This model estimates a relationship that is then used to forecast what the post-installation year energy consumption for participants would have been in the absence of the program. In this way, baseline energy usage is forecast for participants by assuming that their usage will change, on average, in the same way that usage did for the comparison group of nonparticipants. The resulting SAE coefficients are used to adjust the engineering estimates of expected annual energy impacts for the participant population.

Baseline Model

The baseline model explains post-installation energy usage as a function of pre-installation energy usage, weather changes, and customer self-reports of factors that could affect their energy usage. The factors that could affect their energy usage include changes in lighting, cooling, and other end uses, changes in square footage or employees, plans to move, and recent remodels. In order to isolate the program impacts, the baseline model is only estimated for non-participants. The baseline model has the following functional form:

$$kWh_{2006,i} = \beta_j kWh_{2003,i} + \alpha(\Delta CDD)DCAC*kWh_{2003,i} + \lambda(\Delta HDD)*kWh_{2003,i} + \gamma vsmall + \sum_k \eta_k NCHg_{i,k} * kWh_{2003,i} + \varepsilon_i$$

Where,

$kWh_{2006,i}$ = Non-participant i's post installation energy usage;

$kWh_{2003,i}$ = Non-participant i's pre-installation energy usage;

ΔCDD = annual change in cooling degree days (base 65 F) between the post and pre-installation years;

$DCAC$ = binary indicator for the presence of electric cooling;

ΔHDD = annual change in heating degree days (base 65 F) between the post and pre-installation years;

Vsmall = binary indicator that the customer has been designated very small;

$NCHg_{i,k}$ = non-participant self-reported changes in variables from the survey data, including adding or replacing equipment, changing square footage, changing the number of employees and remodeling;

$\beta_j =$ estimated slope on pre-usage, estimated by business type j;

$\alpha, \lambda, \gamma, \eta =$ estimated slope parameters on their respective independent variables;

$\varepsilon_i =$ a random error term.

After the baseline model has been estimated, the parameter estimates are used to simulate the post-installation usage value for participants and non-participants. The simulated usage for participants and nonparticipants takes the same functional form:

$$k\hat{W}h_{2006,i} = \beta_j kWh_{2003,i} + \alpha(\Delta CDD)DCAC^* kWh_{2003,i} + \lambda(\Delta HDD)^* kWh_{2003,i} + \gamma vsmall.$$

The post-installation usage is not a function of changes that occurred at the site. The estimate of post-installation usage for participants is not likely to be impacted by changes at their sites in the same manner as changes in the non-participant sites. All participants have undergone the "change" of going through the audit, while only a fraction of the non-participant sites have undergone a change. Furthermore, it is more likely that participants are installing high efficiency lighting and HVAC equipment following the audit, so it is unlikely that the impact of participant end-use changes are similar to changes made by non-participants. For these reasons, the customer self-reported change variables from the survey data were not included in the estimate of post-installation usage. The SAE model does include the participant and nonparticipant self-reported change variables to control for the differences between actual and predicted post-installation usage.

Table 3-23 lists the coefficients for the independent variables used in the baseline model together with their t-statistics. The signs on the change variables are largely as expected; increasing square footage increases usage while decreasing square footage has an insignificant negative effect on usage. Changing lighting, cooling or other equipment, leads to a statistically insignificant increase in usage among nonparticipants.

Table 3-23: Baseline Non-Participant Model Outputs

Baseline Model		
Regressor	**Coefficient**	**T-Statistic**
Office*kWh_{2003}	1.11482	79.84
Retail*kWh_{2003}	1.05941	60.40
Food Store*kWh_{2003}	0.96084	34.20
Restaurant*kWh_{2003}	0.97619	69.16
Health*kWh_{2003}	0.92418	59.82
Hotel*kWh_{2003}	1.02581	38.95
Warehouse*kWh_{2003}	1.13598	31.83
Community*kWh_{2003}	1.03766	58.71
Processing*kWh_{2003}	0.94104	36.55
Services*kWh_{2003}	1.08811	17.81
Food Services*kWh_{2003}	1.09852	27.03
Misc*kWh_{2003}	0.97067	62.44
$\Delta CDD * DCAC$ *kWh_{2003}	0.0000456	1.08
ΔHDD *kWh_{2003}	0.0001222	2.21
VSmall*kWh_{2003}	-0.02081	-1.55
SQFT_Increase*kWh_{2003}	0.20345	4.43
SQFT_Decrease*kWh_{2003}	-0.14632	-0.09
Lighting Change*kWh_{2003}	0.02053	0.98
Cooling Change*kWh_{2003}	0.02741	1.64
Other Change*kWh_{2003}	0.03807	1.27
EmployeeIncrease*kWh_{2003}	-0.03328	-1.36
EmployeeDecrease*kWh_{2003}	-0.02283	1.37
Remodel*kWh_{2003}	0.04146	2.58
Adjusted R-square = 98.99		
Number of Observations = 525		

SAE Model

Using the predicted values of post-installation usage simulated using the baseline model coefficients, the SAE model is used to estimate the SAE realization rates for lighting and cooling installations. The SAE terms for lighting measures installed by NRA participants have be divided into measures installed under the Express Efficiency program and measures installed by NRA participants outside the Express program. The SAE term for cooling measures, however, is a single realization rate for the Express and non-Express installation. A smaller number of NRA participants installed cooling measures than lighting measures, limiting the study's ability to separately estimate the Express and non-Express cooling SAE realization rates.[17]

The SAE model is described by the following equation:

$$kWh_{2006,i} - k\hat{W}h_{2006,i} = \beta_1\ ExpressLTSAE_i + \beta_2 NonExpressLTSAE_i + \beta_3 CoolingSAE_i + \sum_k \delta_k PChg_{i,k} * kWh_{2003,i} + \sum_k NChg_{i,k} * kWh_{2003,i} + \mu_i$$

Where,

$kWh_{2006,i}$ = customer i's post period consumption;

$k\hat{W}h_{2006,i}$ = customer i's estimate of post period consumptions simulated from the baseline model;

$kWh_{2003,i}$ = customer i's pre period consumption;

$ExpressLTSAE_i$ = are the participant lighting Express SAE engineering estimates for customer i;

$NonExpressLTSAE_i$ = are the participant lighting Non-Express SAE engineering estimate from customer i;

$CoolingSAE_i$ = are the participant cooling Express and Non-Express SAE engineering estimates for customer i;

$Pchg_{i,k}$ = are the participant self-reported change variables from the survey data, the change variables include non-express lighting and cooling installations with zero expected savings, changes in square footage, employment, and remodels;

$NChg_{i,k}$ = are the non-participant self-reported change variables from the survey data, the change variables include installation of lighting, cooling, and other end uses, changes in square footage, employment, and remodeling.

$\beta_1, \beta_2, \beta_3$ = are the participant realization rates on the lighting and cooling engineering estimates.

The difference between predicted and actual usage in 2006 was used as the dependent variable in the SAE model. The engineering estimates and the change variables were used to explain the deviation of actual usage from the predicted usage. As discussed above, the predicted usage is estimated using only the nonparticipant group to forecast 2006 usage as a function of 2003 usage and changes in cooling and heating degree days. The usage

[17] There are 11 Express Cooling installations and 15 non-Express cooling installations among NRA participants. When the Express and Non-Express cooling SAE terms are entered into the model separately, they each have a negative, statistically insignificant coefficient estimate.

prediction presents an estimate of what would have happened in the absence of any changes made at the facility, either rebated or outside the program.

Table 3-24 lists the coefficient estimates for the SAE model. Independent realization rates are estimated for NRA participant Express lighting, NRA participant non-Express lighting, and NRA participant cooling. Attempts were made to estimate separate realization rates for NRA participants who installed cooling measures inside and outside the Express program, but no statistically significant impacts were found. Generally, the sample sizes associated with cooling measures installed by NRA participants was small, and dividing the sample into Express and non-Express installations reduced the total sample sizes to the point were no statistically significant results were found.

The Express lighting SAE realization rate is statistically significant at the 99 percent confidence level while the non-express lighting and the cooling SAE coefficient are significant at the 94 percent confidence level. All of the SAE coefficients are within the commonly accepted 90 percent confidence level.

Table 3-24: SAE Model Estimates

SAE Model		
Regressor	**Coefficient Estimate**	**T Statistic**
Express LT SAE	-0.53655	-6.52
NonExpress LT SAE	-0.46753	-1.88
Cooling SAE	-0.69269	-1.91
Part Δ LT * kWh_{2003}	0.00266	0.07
Part Δ Cooling * kWh_{2003}	0.02310	0.59
Part Δ Other *kWh_{2003}	0.02973	1.18
Part * NoInstall * kWh_{2003}	0.000208	0.03
Part * SQFT Increase *kWh_{2003}	0.31383	2.67
Part * Employee Increase * kWh_{2003}	-0.01648	-0.46
Part * Employee Decrease * kWh_{2003}	-0.24917	-10.22
Part * Remodel * kWh_{2003}	0.05632	4.77
NonPart * Δ LT * kWh_{2003}	0.02000	0.89
NonPart * Δ Cooling * kWh_{2003}	0.02727	1.59
NonPart * Δ Other * kWh_{2003}	0.03807	1.18
NonPart * NoInstall * kWh_{2003}	-0.00120	-0.18
NonPart*SQFT Increase * kWh_{2003}	0.20226	4.46
NonPart*SQFT Decrease * kWh_{2003}	-0.14513	-0.08
NonPart * Employee Increase * kWh_{2003}	-0.03218	-1.22
NonPart*Employee Decrease * kWh_{2003}	-0.02193	-1.38
NonPart*Remodel * kWh_{2003}	0.04229	2.62
Adjusted R squared = 0.2141		
Number of Observations = 828		

In addition to the SAE coefficients, independent variables were included to capture changes in participant lighting and cooling whose SAE values were zero. If these measures truly have no impact on usage, the expected coefficient should not be statistically different from zero. These measures were not found to statistically impact usage. A binary NRA participant variable, interacted with pre-period usage, was included in the analysis to determine if participation in the audit, with no changes in equipment, influences post-audit usage. The analyzed coefficient indicates that audit participation, without measure installation, does not lead to a reduction in usage.

Separate change variables were also developed for participants and nonparticipants to control for the influence of changes in square footage, employment, and remodeling. Of the change variables, participants and nonparticipants who remodel were found to use more electricity after the remodel than prior to the remodel. Increasing the square footage of a business was also shown to significantly increase the energy consumption of Audit and non-Audit participants.

Application of SAE Billing Regression Model Results

The results of the SAE billing regression model are applied to unadjusted gross savings estimates to yield adjusted gross savings. The specific application of the model results by customer size and end-use are described below:

Lighting

The coefficient of 0.47 estimated for lighting measures installed by NRA participants is applied to nearly all lighting measures, including those installed by large and small facilities. It is assumed that part of the explanation for partial realization of expected savings relates to inaccurate assumptions made regarding in-situ equipment, including the extreme case of the replacement of non-functioning equipment with efficient lighting. We believe these factors affect not only smaller facilities, but also large facilities. Thus, the adjustment is applied to both, with one exception.

This exception relates to the specific circumstance that the installed equipment does not replace existing lighting, that is for equipment that is added. For this equipment the factors described above do not apply and therefore there is a smaller expected margin of error. Thus, there is reason to believe that a higher realization rate would apply to these lighting measures. We considered the application of a realization rate of one for these measures, but believed that other factors are at play that may affect both added equipment and replaced equipment equally. As a middle ground, we chose the mid-point between .47 and 1, which is 0.735.

Cooling

The SAE coefficient estimated for combined Express and non-Express cooling measure installations (-0.69) is applied to all NRA participant installed cooling measures. The adjustment is applied to all customer sizes.

Gas

The SAE coefficient estimated for cooling measures (-0.69) is also applied to all therm-saving measures. Similar assumptions were made regarding the efficiency of cooling and gas equipment, resulting in a likely overstatement of equipment impact. Thus, the cooling SAE result is extended to adjust therm gross impacts.

Other

Due to the inability of the SAE model to detect savings from installation in the 'other' end-use, the gross adjusted savings is set to zero for very small and small customers. Gross adjusted impacts for medium and large customer result from the engineering follow up work[18].

Process

The process end-use is not investigated for very small and small customers, and no adjusted gross impacts are applicable. For medium and large customers the gross adjusted impacts result from the engineering follow up work.

Conservation Measures

There was no success in detecting conservation measure impacts through the bill analysis, and so the gross adjusted impacts for these measures are also set to zero.

3.2.4 Self-Report Approach to Net Impact Estimation and Cross Program Attribution

This section details the survey response-based method applied in the calculation of free ridership rates for the Audit program and Cross Program Attribution. The former is focused on measures installed outside the rebate programs, and indicates which activities would have occurred even in the absence of the NRA and Local Programs. The latter is focused on adoptions made through the Express Efficiency or SPC programs, and is focused on measuring how much each program contributes to measure adoption activity. Bear in mind, the latter is performed only for the Cross Program Assessment, and does not have any bearing on final gross or net impact estimates presented for the NRA and Local Programs.

NRA and Local Program Free Ridership Calculation Method

Self-report net-to-gross analyses were conducted for participants in the NRA and Local Program using participant impact survey data. Responses to selected survey questions were analyzed and weighted to develop a free ridership score for each survey respondent. These scores were then weighted by energy savings to determine a weighted free-ridership score by measure and for the NRA program overall. The scoring method was developed to be as

[18] Gross adjusted impacts for medium and large customers for the 'Other' and 'Process' end-uses are not presented, due to the restriction of engineering follow up work to those installations believed to have potential net benefits.

similar as possible to that used for the Express Efficiency self-report analysis while taking into account the slight differences in survey questions used for the NRA program.

Two separate approaches are used to calculated free ridership. For each customer, the results of these two approaches are averaged to yield the final self-reported free ridership result. This dual approach is adopted to improve the consistency of the free ridership measurement methodology.

Self-Report Free Ridership Approach One

The first approach considers the response to a battery of survey questions designed to assess the quantity, efficiency and timing of the customers' purchases in the absence of the program.

LI42. If you had not had &SURVTYPE audit, which of the following best describes what you would have purchased…

a. You would NOT have purchased new equipment
b. You would have purchased less new equipment
c. You would have purchased the same quantity of equipment as you did through the program.

LI44. If you had not had &SURVTYPE audit, would you have installed the efficient equipment….

a. More than 1 year later
b. Within 1 year
c. At the same time

LI43. If you had not had &SURVTYPE audit, which of the following best describes what you would have purchased…

a. Standard efficiency equipment or the least expensive alternative available
b. Less efficient than the equipment we just discussed
c. The same high efficiency equipment we just discussed.

Customers are first divided into three categories. Those that are 100% free riders. Those that are 100% net participants, and those that are partial free riders. To be classified as a 100% free rider, the customer must have:

1. Purchased the same quantity and type of equipment, and (LI42=c)
2. Purchased at the same time, and (LI44=c)
3. Purchased the same level of efficiency (LI43=c)

- That is, if LI42=c and LI44=c and LI43=c then the customer is 100% free rider.

The customer is classified as NOT a Free Rider if either were true:

Would not have purchased the equipment, or
Would have purchased standard equipment

- That is, if LI42=a or LI43=a, then the customer is classified as 100% net, or 0% free rider.

Furthermore, a very low level of free ridership is assessed if the customer would have purchased more than a year later.

- If LI44=a then the customer is assigned a free ridership value of 10%.

If a customer is not classified based on the above rules, they are considered a partial free rider. Partial free ridership values are assigned based on separately calculated “partial score.”

- A response in category “b” to LI42, LI43 or LI44 contributes a value of 1 to the customers partial score.

For example, if the customer responded to all three questions with a category b response, their partial score would be 3. Thus, it is possible to have a score of 0, 1, 2 or 3. A partial score of 1 is assigned a free ridership value of 75%, since there is some evidence that the customer is not a free rider. Either they would have purchased less equipment, less efficient equipment, or purchased at a somewhat later time. Similarly a customer with a partial score of 2 is assigned a free ridership value of 50%, and a partial score of 3 is assigned a free ridership score of 25%.

For customers providing a “don’t know” response to LI43, LI43 or LI44, such that this approach does not result in a free ridership score, the customer is assigned the average program result.

Self-Report Free Ridership Approach Two

The second approach to estimating free ridership is based on a single question designed to assess the program's influence on customers' purchase decisions.

LI33. On a scale of 1-10, with 1 being *NOT AT ALL* Influential and 10 being *EXTREMELY* Influential, how influential was the Audit program on your decision to install the rebated equipment?

- The free ridership score is calculated as: FR= (Influence Rating – 1) / 9

Customers that provide a "don't know" response to LI33 are assigned the average program result.

- The final free ridership score is the average of the two free ridership scores derived using Approach One and Approach Two described above.

Self-Report Based Cross Program Attribution

For customers in the "Cross Program" sample, a self-report based method is applied to "attribute" participant measure adoption behavior between free ridership, the Audit program and the rebate programs. Customers that participated in both the Audit program and the Express Efficiency or SPC programs were subjected to a second round of free ridership questioning. In general, they were asked the same three questions as presented above used to determine NRA and Local Program free ridership, except the questions were focused on how the customer would have behaved in the absence Express Efficiency or SPC program participation. The survey response categories and associated scores assigned for each response category are analogous to those presented above. Thus, the Cross Program participants were assigned two free ridership scores, one for the NRA[19] program and one for the respective incentive program.

Total Free Ridership Score

The total free ridership score—inclusive of the combined effect of both programs—is taken as the minimum of the two separate program-specific free ridership scores. The assessment of how much a single program contributed to a customers' measure adoption behavior must, be a minimum estimate of how much both programs together contributed to customers' adoption decisions. Thus, this is a somewhat conservative estimate of total free ridership.

[19] Local Program participants were not part of the Cross Program impact survey sample.

The method used to allocate the total remaining net-impacts across the two programs is described next.

<u>Allocation of Net-Impacts Across Audit and Incentive Programs.</u>

The allocation of net-impacts across the Audit and incentive programs is done using a survey question designed to elicit the relative importance of each program in customers' adoption decisions. The question reads as follows, "Thinking about the different ways in which the Audit and <incentive program> may have influenced your equipment purchase decisions, which program would you say had more influence on your selection of high efficiency lighting equipment, - the <audit type> Audit Program or the <incentive program> rebate program?" Customers were *not* read a list of pre-categorized responses. Customer responses to this question are used to allocate the measure net impacts across the two programs. The percent allocation to each program based on the various responses is shown in Table 3-25 below.

Table 3-25: Attribution of Final Net-Impacts Across Audit and Incentive Programs

Thinking about the different ways in which the Audit and <incentive program> may have influenced your equipment purchase decisions, which program would you say had more influence on your selection of high efficiency <end-use> equipment, - the Audit Program or the <incentive program> rebate program? [DO NOT READ]		
Responses	**Percent Allocation of Net Impact to Audit Program**	**Percent Allocation of Net Impact to Express Efficiency/SPC**
Audit Program	100%	0%
Incentive Program	0%	100%
Both Program had the equal influence	50%	50%
Neither Program had any influence	N/A[20]	N/A
Don't Know / Refused	50%	50%

[20] Customers that provide this response are coded as 100% Free Riders, and there are no net-impacts to allocate across programs.

3.2.5 Logit Model Approach to Net Impact Estimation and Cross Program Attribution

Discrete Choice Model – Approach Overview

This section describes the discrete choice modeling methodology that was used to estimate net-to-gross ratios and cross program effects for the NRA and Express Efficiency programs. The primary goal of the net-to-gross model is to measure an NRA-only, rebate program-only and combined-program net-to-gross ratio for lighting and HVAC equipment measures. Specifically, the objectives of the net-to-gross model analysis include the following:

- Estimate a net-to-gross ratio for measures and practices adopted by NRA participants that were not rebated through the Express Efficiency or SPC Program. This represents the "NRA-only" net-to-gross ratio.
- Estimate a net-to-gross ratio for measures adopted by non-NRA customers who were rebated through the Express Efficiency or SPC program. This represents the "Rebate-only" net-to-gross ratio.
- Estimate a net-to-gross ratio for measures adopted by NRA participants that were also rebated by the Express Efficiency or SPC Program. This represents the portion of savings that would not have occurred in the absence of both the NRA and the rebate programs.

For different end-use categories, it is expected that a different set of factors may be influential in the purchase and equipment choice decisions. For example, the age of the existing air conditioner may influence the decision to install a new HVAC system, but have no effect on the decision to install lighting. Similarly, the NRA program may have a varying degree of impact on program awareness and equipment purchases depending upon the end-use or customer type. Therefore, three different models were generated for each end-use category to address this variation across lighting and HVAC measures.

The discrete choice modeling was done using two stages for linear fluorescent lighting and HVAC models. The first stage for the linear lighting and HVAC models the decision to purchase equipment and a second stage models the actual equipment chosen. A one-stage purchase decision model was used to estimate net-to-gross ratios for CFLs.

The final discrete choice methodologies described below are a departure from the model framework that was originally described in the final research plan for this evaluation. The research plan called for a nested logit model specification to estimate the purchase decision. Multiple variations on the nested logit model were attempted but none of these models yielded a well-specified model.[21] Since a correctly specified nested logit model was infeasible, an alternative discrete choice method was adopted that involved estimating the various decision stages separately and then combining the probability results outside the model to determine the net-to-gross ratio. This approach is the same as that used in previous evaluations of the Express Efficiency program.

The decision tree structure was also modified from the original research plan. The original research plan suggested a decision tree that had three levels: 1) Receive an audit (Yes/No), 2) Become aware of Express Efficiency/SPC (Yes/No), 3) Purchase equipment (Equipment options, no purchase). It is believed that part of the difficulty with the nested logit model came from the awareness data available for the second stage.[22] Customers were surveyed several years after they participated in the program, which made identifying the actual source of program awareness (NRA audit or otherwise) very difficult to determine. Participants may have also become aware of the Express program several years prior to participating, which further compounds the difficulty of tracing the source of awareness. Despite these issues, an attempt was made to estimate lighting and HVAC models using awareness rather than purchase as the first stage. As discussed below, this resulted in models that were very sensitive to the variables included. For these reasons, the final discrete choice model omits the awareness stage and instead includes awareness as an explanatory variable. The result is a 2-stage rather than 3-stage model for both linear lighting and HVAC, and a 1-stage model for CFLs.

Data Sources

The data used for discrete choice modeling are a combination of NRA, Express Efficiency, and SPC program tracking and survey data. The sample is divided by equipment end use, and then further separated into three groups for the net-to-gross calculation: customers who participated in the NRA program only, customers who participated in the Express Efficiency

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[21] With the nested logit specification, an "inclusive value" coefficient is used to link the different stages of the model. An inclusive value coefficient estimate between 0 and 1 indicates a properly specified model. Despite attempting numerous different specifications and tree structures, the modelers were unable to get inclusive value estimates within this range. For this reason, the nested logit model specification was abandoned in favor of the sequential logit models discussed above.

[22] Multiple different nested logit specifications were attempted without the awareness stage, and none of these alternatives yielded valid results, indicating that there were additional problems with using the nested logit model in this application beyond just the problems relating to accurately measuring the source and timing of program awareness.

or SPC programs only, and customers who participated in both the NRA and a rebate program.

Estimation of Cost, Savings, and Rebates

A requirement of the conditional logit specification is that information must be included in the model for all of the choices in the choice set and not just for the option that is actually selected by the customer. As a result, data on equipment characteristics are needed for all the non-chosen equipment alternatives as well as for the equipment option actually chosen. The method used to calculate these parameters for the non-chosen equipment alternatives is described below. For those customers that installed high-efficiency equipment within the Express Efficiency/SPC program, the cost, savings, and rebate data from the tracking system (if available) are used in the model.

For those customers who installed high-efficiency equipment outside of the Express Efficiency program (or are participants that do not have this information stored in the tracking system), installation costs are determined either from costs data contained in the DEER database or program tracking data for those measures that could be easily matched by description. The per-unit costs are multiplied by the reported quantities installed to determine the total cost of the retrofit. When survey responses did not include information on the number of units installed, an estimate was developed from the tracking data based on the average number of units installed by business size and measure type. Data on per unit energy savings for each measure was also collected from the DEER database. These savings were assigned to each measure based on climate zone and building vintage and then multiplied by the actual or estimated number of units installed to get total energy savings for that customer.

For the non-chosen equipment options, cost, savings, and rebate information is assigned similarly based on customer size, climate zone, and other information collected from customer surveys. Costs and savings per unit are taken from the DEER database and rebates are pulled from Express/SPC tracking data. These are then multiplied by the estimated average quantities installed for each business size and measure type. If a person was unaware of the Express/SPC program, the rebate amount is automatically set to zero for all high efficiency equipment options. The costs, savings, and rebate calculations are summarized below.

- ***Actual Equipment Option Chosen – In Program:*** Uses the reported cost, savings, rebate, and quantity information from Express/SPC tracking data. If this information is not available in the tracking data, estimates were developed based on average values for that measure from other customers in the same size category.

- ***Actual Equipment Option Chosen – Outside Program:*** Costs and savings are calculated using the reported number of units installed and equipment cost/savings information contained in the DEER database. Where applicable, rebates are calculated using reported quantities installed and known Express rebate amounts.

- ***Non-Chosen Equipment Alternatives:*** Costs, savings, and rebates are estimated for each business size and measure using actual and reported information from tracking and survey data. For those unaware of the rebate program, rebate is set to zero for all program qualifying equipment options.

The remainder of this section presents detailed information on the discrete choice models developed for linear lighting, HVAC, and CFLs.

Linear Fluorescent Lighting Model (Linear Lighting)

The decision to purchase high efficiency lighting is modeled here as two separate probabilities. The probability of purchasing any given equipment option A can be expressed as the product of two separate probabilities: the probability that the customer purchases equipment is multiplied by the probability that equipment option A is chosen given that a purchase is made. This can be written as:

$$Prob(Purchase\ \&\ Equip\ A) = Prob(Purchase) \times Prob(Equip\ A\ |\ Purchase)$$

The two-stage model adopted for this analysis estimates both of the right hand side probabilities separately. The first stage of the model estimates the probability that a customer purchases equipment and is referred to as the purchase probability. The second stage of the model estimates the type of equipment chosen given that the customer makes a purchase and is referred to as the equipment choice probability. The product of the purchase probability and the equipment choice probability is the total probability and reflects the probability that any one equipment option is purchased, given the decision to purchase equipment. Once estimated, the model is used to determine the probability of purchasing high-efficiency equipment in the absence of the program. This is simulated by setting both the audit and rebate program awareness variables to zero in both stages of model.

We attempted to run this model using program awareness (rather than purchase) as the first stage. This specification of the model was extremely sensitive to the variables included, with resulting net-to-gross ratios ranging from 1 to 99 percent across two different plausible versions of the model. Because of this sensitivity, we used the purchase decision as the first stage as this yielded more stable results across specifications.

The net-to-gross ratio is calculated using the total probability of purchasing high-efficiency equipment both with and without the existence of the programs (NRA and Express Efficiency/SPC). Details of the net-to-gross ratio calculations are covered later in this section.

Characteristics of the sample used to estimate both stages of the lighting model are shown in Table 3-26 below.

Table 3-26: Linear Lighting Model Sample

Group	Sample Size
Initial Sample	5,999
Observations dropped for Express participants with no rebate data	17
Observations dropped for missing data or for having multiple installations	85
Observations dropped for customers who were not eligible to purchase linear lighting	3,770
Final Sample	2,127
Express/SPC Participants	602
NRA Participants	277
Cross Program Participants	88
Nonparticipants	1,160

Stage 1: Lighting Purchase Model Specification

The purchase model is specified as a logit model with a dependent variable PURCHASE having a value of either zero or one. In this application, customers are given a value of one if they purchased fluorescent lighting equipment and zero if they did not. The purchase model specification is defined as:

$$PURCHASE = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

Variable definitions are given in Table 3-27. The explanatory variables X contain information on audit and rebate program awareness that capture the effect of the energy efficiency programs. Customer characteristics such as knowledge of energy efficiency and information seeking behavior are contained in group Y. Variable group Z contains variables indicating building type and type of lighting. The error term ε is assumed to be distributed logistic consistent with the logit model specification.

The variables AWARENESS and AUDIT are designed to capture the effect of the audit and rebate program on the decision to make a purchase. For AWARENESS, customers are given a value of one if they indicated that they were aware of the retrofit program before they selected their lighting equipment. If they became aware of the program after or at the same time they selected the equipment, they are given a value of zero for AWARENESS. This definition of awareness is used to take into account that the process of shopping for equipment will result in some customers becoming aware of the energy efficiency program. When awareness is set to zero to simulate the absence of the program, only those who started shopping after they became aware of the program will be affected since it is assumed that the program influenced them to shop for new equipment. This definition of program awareness avoids the problem of having program awareness affect those customers who were already looking for equipment when they became aware of the program.

Using this restricted definition of awareness, 70 percent of purchasers were aware of the energy efficiency program at the time that they selected their equipment. For those that did not make any purchases, 27 percent were aware of the program. For the entire sample, 43 percent of the customers were coded as being aware of the energy efficiency program.

The specification for the logit model used to estimate the linear lighting purchase decision is as follows:

$$
\begin{aligned}
PURCHASE = \ & \beta' BLDTYPE + \beta' BLDSIZE + \beta' AUDIT + \beta' AWARE + \\
& + \beta' OWN + \beta' INFOSEEK + \varepsilon
\end{aligned}
$$

$$
\begin{aligned}
\text{Where } BLDTYPE &= \textit{Vector of dummy variables indicating building type} \\
BLDSIZE &= \textit{Vector of dummy variables indicating building size} \\
AUDIT &= \textit{Audit received through the NRA program} \\
AWARE &= \textit{Aware of the Express/SPC program} \\
OWN &= \textit{Participant owns building} \\
INFOSEEK &= \textit{Participant is an efficiency information seeker based on survey responses} \\
\beta &= \textit{Coefficients to be estimated} \\
\varepsilon &= \textit{Random error term assumed logistically distributed}
\end{aligned}
$$

Table 3-27: Linear Lighting Purchase Model Variable Definitions

Variable Name	Units	Variable Type	Description
Very_small	0,1	Z	Very small customer
Small	0,1	Z	Small customer
Medium	0,1	Z	Medium customer
Large	0,1	Z	Large customer
Office	0,1	Z	Office building
Retail	0,1	Z	Retail building
Industrial	0,1	Z	Industrial building
School	0,1	Z	School
Grocery	0,1	Z	Grocery Store
Restaurant	0,1	Z	Restaurant
HealthCare	0,1	Z	Health care facility
Hotel	0,1	Z	Hotel
Warehouse	0,1	Z	Warehouse
Community	0,1	Z	Community building
Awareness	0,1	X	Aware of rebate program prior to purchase
Audit	0,1	X	Customer received an audit through NRA
Own	0,1	Y	Customer owns building
Infoseek	0,1	Y	Customer actively looks for information on energy efficiency

For both the purchase and equipment choice models, several different model alternatives were explored in addition to the final model specifications presented here. The different models indicated that the net-to-gross results are generally sensitive to the model specification used. This is likely due in part to the various correlations and interactions across variables (e.g., awareness and audit, building type and lighting, awareness, etc.). The final model specification was chosen as it included variables for the major factors thought to influence both the purchase and equipment choice decision and the estimation results had the expected signs for most of the variables used. These models also omitted some variables (such as rebates) that are highly correlated with variables already included in the model (i.e., savings, which is used to calculate the rebate amount).

Lighting Purchase Model Estimation Results

The estimation results from the purchase model are given in Table 3-28. A likelihood ratio test yields a test statistic of over 971 with 18 degrees of freedom, indicating that the model specification overall has significant explanatory power. The building size variables (VERY_SMALL, SMALL, MEDIUM, LARGE) take the place of an intercept in the model and all are negative and significant. Based on the building type variables, office, retail, school, restaurant, hotel, and warehouse buildings all have statistically significant coefficient estimates. Among these, warehouse facilities and schools are more likely to make a lighting purchase.

As expected, program awareness (AWARENESS) has a strong positive effect on the decision to purchase lighting equipment. The audit program variable (AUDIT) is also positive as expected and statistically significant. Some of the influence of this variable may be captured in the AWARENESS coefficient. Finally, customers that own their own building (OWN) or have actively sought information on energy efficiency (INFOSEEK) are also more likely to make a lighting purchase.

Table 3-28: Linear Lighting Purchase Model Estimation Results

Variable Name	Coefficient Estimate	Standard Error	Significance Level
Very_Small	-2.23	0.20	< 1%
Small	-2.61	0.20	< 1%
Medium	-2.47	0.21	< 1%
Large	-2.33	0.24	< 1%
Office	0.38	0.19	4%
Retail	0.51	0.20	1%
Industrial	-0.078	0.19	68%
School	0.56	0.24	2%
Grocery	0.15	0.35	68%
Restaurant	-0.53	0.30	7%
HealthCare	0.046	0.30	88%
Hotel	-1.81	0.54	< 1%
Warehouse	0.65	0.27	2%
Community	-0.40	0.23	8%
Awareness	1.75	0.12	< 1%
Audit	0.36	0.14	< 1%
Own	0.098	0.12	42%
Infoseek	0.078	0.13	55%

The estimated model parameters are used to calculate the probability of equipment purchase. With the logit model, the probability of purchasing is given by:

$$PROB_{PURCHASE} = \frac{\exp(Q)}{1+\exp(Q)}$$

$$Where\ Q = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

The probability of making an equipment purchase in absence of the program is calculated by removing the effect of the rebate and NRA programs from the purchase decision model. This is done by setting AWARENESS and AUDIT equal to zero to reflect the absence of both programs. The probability of making a purchase is then recalculated using the logistic density function given above. All other variable values remain the same, as they are not expected to change in absence of the program.

Stage 2: Lighting Equipment Choice Model Specification

The second stage of the model estimates the probability that a specific type of equipment option is chosen given that a linear lighting purchase is made. The choice set for the equipment choice model contains two different fluorescent lighting options: T5/T8s or T10/T12s. In the logit model, customers are given a value of 1 for the dependent variable for the option they actually chose and a zero for the remaining non-chosen alternative.

The equipment choice model specification is:

$$\begin{aligned} EQUIPCHOICE \;=\; & \beta' BLDTYPE + \beta' BLDSIZE + \beta' COST + \beta' SAVINGS + \beta' CINDEX \\ & + \beta' AWARE + \varepsilon \end{aligned}$$

Where BLDTYPE = Vector of dummy variables indicating building type
BLDSIZE = Vector of dummy variables indicating building size
COST= Total job cost
SAVINGS = Annual kWh savings expected from equipment
CINDEX = (Cost - Rebate) / Cost
AWARENESS = Aware of the Express/SPC program
β *= Coefficients to be estimated*
ε *= Random error term assumed logistically distributed*

The explanatory variables used in the equipment choice model are described in Table 3-29. In this stage of the model, awareness is defined in the same way as stage 1: the customer is considered aware of the rebate program (AWARENESS = 1) if they became aware of the program before selecting the lighting equipment.

The variable CINDEX gives the fraction of the cost of the equipment that is paid by the customer and is defined by the cost of the equipment minus any rebate divided by the cost of the equipment. The CINDEX variable indicates that share of the project cost that is not covered by the program rebate. For those that did not purchase equipment or were unaware of the program when the equipment was selected, the expected rebate is zero. This results in a CINDEX value of one since the customer pays the entire cost of the measure. Similarly, for those that made a purchase and are aware of the program, the expected rebate is nonzero and CINDEX takes on a value less than one. For standard efficiency lighting equipment CINDEX takes a value of one since a rebate is not available for this equipment. Although cost and rebate information is combined into one variable called CINDEX, COST is also included in the model to pick up any effects specifically relating to the total cost of the lighting retrofit, which is not captured in the CINDEX ratio.

A characteristic of the conditional logit specification is that variables that do not vary over choices will drop out of the model. For instance, firmographic variables such as size does not vary across the equipment options and therefore cannot be included in the model. One way to avoid this problem is to interact firmographic variables with choice specific dummy variables. This method is used in this application to allow for firm specific variables such as size, building type, and program awareness to influence equipment choice. The variables for building type, customer size, and awareness are all variables interacted with a dummy variable for the high efficiency equipment options and zero values for the standard efficiency option in this stage.

Table 3-29: Linear Fluorescent Equipment Choice Model Variable Definitions

Variable Name	Units	Description
Very_small	0,1	Very small customer (interacted with equip options)
Small	0,1	Small customer (interacted with equip options)
Medium	0,1	Medium customer (interacted with equip options)
Large	0,1	Large customer (interacted with equip options)
Office	0,1	Office building (interacted with equip options)
Retail	0,1	Retail building (interacted with equip options)
Industrial	0,1	Industrial building (interacted with equip options)
Savings	kWh	Annual kWh savings expected from equipment
Cost	dollars	Total job cost of lighting equipment
Cindex	ratio	(Cost-Rebate)/Cost
Awareness	0,1	Awareness of rebate program (interacted with equip options)

Lighting Equipment Choice Model Estimation Results

The estimation results for the equipment choice model are given in Table 3-30. In general, the estimation results conform to expectations. The coefficient estimate on CINDEX is negative, indicating that the greater portion of the installation cost a customer must pay out-of-pocket, the less attractive the equipment option. As expected, the estimate for SAVINGS is positive, while the estimate for COST is negative.

The remaining variables are all interacted with a dummy variable indicating a high efficiency equipment option. The coefficient estimate on AWARENESS is positive, indicating that those that are aware of the rebate program are more likely to purchase high efficiency equipment. The coefficient estimates for MEDIUM and LARGE are negative and increasing in magnitude, indicating a slight tendency for larger firms to purchase standard efficiency equipment. The remaining variables indicate business type. All three (OFFICE, RETAIL, INDUSTRIAL) have negative coefficient estimates, indicating that these customers are less likely to choose T8s.

Table 3-30: Linear Fluorescent Equipment Choice Model Estimation Results

Variable Name	Coefficient Estimate	Standard Error	Significance Level
Very_small	1.15	9.89	91%
Small	17.23	1,939	99%
Medium	-2.81	42.87	95%
Large	-3.43	52.99	95%
Office	-0.78	0.75	30%
Retail	-0.62	0.78	43%
Industrial	-0.65	0.74	38%
Savings	0.00024	0.0022	91%
Cost	-0.00045	0.0041	91%
Cindex	-7.96	36.60	83%
Awareness	0.91	6.68	89%

Using the coefficient estimates from the purchase model, the probability of choosing any particular equipment option is calculated. Using the conditional logit density function, the probability of selecting equipment option j is given by:

$$PROB_{EQUIP\,j} = \frac{\exp(\beta' X_j)}{\sum \exp(\beta' X)}$$

where $\beta' X_j$ is the product of the variables and coefficient estimates used in the equipment choice model for equipment option j and the denominator is the sum of $\beta' X$ across the two equipment options in the choice set.

The equipment choice probability is calculated both with and in absence of the program utilizing the same method applied to the purchase probability. To simulate the absence of the program, AWARENESS is set to zero and CINDEX is set to one for all of the lighting equipment options in the equipment choice stage.

The total probability of choosing high efficiency equipment option j is then the product of the purchase probability and the equipment choice probability for option j:

$$PROB_{TOTAL} = PROB_{PURCHASE} \times PROB_{EQUIP\ j}$$

The total probability is then calculated with and without the program variables as described above. The change in the total probability with and without the program variables is used to calculate the net-to-gross ratio and is discussed in more detail at the end of this section.

HVAC Purchase Model

The HVAC purchase model has the same underlying theory as the lighting purchase model. The probability of purchasing any given equipment option A is expressed as the product of the probability of making any equipment purchase and probability of choosing equipment option A given that some purchase is being made:

$$Prob(Purchase\ \&\ Equip\ A) = Prob(Purchase) \times Prob(Equip\ A \mid Purchase)$$

A similar two-stage model is sued to estimate both of the right hand side probabilities separately. As before, the first stage of the model estimates the probability that a customer makes an HVAC purchase and is referred to as the purchase probability. The second stage of the model estimates the type of equipment chosen given that the customer is making a purchase and is referred to as the equipment choice probability. The product of the purchase probability and the equipment choice probability is the total probability and reflects the probability that any one equipment option will be purchased. Once estimated, the model is used to determine the probability of purchasing high-efficiency equipment in the absence of the programs. This is simulated by setting both the audit and rebate program awareness variables to zero in both stages of model. Both stages of the model are estimated using population weights developed from the survey sample size and the respective participant and nonparticipant population sizes.

As with the lighting model, we attempted to run this model using program awareness (rather than purchase) as the first stage. This specification of the model was also very sensitive to the variables included, with resulting net-to-gross ratios ranging from 18 to 66 percent across two different similar and equally plausible versions of the model. Because of this sensitivity, we used the purchase decision as the first stage as this yielded more stable results across specifications.

Characteristics of the sample used to estimate both stages of the HVAC model are shown in Table 3-31 below.

Table 3-31: HVAC Model Sample

Group	Sample Size
Initial Sample	2,603
Observations dropped for PTAC purchasers	64
Observations dropped for missing data	79
Final Sample	2,460
Express/SPC Participants	49
NRA Participants	647
Cross Program Participants	74
Nonparticipants	1,690

Stage 1: HVAC Purchase Model Specification

The HVAC purchase model is specified as a logit model with a dependent variable having a value of one if an HVAC purchase is made and zero otherwise. The basic model structure for the purchase stage is as follows:

$$PURCHASE = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

The HVAC model is estimated for split and package unit purchases only, as the other equipment options had very small sample sizes and did not produce reasonable results when included in the model. For this reason, only split and package units were used for the HVAC model.

Variable definitions are given in Table 3-32. The explanatory variables X contain information on audit and rebate program awareness that capture the effect of the energy efficiency programs. Customer characteristics such as knowledge of energy efficiency and information seeking behavior are contained in group Y. Variable group Z contains variables indicating building type and size. The error term ε is assumed to be distributed logistic consistent with the logit model specification.

The variable AUDIT is included to capture the effect of the audit program on the probability of being aware of the rebate program. For AUDIT, customers are given a value of one if they received an audit through the NRA program, otherwise they are assigned a zero value.

Table 3-32: HVAC Purchase Model Variable Definitions

Variable Name	Units	Variable Type	Description
Very_small	0,1	Z	Very small customer
Small	0,1	Z	Small customer
Medium	0,1	Z	Medium customer
Large	0,1	Z	Large customer
Office	0,1	Z	Office building
Retail	0,1	Z	Retail building
Industrial	0,1	Z	Industrial building
School	0,1	Z	School
Grocery	0,1	Z	Grocery Store
Restaurant	0,1	Z	Restaurant
HealthCare	0,1	Z	Health care facility
Hotel	0,1	Z	Hotel
Warehouse	0,1	Z	Warehouse
Community	0,1	Z	Community building
Awareness	0,1	X	Aware of rebate program prior to purchase
Audit	0,1	X	Customer received an audit through NRA
Benefits	0,1	Y	Customer receives benefits of energy savings (pays own utility bills)
EE_Import	0,1	Y	Customer indicates that energy efficiency is important to their business

<u>HVAC Purchase Model Estimation Results</u>

The estimation results for the HVAC purchase model are given in Table 3-33. The model was weighted to the population based on the survey sample sizes and the respective participant and nonparticipant population sizes. A likelihood ratio test (calculated with these sample weights included) yields a test statistic of over 821,851 with 18 degrees of freedom, which is well above the critical value at any of the conventional levels of significance. As expected, AUDIT and AWARENESS have positive and significant effects on the decision to make an HVAC purchase. Business size indicators (VERY_SMALL, SMALL, MEDIUM, LARGE) serve as intercepts in the model and are all negative and significant. Among the building types, grocery stores and schools are more likely to make an HVAC purchase.

Offices and warehouses also had positive and significant coefficient estimates, however the magnitude of these coefficients is smaller. Those customers that receive the benefits of energy savings (BENEFITS), meaning that they pay their own utility bills, had a negative and significant estimate. This indicates that customers that have their utility bills paid by a third party (such as a corporate office) are still likely to make an HVAC purchase. Those customers that also indicated that energy efficiency was important to them (EE_IMPORT) also were more likely to make a new HVAC purchase.

Table 3-33: HVAC Purchase Model Estimation Results

Variable Name	Coefficient Estimate	Standard Error	Significance Level
Very_small	-3.49	0.02	< 1%
Small	-3.39	0.02	< 1%
Medium	-2.67	0.03	< 1%
Large	-2.59	0.03	< 1%
Office	0.04	0.02	1%
Retail	-1.29	0.03	< 1%
Industrial	-0.83	0.03	< 1%
School	0.76	0.03	< 1%
Grocery	1.26	0.03	< 1%
Restaurant	-0.74	0.04	< 1%
HealthCare	-0.82	0.03	< 1%
Hotel	-2.02	0.13	< 1%
Warehouse	0.06	0.03	3%
Community	-0.25	0.03	< 1%
Awareness	0.27	0.02	< 1%
Audit	0.36	0.02	< 1%
Benefits	-0.12	0.01	< 1%
EE_Import	0.52	0.01	< 1%

The estimated model parameters are used to calculate the purchase probability. With the logit model, the probability of making an HVAC purchase is given by:

$$PROB_{PURCHASE} = \frac{\exp(Q)}{1+\exp(Q)}$$
$$Where\ Q = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

The probability of an HVAC purchase in absence of the program is calculated by removing the effect of the audit and Express/SPC programs from the purchase model. This is done by setting AUDIT and AWARENESS equal to zero. The purchase probability is then recalculated using the logistic density function given above. All other variable values remain the same as they are not expected to change in absence of the program.

Stage 2: HVAC Equipment Choice Model Specification

The second stage of the model is devoted to estimating the probability that a specific type of equipment option is chosen given that an HVAC purchase is being made. This second stage of the model is specified as a conditional logit and is described below.

The choice set for the equipment choice model includes two options: a high efficiency split or package system and a standard efficiency split or package system. In the logit model, customers are given a value of 1 for the dependent variable for the option they actually chose and a zero for the non-chosen alternative.

The equipment choice model specification is:

$$EQUIP\text{CHOICE} = \beta'\text{COST} + \beta'\text{SAVINGS} + \beta'\text{CINDEX} + \varepsilon$$
$$\begin{aligned} \text{Where COST} &= \text{Total job cost} \\ \text{SAVINGS} &= \text{Annual kWh savings expected from equipment} \\ \text{CINDEX} &= \text{(Cost - Rebate) / Cost} \\ \beta &= \text{Coefficients to be estimated} \\ \varepsilon &= \text{Random error term assumed logistically distributed} \end{aligned}$$

The explanatory variables used in the equipment choice model are described in Table 3-34.

Because of the small sample sizes for the HVAC group, we were unable to include choice-specific variables in the equipment choice model as was done in the lighting equipment choice model. We attempted to include these variables, but got wildly divergent results depending on which variables were used. Consequently, only those variables that varied across the HVAC equipment options were used in the HVAC equipment choice model.

Cost and rebate information is combined into one variable called CINDEX. As before in the linear fluorescent lighting model, the variable COST is also included to pick up any effects of the total equipment cost on equipment choice not already covered by CINDEX.

For those that were unaware of the rebate program when the equipment was selected, the expected rebate is zero. This results in a CINDEX value of one since the customer pays the entire cost of the measure. Similarly, for those that made a purchase and are aware of the program, the expected rebate is nonzero and CINDEX takes on a value less than one. For the standard efficiency equipment choice, CINDEX takes a value of one since a rebate is not available for this equipment.

Table 3-34: HVAC Equipment Choice Model Variable Definitions

Variable Name	Units	Description
Cost	dollars	Total job cost of lighting equipment
Savings	kWh	Annual amount of kWh savings expected from equipment
Cindex	ratio	(Cost-Rebate)/Cost

HVAC Equipment Choice Model Estimation Results

The estimation results for the equipment choice model are given in Table 3-35. In general, the estimation results conform to expectations. The coefficient estimate on CINDEX is negative and significant, indicating that the greater portion of the installation cost a customer must pay out-of-pocket, the less attractive the equipment option. The estimate for SAVINGS is positive and COST is negative, as would be expected, and both are statistically significant.

Table 3-35: Equipment Choice Model Estimation Results

Variable Name	Coefficient Estimate	Standard Error	Significance Level
Cost	-0.000026	0.000004	< 1%
Savings	0.000017	0.000002	< 1%
Cindex	-7.790650	0.208550	< 1%

Using the coefficient estimates from the awareness model, the probability of choosing any particular equipment option is calculated. Using the conditional logit density function, the probability of selecting equipment option j is given by:

$$PROB_{EQUIP\,j} = \frac{\exp(\beta' X_j)}{\sum \exp(\beta' X)}$$

where $\beta' X_j$ is the product of the variables and coefficient estimates used in the equipment choice model for equipment option j and the denominator is the sum of $\beta' X$ across the two equipment options in the choice set. To simulate the absence of the audit and rebate programs, CINDEX is set to one for all of the HVAC equipment options.

The total probability of choosing high efficiency equipment option j is then the product of the purchase probability and the equipment choice probability for option j:

$$PROB_{TOTAL} = PROB_{PURCHASE} \times PROB_{EQUIP\,j}$$

The total probability is then calculated with and without the program variables as described above. The change in the total probability with and without the program variables is used to calculate the net-to-gross ratio and is discussed in more detail at the end of this section.

CFL Model

A one-stage discrete choice model of the decision to purchase CFLs was used to determine the probability of choosing high-efficiency equipment, specifically CFLs, over standard efficiency, incandescent bulbs in this case. The CFL model was weighted to the population using weights developed from the survey sample sizes for participants and nonparticipants and the corresponding population numbers. Once estimated, the model is used to determine the probability of purchasing high-efficiency equipment in the absence of the program. This is simulated by setting both the audit and rebate program awareness variables to zero in the model. Several model specifications were explored and the final specification drops those customers that had abnormally large CFL installations (more than 1000 CFLs) as these outlier observations were having a disproportionate influence over the estimation results.

Characteristics of the sample used to estimate both stages of the HVAC model are shown in Table 3-36 below.

Table 3-36: CFL Model Sample

Group	Sample Size
Initial Sample	5,999
Observations dropped for Express participants with no rebate data	8
Observations dropped for missing data or having multiple installations	83
Observations dropped for large jobs (> 1000 CFLs)	14
Observations dropped for customers who were not eligible to purchase CFLs	4,332
Final Sample	1,562
Express/SPC Participants	568
NRA Participants	133
Cross Program Participants	110
Nonparticipants	751

Stage 1: CFL Purchase Model Specification

The purchase model is specified as a logit model with a dependent variable having a value of either zero or one. In this application, customers are given a value of one if they purchased CFLs and zero if they did not. The purchase model specification is defined as:

$$PURCHASE = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

The CFL model variable definitions are given in Table 3-37. The explanatory variables X contain information on audit and rebate program awareness that capture the effect of the energy efficiency programs. Customer characteristics such as knowledge of energy efficiency and information seeking behavior are contained in group Y. Variable group Z contains variables indicating building type and type of lighting. The error term ε is assumed to be distributed logistic consistent with the logit model specification.

The variable definitions and rationale for using them in the CFL model is the same as for the linear lighting and HVAC models. The variables AWARENESS and AUDIT are specified to capture the effect of the audit and rebate programs on the decision to make a purchase. For AWARENESS, customers are given a value of one if they indicated that they were aware of the retrofit program before they selected their lighting equipment. If they became aware of the program after or at the same time they selected the equipment, they are given a value of zero for AWARENESS. This definition of awareness is used to take into account that the process of shopping for equipment will result in some customers becoming aware of the energy efficiency program. When awareness is set to zero to simulate the absence of the program, only those who started shopping after they became aware of the program will be affected since it is assumed that the program influenced them to shop for new equipment.

Using this definition of awareness, 86 percent of CFL purchasers were aware of the energy efficiency program at the time that they selected their equipment. For those that did not make any purchases, 30 percent were aware of the program. For the entire sample, 50 percent of the customers were aware of the energy efficiency program.

Table 3-37: CFL Purchase Model Variable Definitions

Variable Name	Units	Variable Type	Description
Office	0,1	Z	Office building
Retail	0,1	Z	Retail building
Industrial	0,1	Z	Industrial building
School	0,1	Z	School
Grocery	0,1	Z	Grocery
Restaurant	0,1	Z	Restaurant
HealthCare	0,1	Z	Health care facility
Warehouse	0,1	Z	Warehouse
Very_Small	0,1	Y	Very small customer
Small	0,1	Y	Small customer
Medium	0,1	Y	Medium customer
Large	0,1	Y	Large customer
Net_cost	0,1	X	Cost- Rebate
EEimport	0,1	Y	Customer indicates that energy efficiency is important to their business
Infoseek	0,1	Y	Customer actively looks for information on energy efficiency
Awareness	0,1	X	Aware of rebate program prior to purchase
Audit	0,1	X	Audit received through the NRA program
Aware_other	0,1	Y	Aware of other energy efficiency programs
Benefits	0,1	Y	Customer receives benefits of energy savings (pays own utility bills)

CFL Purchase Model Estimation Results

The estimation results from the CFL purchase model are given in Table 3-38. A likelihood ratio test yields a test statistic of over 278,440 with 19 degrees of freedom, which is well above the critical value and indicates that the model has significant explanatory power. As expected, program awareness (AWARENESS) has a positive effect on the decision to purchase CFLs. Receiving an audit also has a positive effect on the CFL purchase decision and is also statistically significant. Based on the building type coefficient estimates, industrial is the building type that was most likely to make a CFL purchase. All of the other variables except GROCERY, including the building type and customer size variables, were all statistically significant in this model. The customer size variables are all negative with the estimate for small size having the largest magnitude. Finally, the NETCOST variable (reflecting CFL cost net of the program incentive) is negative and statistically significant.

Table 3-38: CFL Purchase Model Estimation Results

Variable Name	Coefficient Estimate	Standard Error	Significance Level
Office	0.11	0.024	< 1%
Retail	0.089	0.025	< 1%
Industrial	0.46	0.03	< 1%
School	0.25	0.044	< 1%
Grocery	0.021	0.086	81%
Restaurant	-1.07	0.031	< 1%
HealthCare	-1.12	0.043	< 1%
Warehouse	0.93	0.031	< 1%
Very_Small	-3.47	0.027	< 1%
Small	-4.35	0.031	< 1%
Medium	-3.41	0.043	< 1%
Large	-3.94	0.060	< 1%
Net_cost	0.00011	0.0000089	< 1%
EEimport	-0.076	0.017	< 1%
Infoseek	-0.15	0.017	< 1%
Awareness	1.60	0.018	< 1%
Audit	2.15	0.019	< 1%
Aware_other	0.70	0.021	< 1%
Benefits	0.39	0.017	< 1%

The estimated model parameters are used to calculate the probability of purchase. With the logit model, the probability of purchasing is given by:

$$PROB_{PURCHASE} = \frac{\exp(Q)}{1+\exp(Q)}$$

$$Where\ Q = \alpha + \beta' X + \gamma' Y + \theta' Z + \varepsilon$$

The probability of making an equipment purchase in absence of the program is calculated by removing the effect of the energy efficiency program from the purchase decision model. This is done by setting AWARENESS and AUDIT equal to zero and adding back the rebate amount to the NETCOST variable. The probability of making a purchase is then recalculated using the logistic density function given above using the new variable values that simulate the absence of the program. All other variable values remain the same as they are not expected to change in absence of the program.

Net-to-Gross Calculation

Once both the purchase probability and the equipment choice probability are estimated, the two probabilities are multiplied together to determine the total probability that an individual equipment option is selected, given a purchase is made. This total probability is calculated twice. First, the total probability is calculated using the original values for the program variables AUDIT, AWARENESS, and CINDEX (or NETCOST). This gives the total probability with the existence of the program. Next, the total probability is calculated in absence of the program. This is done by setting AUDIT and AWARE equal to zero and CINDEX equal to one to reflect the absence of rebates. If the model uses the NETCOST variable (as in the HVAC and CFL models), the value is adjusted adding back in the rebate amount so that NETCOST reflects the full cost of the installation without any program incentive.

The estimated net-to-gross ratios are based on the probability of purchasing high efficiency measures with and without the program:

$$NTG = \frac{PROB_{TOTAL\ j}^{W} - PROB_{TOTAL\ j}^{WO}}{P_{TOTAL\ j}^{W}}$$

$$Where\ PROB_{TOTAL\ j}^{W} = Probability\ of\ choosing\ option\ j\ with\ the\ rebate\ Program$$

$$Where\ PROB_{TOTAL\ j}^{WO} = Probability\ of\ choosing\ option\ j\ in\ absence\ of\ the\ rebate\ Program$$

The estimated net-to-gross impacts are weighted up to the population based on the survey sample sizes. Participants are weighted to reflect either the NRA or Express Efficiency/SPC participant population. Nonparticipants are assigned weights based on the nonparticipant population represented in the sample. For NRA participants, weights were assigned based on size, utility, and type of audit. Weights for Express/SPC participants and all nonparticipants were assigned based on size and utility.

The resulting net-to-gross ratios using this calculation are shown below in Table 3-39.

Table 3-39: Estimated NTG Ratios

Measure Type	NRA Participants	Express Participants	Cross-program Participants
CFLs	0.88	0.77	0.93
T5/T8s	0.79	0.76	0.80
Split and Packaged A/C	0.44	0.58	0.60

3.2.6 Final Impact Calculations

This section describes the methods used to combine unadjusted engineering impact estimates, the SAE billing regression results, and the net impact estimates to yield the final adjusted gross impact and net impact databases.

As discussed above, engineering, statistical modeling, and survey-based self-report techniques are used to derive total impact estimates for the impact survey samples. These sample-based impact results are then used to derive total program impacts and average impacts per Audit. Total program impacts are calculated by applying population weights to the participant impact sample results. In general, these weights are the ratio of the sample to the whole population. In this way, sample results are leveraged back to the population. Once the population results have been calculated by applying weights, the result can then be divided by total tracking system completes to estimate a per audit result.

This section walks the reader through the development of the weights applied to the impact survey sample to derive population impact results for the 2004/2005 NRA program. First, basic program participant population and sampling statistics are shown. This is followed by explanations of various adjustments that were made to the population necessary in arriving at a usable and accurate final distribution. Finally, the adjusted population statistics are ratioed with the impact survey complete statistics to arrive at final weights. Again, these weights are applied to total impact values resulting from the application of the above-discussed techniques.

Table 3-40 below summarizes 2004/2005 participation by key strata variables, including audit type, IOU service territory[23] and cross-program participation status. Unsampled cells include medium/large remote[24] audits[25], both NRA-only and cross-program.

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[23] Remote audits are grouped together, rather than broken out by IOU service territory because these audits are similar statewide and with varying degrees of contact information. Thus separating them by service territory

Table 3-40: Program Year 2004/2005 Total Tracking System and Survey Complete Summary

year	Utilitly	Audit Type	Total 0405 Tracking Records	Survey Completes
Small and Very Small	On-Site	PG&E	8,316	116
		SCE	8,719	118
		SCG	1,797	33
		SDG&E	930	25
	Phone		8,396	132
	Mail		14,767	138
	Online		3,001	45
	CD ROM		7,299	48
	Cross Program		1,665	160
Medium and Large	On-Site	PG&E	694	21
		SCE	2,669	63
		SCG	455	11
		SDG&E	258	6
	Cross Program (On-Site only)		512	49
	Phone		318	0
	Mail		95	0
	Online		413	0
	CD ROM		812	0
	Remote Cross Program		131	0

The objective in creating weights for final impact calculations is to represent all program accomplishments. Thus, we seek to map the missing cells into similar cells that were sampled. Table 3-41 below shows each of the unsampled cells and the cell chosen for mapping. In general the Medium/Large remote audits that are part of the cross program population are mapped to the corresponding remote audit cell within the very small/small segment[26].

would have resulted in large fluctuations in applicable weights, introducing unwarranted and greater variability into the final results.

[24] "Remote" audits refer to phone, mail, CD-ROM and online delivery mechanisms.

[25] As discussed previously, the medium/large remote audits were not sampled in the impact survey. Medium and large customer remote audits make up about 3 percent of the total PY 2004/2005 participant population, not providing enough representation to warrant separate measurement.

[26] The most reasonable available choices for mapping include medium/large on-site audits for the corresponding utility or the corresponding audit type cell within the very small/small segment. The latter

The medium/large remote cross program audits were mapped to the medium/large on-site cross program audits. This decision was made partly to balance the conservative mapping for the other medium/large remote audits, and partly because cross-program participants have already shown propensity to respond to audit recommendations and install energy efficiency measures, and therefore we can more justifiably expect them to perform more similarly to a medium/large on-site cross program audit than a very small/small cross-program audit.

Table 3-41: Unsampled Cell Mapping for Final Impact Calculation Weights

Unsampled Cell	Mapping for Impact Calculations
Medium/Large Phone Audits	Very Small/Small Phone Audits
Medium/Large Mail Audits	Very Small/Small Mail Audits
Medium/Large CD-ROM Audits	Very Small/Small CD-ROM Audits
Medium/Large Online Audits	Very Small/Small Online Audits
Medium/Large Remote Cross Program Audits	Medium/Large On-Site Cross Program

In addition to re-mapping unsampled cells to sampled cells, another important adjustment was made to final impact calculation weights. When the impact survey was fielded, there was some difficulty in completing the sought-after number of CD-ROM completes. This was due in large part to a substantial portion of CD-ROM participants reporting that they had not put the CD-ROM into a computer and run the software. It can be assumed that no program impacts are achieved when CD-ROM audit software is not installed or run on a computer. For this reason, these customers were not considered eligible for the impact survey sample. However, leveraging the final survey completes up to the population without an adjustment for the proportion of CD-ROM participants estimated to have not installed the software would substantially overstate the impacts achieved through this delivery mechanism.

Table 3-42 below shows the total number of CD-ROM recipients that were successfully contacted during the impact telephone survey effort. These customers were contacted through tracking system data and verified over the phone receiving the CD-ROM audit tool. The table also shows that 70 percent of these customers reported not having installed the CD-ROM. Thus, we apply a 30 percent adjustment factor to the population statistics to correct for portion of the CD-ROM population estimated to have not installed the tool.

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was chosen because it is a more conservative choice, and we judge the medium/large remote audits to behave more like a very small/small audit than like a medium/large on-site audit.

Table 3-42: CD-ROM Non-Installation Correction Factor

CD ROM Customers Successfully Contacted through Survey Efforts	176
Percent that did not install CD-ROM	70%
CD-ROM Adjustment Applied to Tracking System	**30%**

Table 3-43 below shows the unadjusted total program year 2004/2005 NRA participant population distributions, including the participation totals and the percent distributions. The table also shows the adjusted tracking system totals and percent distribution. Adjustments include the remapping of unsampled cells, and a factor of .30 applied to the CD-ROM participation numbers to control for non-installation of the tool. The final weights are equal to the ratio of the adjusted tracking system totals to the impact survey sample completes. Weights range from a high of 108 for very small/small mail audits to a low of 13 for the medium/large cross-program on-site audits.

Table 3-43: Program Year 2004/2005 Population Statistics, Adjusted Population Statistics and Resulting Impact Calculation Weights

Customer Size Segment	Audit Type	Utility	Total PY 04/05 Tracking Records		Adjusted Total PY 04/05 Tracking Records		Survey Completes	Weight for Impact Calculations
			Number of Records	Percent of Total	Adjusted Total Traacking Records	Percent of Total		
Small and Very Small	On-Site	PG&E	8,316	14%	8,316	15%	116	**72**
		SCE	8,719	14%	8,719	16%	118	**74**
		SCG	1,797	3%	1,797	3%	33	**54**
		SDG&E	930	2%	930	2%	25	**37**
	Phone		8,396	14%	8,714	16%	132	**66**
	Mail		14,767	24%	14,862	27%	138	**108**
	Online		3,001	5%	3,414	6%	45	**76**
	CD ROM		7,299	12%	2,396	4%	48	**50**
	Cross Program		1,665	3%	1,665	3%	160	**10**
Medium and Large	On-Site	PG&E	694	1%	694	1%	21	**33**
		SCE	2,669	4%	2,669	5%	63	**42**
		SCG	455	1%	455	1%	11	**41**
		SDG&E	258	0%	258	0%	6	**43**
	Cross Program (On-Site)		512	1%	643	1%	49	**13**
	Phone		318	1%	0	0%	0	-
	Mail		95	0%	0	0%	0	-
	Online		413	1%	0	0%	0	-
	CD ROM		812	1%	0	0%	0	-
	Remote Cross Program		131	0%	0	0%	0	-

4

Tracking System Assessment

The Tracking System Assessment incorporates all relevant and available IOU tracking, marketing, follow up and customer information system data to assess the current quality of tracking databases and to illustrate program characteristics, accomplishments and areas for potential improvement. This assessment relies not only on NRA statewide tracking systems, but on follow-up program tracking systems, marketing databases, and the Express Efficiency, SPC and Demand Response statewide tracking systems.

The tracking system assessment thoroughly explores existing data sources to gain a better understanding of population characteristics. In doing so, the assessment also completes a verification of program accomplishments and provides a snapshot of tracking system content, including an assessment of the quality of the data stored in various NRA tracking systems. As part of the Cross Program Assessment, this Tracking System Assessment goes a step further, integrating participation patterns across statewide nonresidential programs, with a focus on rebate program participation following NRA participation.

There are five primary objectives of the Tracking System Assessment, as follows:

Verify Audit Completes and Assess Tracking System Content. Tracking systems are analyzed to verify program audit completes by delivery channel versus quarterly reports and program goals, both in total and by delivery channel. A second focus is assessing database content and quality, including an inventory of key program variables, as well as measuring tracking system improvements relative to previous findings.

Participation Matrices and Analysis of Participation Patterns. Detailed participation summary matrices are constructed from the cleaned and integrated statewide audit tracking system. Matrices characterize participation by program year, IOU service territory, audit delivery channel, business type and customer size. Tracking system content and quality is assessed and the results serve as the basis for the Study Sample Design and refinement of the data collection strategy.

Assess Follow Up Tracking System Content and Frequency. For some IOU service territories and delivery mechanisms Follow-Up programs are utilized by the IOUs to assist and encourage participants to adopt audit recommended measures. Tracking databases of these follow up efforts are assessed for quality and content and summarized. An assessment of the Follow-Up program effects on customer behavior is presented in the Chapter 5, Process Assessment.

Examine Marketing Effectiveness by Delivery Approach. Each IOU implements a wide variety of Audit marketing approaches. The goal of the marketing effectiveness assessment is to track the effectiveness marketing strategies in drawing customers into the program. Lists of customers targeted in various marketing effort are merged with tracking databases to provide a "success" rate.

Perform a Cross Program Tracking System Assessment. This will reveal participation patterns, to see how, over time, the NRA and Local Program have successfully referred customers to other statewide programs. The tracking system assessment will also examine other aspects of participation, such as the diversity of measures adopted through the rebate programs and the differences in associated energy impacts. This analysis incorporates tracking data from NRA, Local Program, Express Efficiency, SPC and Demand Response programs.

4.1 Verify Accomplishments and Assess Tracking System Content

The tracking system assessment presented in this section is conducted to verify program audit completes by delivery channel and compare them with 4th quarter program reports and program goals, both in total and by delivery channel. In addition, tracking database content and quality are assessed, including an inventory of key program variables, and measurement of tracking system improvements relative to previous findings.

4.1.1 Audit Program Verification

Table 4-1 below presents Audit program verification results for the 2004-2005 program years. The Table shows that each utility exceeded their Audit participation goals, and quarterly reports were generally consistent with the statewide tracking system, with PG&E data having the greatest differences. SCG accomplishments stand out, at nearly twice the goal that was set.

Table 4-1: Nonresidential Audit and Local Program Verification Results, Program Years 2004-2005

Utility	Audit Type	Total Tracking System Records for 2004/2005	Quarterly Report	Goals
PG&E	Onsite	9,617	10,438	8,000
	Phone	2,889	3,685	3,400
	Mail	2,641	2,712	1,600
	CD ROM	5,696	5,852	4,600
	Online	1,810	1,509	1,000
	Total NRA	22,653	24,196	18,600
	Local Program	783		
SCE	Onsite	12,418	12,432	
	Phone	1,560	1,560	
	Mail	117	117	
	CD ROM	1,414	1,415	
	Online	497	498	
	TOTAL	16,006	16,022	14,200
SDG&E	Onsite	1,969	1,305	1,200
	Phone	3,407	3,415	3,400
	Mail	2,038	2,212	600
	CD ROM	753	781	1,000
	Online	483	505	1,400
	TOTAL	8,650	8,218	7,600
SCG	Onsite	2,390	2,154	800
	Phone	1,036	1,056	2,200
	Mail	10,098	8,505	1,700
	CD ROM	513	308	600
	Online	627	566	1,100
	TOTAL	14,664	12,589	7,040

4.1.2 Tracking System Content

This section presents the results of the Tracking System Content Assessment. What follows is a summary of the frequency of key program variables in the IOU tracking systems by Audit delivery mechanisms. The origin of this task is the PY 2002 Evaluation, where it was found that key variables were missing or incomplete in the tracking systems. The IOUs were alerted to the shortcomings in the 2002 tracking systems, and worked to improve them over the 2003 program year. A tracking system content assessment was conducted as part of the PY 2003 Evaluation, where significant improvement was documented. As discussed below, even more progress has been made in PY 2004 and 2005.

Good program tracking is crucial to many M&E efforts directed at enhancing program delivery and a valuable tool for tracking program accomplishments versus goals. Tracking system data that is linked to customer information systems provides for accurate and detailed customer segmentation as well as the ability to analyze participating customers' billing data. These components allow for more flexible, sophisticated and useful sample design and analysis techniques. Other critical elements of the tracking systems include contact names and phone numbers for the individual that completed the Audit. These provide the best possible contact information for completing participant follow-up and telephone surveys.

Account number is generally the best identifier for linking a tracking system record to the customer information system; site identifiers (such as GNN ID for SCG) are also very useful. However, it is important that the identifier be unique to a site. For example, an identifier unique to a customer is not always useful. The customer may have several accounts, possibly spanning more than one site.

Table 4-2 below summarizes the presence of key tracking system variables for the 2004/2005 tracking systems and compares them with previous tracking system content. The Table shows that account numbers are well populated for on-site and phone audits across all four IOU tracking systems. Even CD ROM audits are now over 90 percent populated with account numbers statewide, though SDG&E still has room for improvement at a current level of 35 percent. Mail audits contain account number 80 percent of the time statewide, owing mostly to outstanding performance from SCG. SCE also has a perfect record of keeping account number with mail audit tracking records, but completed less than one percent of total mail audits in 2004/2005. PG&E and SDG&E maintain a little over one-third of mail audit records with account number, leaving room for improvement. Not surprisingly, online audits have a low frequency of account number, as they are often offered without requiring customers to log in or provide a valid account number.

Moreover, the account numbers provided by PG&E for customers participating in the mail and online audits did not merge to the CIS database, a problem not encountered with the account numbers provided by PG&E for other audit types.

Relative to previous tracking systems, significant improvements were shown by all four utilities in maintaining account numbers with audit tracking records. Overall, account numbers populated 93 percent of all tracking records over the 2004/2005 period, versus 71 percent for the 2003 program year. SCG and SDG&E showed the highest gain, at about 25 percent each. PG&E and SCE improved by about 15 percent each. Mail, CD ROM and Online audits had the most to gain from these improvements in record keeping, and are now exhibiting much improved records keeping.

The tracking data quality for contact information is not as reliable as it is for account number. Though contact information is not as critical to evaluation efforts as account information (because, one can find contact information through CIS databases using account numbers) it is nonetheless quite valuable to have the name and phone number of the primary audit contact person when performing evaluation telephone surveys or other types of follow-up contact.

Statewide contact information is present in 62 percent of all audit tracking records, down from 83 percent in 2003.

Table 4-2: Tracking System Content Summary, Program Years 2004-2005

Program Year	Audit Type	Tracking System Records	Program Years 2004/2005		Program Year 2003		2004/2005 Versus 2003	
			Percent with Account Number	Percent with Contact Information	Percent with Account Number	Percent with Contact Information	Change in Percent with Account Number	Change in Percent with Contact Information
PG&E	On Site	9,617	100%	100%	99%	100%	1%	0%
	Phone	2,889	100%	96%	100%	100%	0%	-4%
	Mail	2,641	36%	10%	20%	18%	15%	-8%
	CD ROM	5,696	100%	0%	100%	100%	0%	-100%
	Online	1,810	28%	14%	0%	0%	28%	14%
	Total NRA	22,653	87%	57%	71%	71%	16%	-14%
	Local Program	783	100%	99%	-	-	-	-
SCE	On Site	12,418	100%	100%	93%	95%	7%	4%
	Phone	1,560	100%	100%	100%	100%	0%	0%
	Mail	117	100%	93%	16%	52%	84%	41%
	CD ROM	1,414	100%	59%	94%	98%	6%	-39%
	Online	497	65%	53%	40%	89%	25%	-36%
	Total	16,006	99%	95%	84%	92%	15%	3%
SDG&E	On Site	1,969	93%	100%	80%	86%	12%	14%
	Phone	3,407	99%	90%	100%	100%	-1%	-10%
	Mail	2,038	35%	87%	0%	86%	35%	1%
	CD ROM	753	35%	98%	0%	90%	35%	7%
	Online	483	23%	37%	1%	0%	23%	37%
	Total	8,650	72%	89%	48%	82%	24%	7%
SCG	On Site	2,390	100%	60%	100%	100%	0%	-40%
	Phone	1,036	100%	0%	100%	100%	0%	-100%
	Mail	10,098	100%	9%	100%	100%	0%	-91%
	CD ROM	513	100%	0%	0%	97%	100%	-97%
	Online	627	52%	72%	1%	85%	51%	-13%
	Total	14,664	98%	19%	75%	98%	23%	-79%
Statewide	On Site	26,394	99%	96%	95%	97%	5%	-1%
	Phone	8,892	99%	83%	100%	100%	-1%	-17%
	Mail	14,894	80%	20%	37%	54%	43%	-34%
	CD ROM	8,376	94%	19%	61%	97%	34%	-78%
	Online	3,417	37%	33%	6%	25%	31%	8%
	Total	61,973	91%	62%	71%	83%	19%	-21%
	Local Program	783	100%	99%	-	-	-	-

4.2 Participation Patterns

This section highlights participation patterns that will help the reader become familiar with some high-level characteristics of the 2004-2005 Nonresidential Audit Program. This information can be helpful in interpreting segment-specific results. For example, when viewing and comparing results for "small" and "very small" customers, it is important to keep in mind differences in the composition of delivery mechanism within those customer size categories.

Table 4-3 below summarizes the participant population by program year, customer size, IOU service territory and delivery mechanism.

Table 4-3: Program Years 2004 -2005 Participant Population Summary, Distribution by Customer Size, Audit Delivery Mechanism and IOU Service Territory

Utilitly	Audit Type	Program Year 2004			Program Year 2005		
		Tracking Records	Medium/ Large	Very Small/ Small	Tracking Records	Medium /Large	Very Small/ Small
PGE	**On-Site**	5,051	330	4,721	4,566	437	4,129
	Phone	1,728	115	1,613	1,161	109	1,052
	Mail	1,608	-	-	1,034	-	-
	Online	580	-	-	1,230	-	-
	CD ROM	3,084	443	2,641	2,612	348	2,264
	Total	12,051	888	8,975	10,603	895	7,444
	Local	*304*	*289*	*15*	*479*	*461*	*18*
SCE	**On-Site**	6,500	1,590	4,910	5,918	1,445	4,473
	Phone	790	20	770	770	19	751
	Mail	116	1	115	1	0	1
	Online	237	95	142	260	71	189
	CD ROM	459	43	416	955	18	937
	Total	8,102	1,749	6,353	7,904	1,554	6,350
SCG	**On-Site**	1,783	341	1,442	607	155	452
	Phone	1,017	19	998	19	1	18
	Mail	3,476	17	3,459	6,622	19	6,603
	Online	399	-	-	228	-	-
	CD ROM	509	3	506	4	0	4
	Total	7,184	380	6,405	7,480	175	7,077
SDG&E	**On-Site**	1,309	292	1,017	660	176	484
	Phone	1,704	41	1,663	1,703	27	1,676
	Mail	255	16	239	1,783	0	1,783
	Online	274	91	183	209	0	209
	CD ROM	479	24	455	274	14	260
	Total	4,021	465	3,556	4,629	217	4,412
Statewide	**On-Site**	14,643	2,552	12,091	11,751	2,214	9,537
	Phone	5,239	195	5,044	3,653	157	3,496
	Mail	5,455	311	3,813	9,440	19	8,387
	Online	1,490	186	325	1,927	71	398
	CD ROM	4,531	514	4,017	3,845	380	3,465
	Total	31,358	3,758	25,289	30,616	2,841	25,283

Figure 4-1 below presents the 2004/2005 participant population size distribution by delivery mechanism. As would be expected, the remote audits (phone, mail and CD-ROM) have larger relative proportions of very small customers, and the on-site and Local Program have the largest number of medium and large customers.

Figure 4-1: Program Years 2004-2005 Distribution of Customer Size by Delivery Mechanism

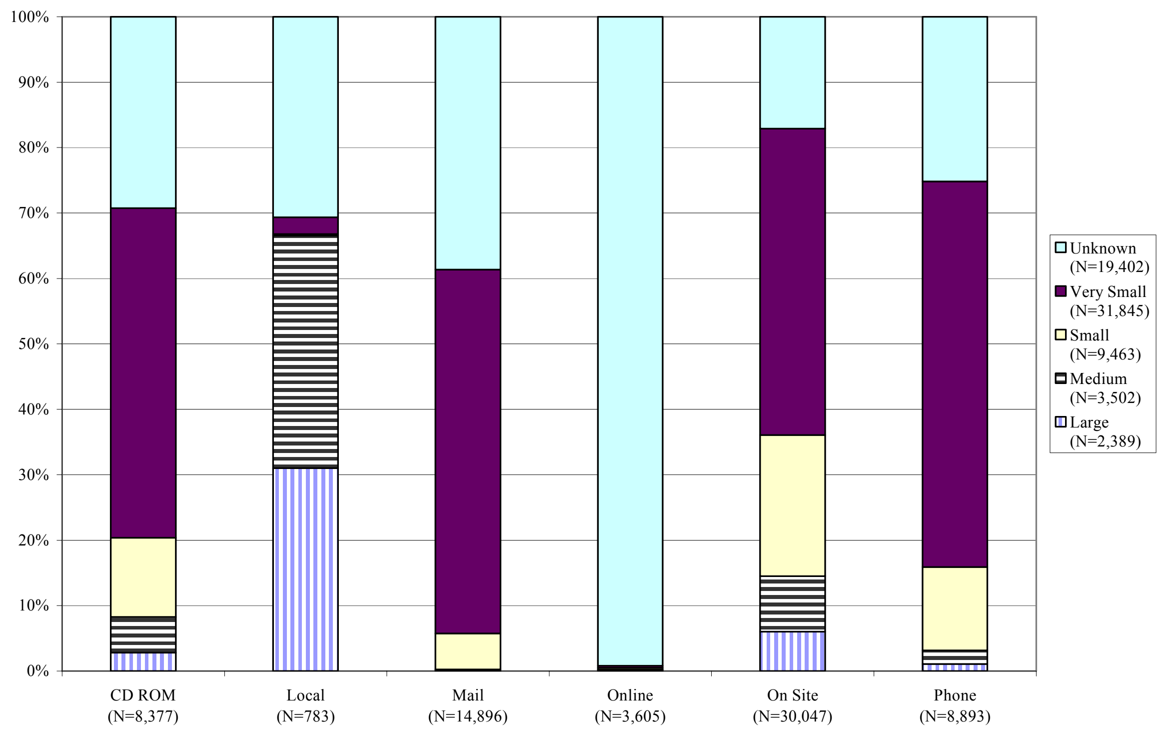
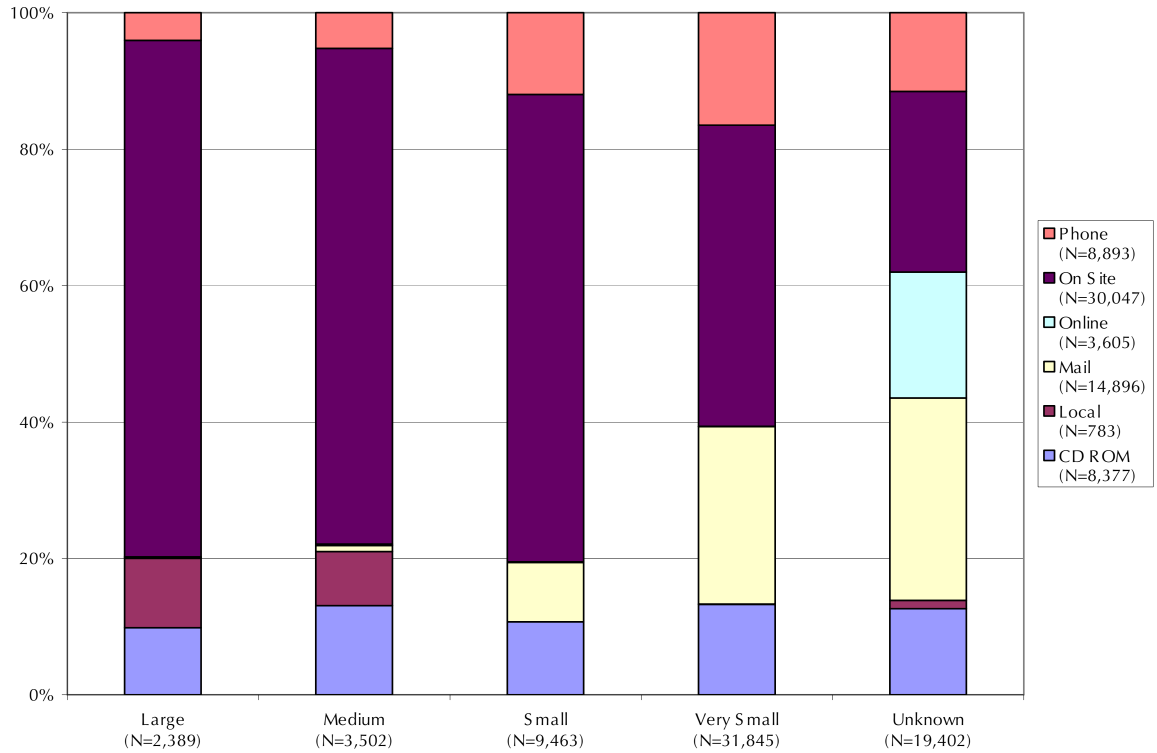


Figure 4-2 below underscores the results shown in Figure 4-1 above, by displaying the distribution of delivery mechanism for each customer size category. The Figure shows that medium and large customers almost exclusively participate in the on-site audit, although all customer size categories show a significant on-site component.

Figure 4-2: Program Years 2004-2005 Distribution of Delivery Mechanism by Customer Size



The previous two Figures have shown results that are fairly intuitive. Program theory and resulting IOU marketing efforts couple larger customers to the on site audit, and smaller customers to CD ROM, online, mail and phone. However, Figure 4-3 findings are more interesting and less intuitive. This Figure shows the distribution of delivery mechanism by IOU service territory. SCE delivered primarily onsite audits, while SCG emphasized mail audits. SDG&E delivered more phone audits than other IOUs, and PG&E delivered more CD-ROM audits than other IOUs.

Figure 4-3: Program Years 2004-2005 Distribution of Delivery Mechanism by Utility Service Territory

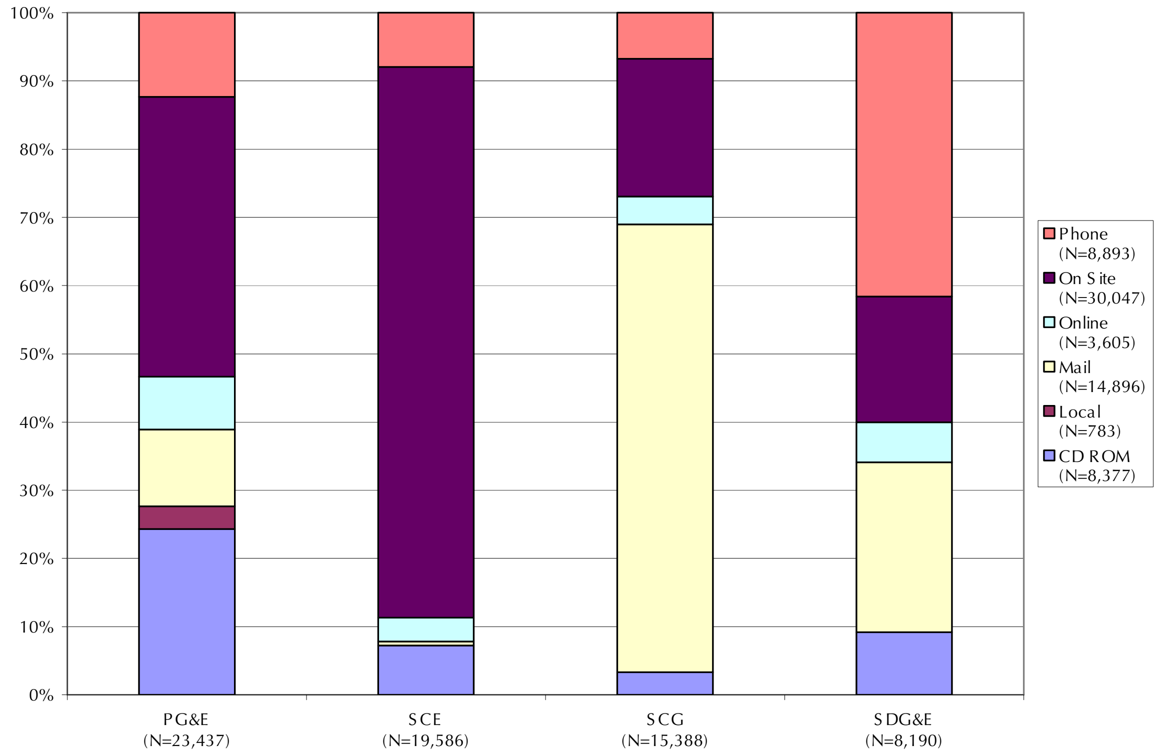
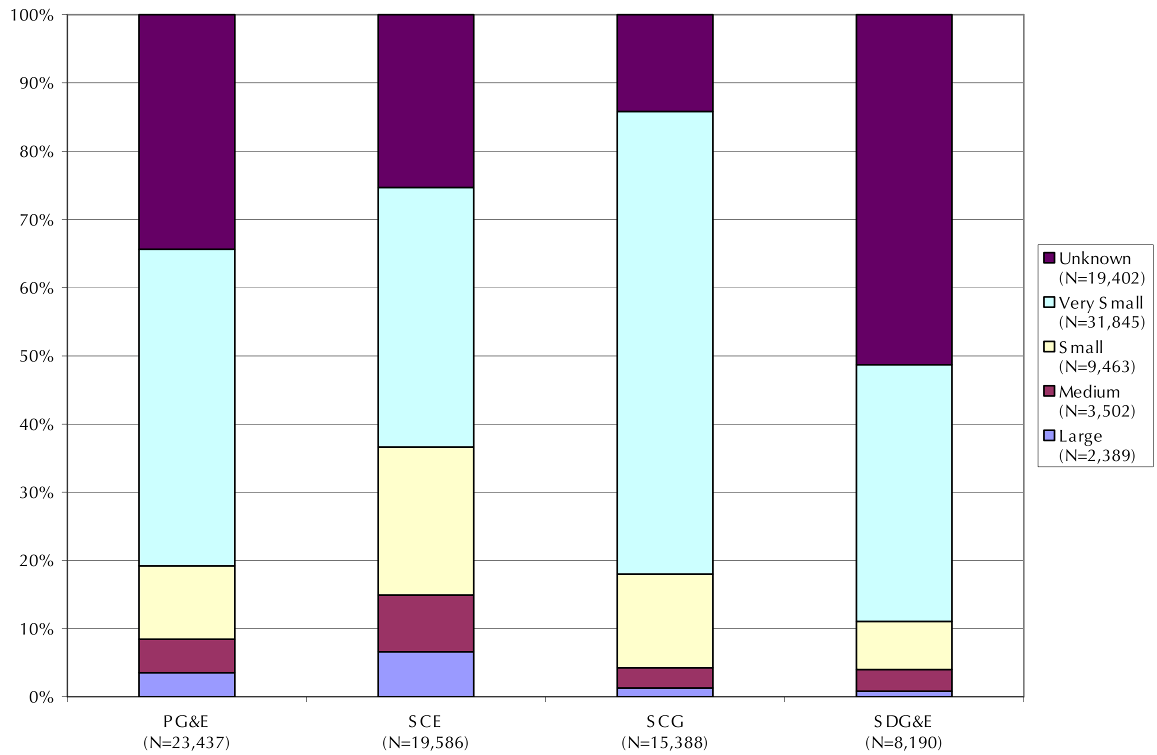


Figure 4-4 below shows that SCG has the greatest numbers of small and very small customers, while SCE has the greatest numbers of medium and large customers. Half of the SDG&E customers are of unknown size, making it more difficult to discern size-associated audit effects with this utility. We can note that improved utility record-keeping since the 2002 program year has greatly reduced the relative size of the Unknown share for all utilities.

Figure 4-4: Program Years 2004-2005 Distribution of Customer Size by Utility Service Territory



4.3 Follow Up Tracking System Assessment

In some cases, the investor owned utilities follow up with Audit program participants to obtain program feedback and encourage customers to install recommended measures. Analysis of the efficacy of the follow up programs is presented in Chapter 6, Process Assessment. This section summarizes the quality and content of the data utilized to track these follow up program efforts.

Three of the four investor owned utilities (IOUs) provided follow-up services to Audit participants during program years 2004 and 2005. The participant program year and audit type distribution associated with follow-up services are shown in Table 4-4 below. PG&E, SCE, and SDG&E provided follow-up services. PG&E provided follow-up to phone and on-site participants, while SCE and SDG&E followed up with on-site audit participants only. All three IOUs provided follow-up service via the telephone. PG&E placed 2,233 phone calls, SCE placed 1,061 and SDG&E placed 793 calls. While PG&E placed most of the calls with 2005 participants, SCE and SDG&E placed more than half of their calls with 2004 participants.

Table 4-4: Overview of Follow Up Tracking Systems

Utility	2004/2005 Follow Up Records	2004 Audit	2005 Audit	Audit Type		Local Program
				Phone	Onsite	
SCE	1061	598	463	-	908	
PG&E	2,233	882	1,351	1,323	448	462
SDG&E	793	583	191	-	793	

As shown in Table 4-5 below, the program year 2004/2005 follow-up tracking systems are generally well populated with key data, including account numbers and dates of follow-up phone calls. Eighty to 100 percent of follow-up recipients tracked in the database had an account number associated with the record. Dates when follow-up calls were placed is well documented in the PG&E and SCE databases, while the SDG&E records are mostly missing the follow-up date.

All three IOU follow-up efforts include a short survey administered to the participant and recorded in the follow-up tracking databases. The topics covered in this short survey are summarized in the right hand column of Table 4-5 below. Both PG&E and SDG&E focus on customers' plans to retrofit, and the documentation of any remaining barriers to retrofit activities. The focus of the SCE follow-up call is customer satisfaction with the audit service and verification the customer received the proper report and referrals.

Table 4-5: Summary of Follow Up Tracking System Content

Utility	2004/2005 Follow Up Records	Records with Account Number	Records with Follow-Up Date	Follow Up Survey Topics
SCE	1061	85%	86%	satisfaction, verification
PG&E	2,233	100%	100%	plan to retrofit, barriers
SDG&E	793	80%	13%	plan to retrofit, barriers

The results of PG&E and SDG&E's follow-up survey regarding plans to retrofit are summarized in Table 4-6 below. The Table shows that near half of all follow-up respondents reported plans to retrofit their facility. The portion of Local Program participants planning to retrofit is somewhat higher than the others, at 55 percent versus 45 to 48 percent for the NRA program.

Table 4-6: Summary of Follow Up Tracking System Content

Utility	Audit Type	N	Plan to Retrofit	Do Not Plan to Retrofit	Missing Response
PG&E	On-Site	448	47%	37%	16%
	Phone	1623	48%	29%	5%
	Local Program	462	55%	33%	12%
SDG&E	On-Site	793	45%	33%	23%

Table 4-7 below summarizes the average number of days elapsing between the completion of the audit and the follow-up telephone call. The data show that SCE follows up very soon after the audit, with an average elapsed time of 30 days. Estimates for the SDG&E effort are based on fewer data points, but indicate an average elapsed time of less than two months. PG&E allows a somewhat longer time to pass for the NRA participants, with average elapsed time near 3 months. The PG&E Local Program follow-up generally occurs after less time has passed, with a 63 day average.

Table 4-7: Summary of Follow Up Tracking System Content

Description	SCE	PG&E			SDG&E
Audit Type	On-Site	Phone	On-Site	Local Program	On-Site
Mean Days Elapsed Between Audit and Follow Up	30	134	108	63	52
N	887	1,315	444	455	78

The PG&E follow-up survey captures participants' self-reported barriers to retrofitting their facilities. Though the majority of responses were recorded in the database as "other", a summary of the more specific responses are summarized in Table 4-8 below. The most common reason (excluding "other") provided by participants for not retrofitting their facility is a lack of time (54 percent). The next three most common barriers reported by participants relate to cost –either a high price (17 percent) or low rebate (22 percent). Only 8 percent report a need for technical assistance with equipment or assistance finding equipment or installation professionals.

Table 4-8: PG&E Follow Up Survey Results

Reason for not Retrofitting	Percent*
Busy no time to retrofit	54%
Equipment too expensive	17%
Retrofit measure not eligible for rebate	15%
Rebates too low not worth applying	7%
Need technical assistance on equipment	7%
Need help locating vendor/contractor	1%
N	197

*Another 460 respondents provided "other" reasons for not retrofitting.

The SDG&E follow-up survey results are summarized in Table 4-9. The survey captures participants' plans to retrofit and self-reported barriers to retrofitting their facilities. SDG&E also records the program the customer was referred to, and whether or not they report participating in a rebate program. Over half of the follow-up survey respondents report plans to retrofit their facility. Interestingly, unlike PG&E where lack of time was the most common reason reported for not pursuing retrofit opportunities, SDG&E customers report cost and rebate issues to be very important but time not to be very high on the list of constraints. Only 3 percent report they are "too busy" to pursue retrofit opportunities.

Table 4-9: SDG&E Follow Up Survey Results

Survey Question and Response Categories	Response Distribution
Do You Plan to Retrofit facility	
Yes	58%
No	42%
N	614
Who did <SDG&E representative> refer the customer to?	
Express Efficiency Group	93%
SPC Group	4%
Other	3%
N	427
If there are no current plans to retrofit, why not?	
Rebate too low	48%
Other	36%
Equipment is too expensive	7%
No Recommendations	6%
Too busy	3%
N	267
Participating in a Rebate Program?	
Express Efficiency	62%
Not participating	30%
Other	9%
N	413

The SCE follow-up survey collects feedback on program performance and verifies participants received the proper reports and referrals. As shown in Table 4-10, the survey results are overwhelmingly positive. The data indicate that the vast majority of follow-up recipients not only received and understood the audit report and rebate program information, but also report high levels of satisfaction with key program elements.

Table 4-10: SCE Follow Up Survey Results

	Response Summary			
SCE Follow-Up Question	Yes	No	Average Score*	N
Q1. Received survey report?	99%	1%		795
Q2. Did you understand the report?	97%	3%		793
Q3. Did our rep help you understand your electric rate?	98%	2%		794
Q4. Did our rep provide usefull info on EE programs?	100%	0%		793
Q5. Overall, how satisfied were you with the service provided?			9.5	795
Q6. How satisfied were you with the quality of info provided?			9.5	795
Q7. How satisfied were you with the reps willingness to listen to your needs?			9.7	795

*Satisfaction questions are on a scale from 1-10, where 1 is not at all satisfied and 10 is very satisfied.

4.4 Marketing Activities Assessment

Each IOU implements a wide variety of Audit marketing approaches. The goal of the marketing activities assessment is to track the effectiveness of each marketing strategy in drawing customers into the program. The IOUs were asked to provide lists of customers targeted in marketing efforts implemented in support of the 2004/2005 Audit program. These lists of customers are analyzed in conjunction with tracking databases to provide a “success” rate for the various marketing efforts.

PG&E and SCE provided lists of customers that received marketing material through the mail. These lists were merged to program tracking systems to estimate a “success rate” for each mailer. These results are described in detail below.

4.4.1 PG&E Marketing Activities Assessment

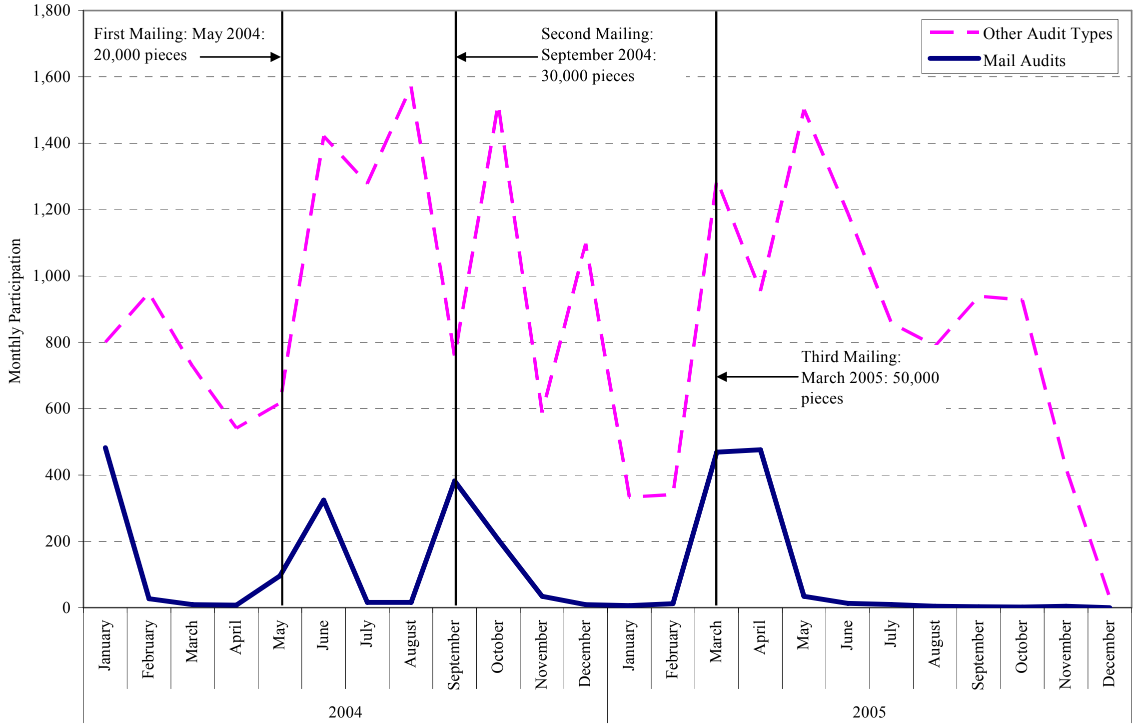
PG&E was able to provide lists of customers that may have received a Mail Audit survey through the mail, encouraging them to participate in the Audit program. Due to limitations in the available data, some customers on this list may not have received a mailer. In addition, account numbers were missing or invalid for the great majority of the PG&E 2004/2005 Mail Audit Tracking Systems records. This made it difficult to match the mailer recipient records to the Mail audit tracking system customers. For these reasons, what we estimate as a success rate for the PG&E mailer is a lower bound to a true estimate of the mailer success rate. Table 4-11 below compares the participation rate among those on the mail list to the general population participation rate by customer size. Overall, market penetration among mail list customers is twice that of the general population, and indicative of a success rate of at least 3 percent, or 3,300 customers.

Table 4-11: PG&E Mass Mailing Results

Customer Size	Mail List Customers	Mail List Penetration	Total Audit Program Penetration
Large	677	14%	7%
Medium	1,619	7%	7%
Small	4,690	5%	2%
Very Small	47,560	4%	3%
Total	54,546	6%	3%

PG&E mail marketing efforts for the NRA 2004/2005 program were concentrated into three major efforts. There were two mailings in 2004, one in May (20,000) and one in September (30,000). In March of 2005 there was one mailing of 50,000 pieces. As shown in Figure 4-5 the mailings correspond to spikes in mail audit participation, and also generally precede periods of growth in participation across delivery channels, indicating that direct mail is an effective marketing approach for this program.

Figure 4-5: PG&E Audit Program Monthly Participation Levels and Mass Mailing Activities



4.4.2 SCE Marketing Activities Assessment

SCE engaged in 33 distinct marketing activities in 2004 and 2005 that promoted participation in the Nonresidential Audit program. In 2004 they conducted 7 direct mailings, total of 265 thousand pieces of mail. In 2005, another 5 mailings were completed, totaling about 362 thousand pieces of mail. Handouts, flyers, event displays, web postings and brochures were also distributed to SCE's customers in 2004 and 2005. Table 4-12 below summarizes the marketing activities completed by SCE in 2004 and 2005.

Table 4-12: Summary of SCE Marketing Activities for Program Year 2004/2005

Delivery Channel	Number of Distinct Activities			Total Items Associated with Activities		
	2004	2005	Total	2004	2005	Total
Brochure	1	0	1	25,000	0	25,000
Direct mail	7	5	12	265,452	361,555	627,007
Direct Mail/Handout	1	0	1	1,500	0	1,500
Event Display	2	2	4	14	15	29
Flyer	1	0	1	5,000	0	5,000
Handout	3	5	8	35,300	85,000	120,300
Web Posting	1	1	2	1	1	2
Trade Show Event Display	1	0	1	3	0	3
Letter/Newsletter	1	2	3	1	2	3
Grand Total	18	15	33	332,271	446,573	778,844

SCE was able to provide lists of customers that received direct mail marketing materials for most of the direct mail efforts. Three lists of customers were analyzed for this exercise. The first is a letter promoting a number of nonresidential programs including the Audit program[27] that was completed in May of 2004, The second includes two size-specific mailings completed in 2005; a mailer targeted to larger customers[28] (12k) and one targeting smaller customers (280k). Each of these size-specific mailers promoted a slightly different portfolio of programs[29], but both promote the Nonresidential Audit program. The final list of mailer recipients include about 70k that received industry specific mailings sent in June of 2005. About 23k of these mailers targeted businesses typically made up of larger customers, including warehouses, institutions, and food service industries. Another 47k targeted businesses typically made up of smaller customers, such as office, retail, restaurant, and hotel/motels.

Each of these three lists were segmented by customer size and merged to the Nonresidential Audit tracking system to estimate a program penetration rate specific to these mailer recipients. The results of this analysis are presented in Table 4-13 below. For comparison, the overall Audit program penetration by customer size class is shown in the right hand

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[27] The mailer promoted Express Efficiency Rebates, Commercial Summer Discount Plan, SCE Bill Manager, Nonresidential Audits and Energy Centers.

[28] "Large" in this case is defined as those customers assigned an account representative. "Smaller" customers are those in the GS-1 and GS-2 rate classes that have not been assigned account representatives.

[29] The mailer directed at larger companies promoted Nonresidential Audits, Express Efficiency, SPC, Energy Manager, DRP, and Energy Centers. The mailer directed to smaller companies targeted Nonresidential Audits, Express Efficiency, DR tips, 20/20, and Energy Centers.

column. The Table indicates that the May 2004 mailing was not very successful in recruiting customers, with penetration rates matching – or even falling short of overall program penetration rates. The 2005 mailings, however, were more successful. The size specific mailers achieved greater penetration than the overall program for small and very small customers. The industry specific mailers exceeded the overall penetration rate for all customer sizes.

Table 4-13: SCE Mass Mailing Results

Customer Size	May 2004 Mailing		2005 Size Specific Mailing		2005 Business Specific Mailing		Audit Program Penetration by size
	Customers	Penetration	Customers	Penetration	Customers	Penetration	
Large	1	0%	331	15%	153	33%	22%
Medium	124	5%	9,214	4%	3,754	6%	5%
Small	1,564	4%	56,146	5%	28,699	7%	3%
Very Small	6,605	2%	169,872	3%	81,105	3%	2%
Total	8,296	2%	237,806	4%	114,154	5%	3%

In order to assess the success of the business specific mailings more thoroughly the mailer recipients were grouped into business categories, as were SCE Audit program participants. Program penetration among mail list recipients is contrasted with overall program penetration for each of the targeted businesses. It should be noted that while NAICS codes were available for categorization of the tracking system, SIC codes were used to form businesses for the mail lists. Table 4-14 below reveals that the business specific mailings may have had the most success among warehouses, but that among these businesses the mail list penetration just matches the overall penetration. This could be because the mailings essentially canvass these industries. Unfortunately, due to the inconsistency in methods of forming industry groups (NAICS versus SIC codes) this contention cannot be verified or refuted.

Table 4-14: SCE Mass Mailing Results by Targeted Industry Mailings

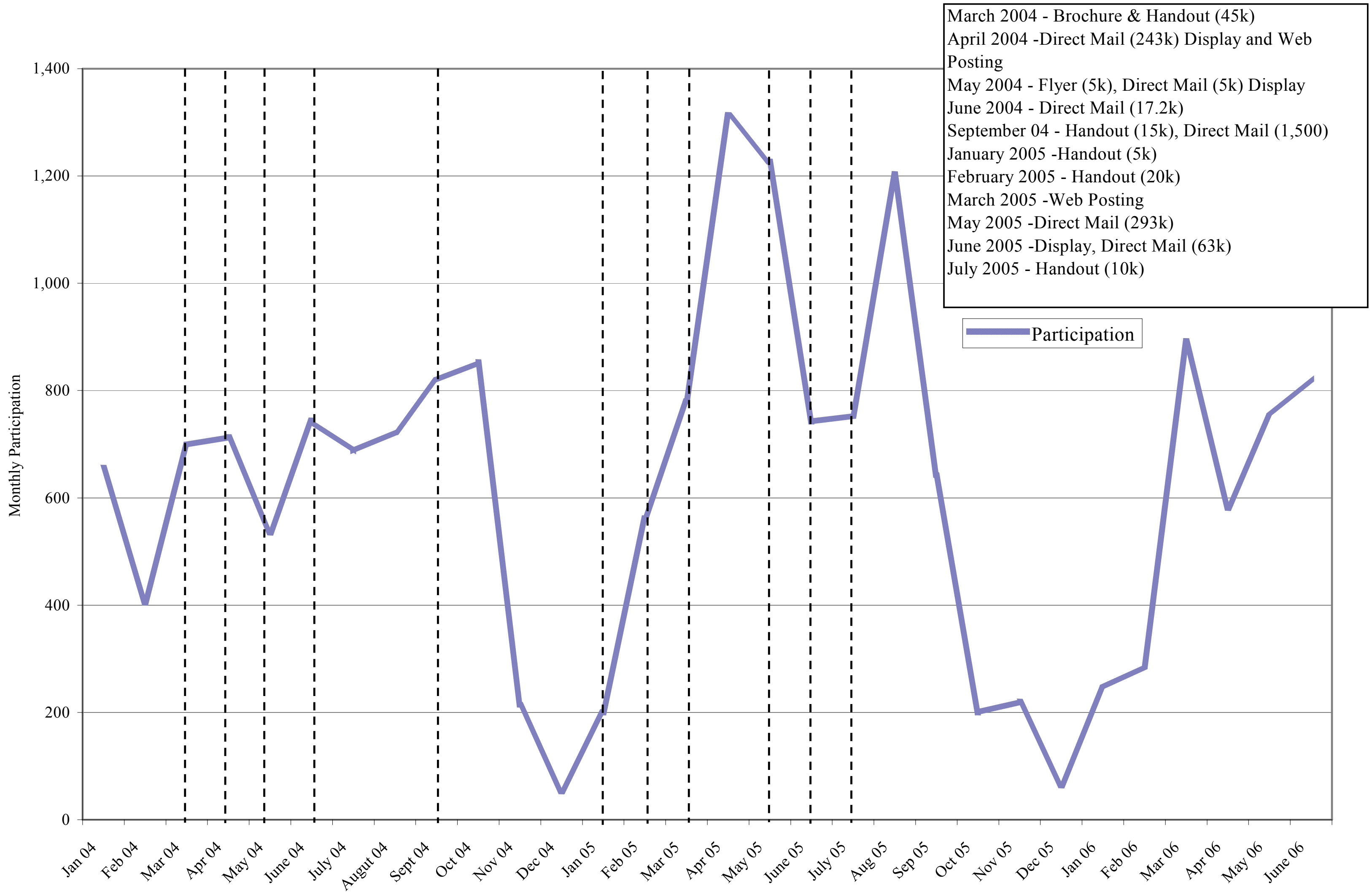
Target Business	Marketing Mail List Customers	Program Mail List Penetration	Overall Audit Program Penetration*
Hotel	1,788	5%	8%
Institutional	697	3%	3%
Office	78,018	4%	3%
Restaurant	13,465	11%	10%
Warehouse	20,186	5%	2%
Total - Selected Businesses	114,154	5%	5%
Total - All Segments	N/A	N/A	3%

*Business specific mail lists are based on SIC code groupings, while audit program penetration rates are defined based on NAICS grouping.

Another approach to the assessment of marketing activity success is to examine overall participation trends and how they relate to marketing activities. Figure 4-6 below graphically displays monthly participation and marks with vertical dashed lines the implementation of various marketing activities. Generally, the marketing activities cluster around the first half of 2004 and the first half of 2005. Another important general observation is that program participation shows a marked annual pattern, with low participation in the winter, particularly in December.

The 2004 marketing activities are associated with a general upward trend in participation, which then drops off dramatically toward the end of the year. The early 2005 activities are associated with strong growth in participation. The significant direct mail efforts completed in May/June of 2005 seem to have a delayed effect, perhaps contributing to the spike in participation observed in August.

Figure 4-6: SCE Audit Program Monthly Participation Levels and Marketing Activities



4.5 Cross Program Tracking System Assessment

The Cross Program Tracking System Assessment presented here reveals participation patterns within and across Statewide programs with an emphasis on comparing participation patterns of customers who had an Audit to those that did not. The objective is to the test program theory described above. More specifically, the Assessment seeks to determine whether Audit program participation leads to a greater likelihood to invest in energy efficiency, and to do so more frequently, with a greater variety of energy efficiency measures and enhanced saturation of each.

The Statewide Programs that are analyzed in the Tracking System Assessment include NRA, Express Efficiency, SPC, PG&E Local Program, and Demand Response (DR)[30]. The Demand Response program is part of the offerings to the nonresidential sector and is mentioned in some of the larger customer Audits. In particular the PG&E Local Program Audit, makes efforts to refer customers to this program.

This Assessment leverages tracking data for all available program years going back to PY 2002. The Assessment presented below characterizes and compares participant populations in each program to gain a perspective on Statewide participation patterns. This provides a starting point for investigating cross-program participation patterns. Cross program participants are identified by merging the NRA tracking database to all other program tracking databases, for program years 2002 through 2005. Cross program participation is documented by program participation year(s), Audit type, IOU service territory, customer size, measure type, and ex-ante program savings. The Tracking System Assessment compares and contrasts cross program participant adoption patterns along these lines, with special attention to the diversity of measures, average measure savings and frequency of participation, to see if the increased knowledge provided by the NRA program results in customers' making greater or more effective investments in energy efficiency over time.

4.5.1 Characterization of Program Populations

Table 4-15 below depicts the size and service territory distribution of the Audit, Express Efficiency, SPC and Demand Response programs. As expected the SPC and Demand Response programs are highly concentrated in the medium and large customer size segments.

[30] Self-Generation Program tracking data was obtained as part of this assessment, but did not contain necessary elements for meaningful comparison to other tracking systems and therefore is not included in this Assessment.

The Audit and Express Efficiency distributions are similar with about three-fourths of statewide participation coming from the small and very small sectors.

Table 4-15: Customer Size and Service Territory Distribution By Program

Utility	Size	Size and Service Territory Distribution			
		Audit Program	Express Efficiency	SPC	Demand Response
PG&E	Large	2%	6%	23%	30%
	Medium	2%	6%	4%	6%
	Small	6%	10%	4%	1%
	Very Small	25%	21%	3%	0%
	TOTAL	35%	43%	34%	37%
SCE	Large	3%	2%	36%	49%
	Medium	4%	9%	15%	5%
	Small	8%	17%	4%	0%
	Very Small	15%	16%	1%	0%
	TOTAL	31%	44%	57%	54%
SCG	Large	0%	0%	0%	0%
	Medium	2%	1%	0%	0%
	Small	5%	3%	0%	0%
	Very Small	19%	2%	0%	0%
	TOTAL	26%	6%	0%	0%
SDG&E	Large	0%	0%	3%	5%
	Medium	1%	2%	2%	4%
	Small	1%	5%	3%	0%
	Very Small	6%	1%	0%	0%
	TOTAL	8%	7%	9%	9%
Statewide	Large	6%	8%	63%	83%
	Medium	8%	18%	22%	15%
	Small	21%	34%	11%	1%
	Very Small	66%	40%	4%	0%
	TOTAL	100%	100%	100%	100%
N		70,147	29,686	2,682	1,581

4.5.2 Cross Program Participation Patterns

Historical tracking systems were assembled for the NRA, Express Efficiency and SPC tracking systems running from 2002 through 2005. Usable tracking records were limited to those that could be associated with a current valid site in one of the four IOU customer information systems. The NRA historical tracking data was merged with Express Efficiency and SPC tracking data to better understand patterns of duel program participation.

Cross Program Participation Patterns over Time, by Utility, Delivery Mechanism and Customer Size

Table 4-16 below focuses on small and very small customers, and shows the rate of cross over to the Express Efficiency program overall, as well as the timing of Express Efficiency participation relative to the Audit program participation. Table 4-16 underscores the impact of Audit participation in the first year following the audit, with Express Efficiency participation rates dramatically higher in the first year after participation than any proceeding year. Additionally, the On-Site audit delivery mechanism stands out as having a substantially higher cross-over rate than other Audit delivery mechanisms. Other high performers are PG&E's phone Audit and SCE's CD ROM, both of which appear to be an exception to this. Overall, approximately 8 percent of the NRA program's very small and small company participants went on to participate in Express Efficiency over the program years 2002 through 2005. Express participation within one year of NRA participation is 6 percent, falling to 3 and then 2 percent in years 2 and 3. Participation four years after the Audit is also estimated to be 2 percent[31].

PG&E's Local Program results are also shown in Table 4-16 below, but have very few points since the vast majority of this programs' participation is among medium and large companies. Nonetheless, the rate of participation in Express Efficiency is very high among Local Program participants, at 32 percent overall.

[31] The sample changes for each calculation of participation specific to a time period elapsing after the Audit. Thus, the reader should not expect the participation rates to be additive, or near additive due to varying sample sizes and repeat participation

Table 4-16: Cross Program Participation Summary, Audit Participants Going On to Express Efficiency, Very Small and Small Customers

Utility	Audit Type	NRA 2002-2005 (current, valid, sites)	Percent Going On To Express 2002 2005	Participation rate, Years After the Audit: First Year	Second Year	Third Year	Fourth Year
PGE	On-Site	10,217	14%	10%	5%	4%	4%
	Phone	4,402	11%	8%	3%	2%	3%
	Mail	986	7%	1%	1%	3%	3%
	Online	-		-	-	-	-
	CD ROM	6,078	6%	4%	3%	3%	3%
SCE	On-Site	12,193	14%	12%	2%	1%	1%
	Phone	791	2%	1%	4%	2%	0%
	Mail	129	4%	2%	1%	2%	-
	Online	79	4%	3%	1%	0%	-
	CD ROM	851	12%	11%	3%	2%	3%
SCG	On-Site	3,567	8%	4%	3%	2%	2%
	Phone	1,772	2%	1%	1%	1%	0%
	Mail	10,363	1%	0%	0%	0%	1%
	Online	8	0%	0%	0%	0%	-
	CD ROM	446	0%	0%	0%	-	-
SDG&E	On-Site	1,273	11%	8%	3%	2%	0%
	Phone	3,624	1%	1%	1%	0%	-
	Mail	113	2%	0%	1%	2%	0%
	Online	5	0%	0%	0%	-	-
	CD ROM	205	4%	4%	-	-	-
Statewide	On-Site	27,250	13%	10%	3%	2%	2%
	Phone	10,589	5%	4%	2%	1%	2%
	Mail	11,591	1%	1%	1%	1%	2%
	Online	92	3%	2%	1%	0%	-
	CD ROM	7,580	6%	4%	3%	3%	3%
Total NRA		57,102	8%	6%	3%	2%	2%
N		57,102	57,102	57,102	37,397	19,105	5,867
Local Program		22	32%	32%	13%	-	-
N		22	22	22	8	0	0

Table 4-17 below shows the cross over between the NRA program and Express Efficiency for medium and large customers. This Table utilizes the 4 year historical tracking systems described above. The Table shows very high levels of cross-over for this group, at 20 percent overall. Moreover, in contrast to the very small/small group of customers, the remote audits also display good cross-over rates, though the relative participation in these delivery channels is very small. Another striking characteristic of this Table –also in contrast to smaller customer results—medium/large customers do not trail off in their tendency to participate in Express by nearly such a dramatic rate. That is, the Table below supports the general belief that larger customers take longer to implement audit recommendations. Similarly, these results could suggest a longer life of audit recommendations for larger customers, possibly related to greater detail and customization afforded larger customer Audits. That is, it appears that larger customers retain useful audit information for a greater period of time. Overall, twenty percent of medium and large Audit participants went on to install energy efficient measures through the Express program. Eleven percent purchased a measure through Express Efficiency within one year following their Audit. This cross-over rate drops only a few points to 8 or 9 percent in years 2, 3 and 4 following the Audit.

The Local Program shows outstanding cross-over results with nearly one-third going on to install measures through the Express Program. Moreover, the cross-over rate actually increases between the first year and the second, with 31 percent of participants installing measures two years following their Local Program audit, and 25 percent installing measures within one year.

Table 4-17: Cross Program Participation Summary, Audit Participants Going On to Express Efficiency, Medium and Large Customers

Utility	Audit Type	NRA 2002-2005 (current, valid, sites)	Percent Going On To Express 2002-2005	Participation rate, Years After the Audit			
				First Year	Second Year	Third Year	Fourth Year
PGE	On-Site	1,114	33%	19%	14%	15%	14%
	Phone	379	21%	11%	11%	4%	6%
	Mail	60	13%	2%	2%	3%	7%
	Online	-	-	-	-	-	-
	CD ROM	863	19%	10%	9%	18%	10%
SCE	On-Site	4,418	18%	9%	7%	8%	9%
	Phone	26	8%	0%	11%	11%	0%
	Mail	5	20%	0%	0%	25%	-
	Online	30	7%	0%	4%	4%	-
	CD ROM	58	17%	7%	4%	15%	0%
SCG	On-Site	1,119	19%	11%	6%	7%	5%
	Phone	34	12%	0%	6%	13%	-
	Mail	40	5%	3%	0%	13%	0%
	Online	2	0%	0%	0%	-	-
	CD ROM	3	0%	0%	0%	-	-
SDG&E	On-Site	315	20%	9%	14%	8%	8%
	Phone	76	9%	8%	2%	0%	-
	Mail	3	0%	0%	0%	0%	0%
	Online	1	100%	0%	100%	-	-
	CD ROM	11	27%	27%	-	-	-
Statewide	On-Site	6,966	20%	11%	8%	9%	8%
	Phone	515	18%	10%	10%	5%	6%
	Mail	108	10%	2%	1%	5%	6%
	Online	33	9%	0%	7%	4%	-
	CD ROM	935	19%	10%	9%	17%	9%
Total NRA		8,557	20%	11%	8%	9%	8%
N		8,557	8,557	8,557	6,155	3,752	1,722
Local Program		521	31%	25%	31%	-	-
N		521	521	521	157	-	-

Table 4-18 below shows the cross over between the NRA program and Standard Performance Contracting (SPC) for medium and large customers[32]. This Table utilizes the 4 year historical tracking systems described above. The cross over from NRA to SPC is about half the rate of cross over from NRA to Express Efficiency – at 10 percent. The results for the SCE on-site audit are significantly higher than other utility/delivery mechanism segments, at 13 percent. The highest rate of cross over occurs in the first year following the

[32] Cross over from NRA to SPC among very small and small customers is not shown because the SPC Program is not targeted to very small/small customers.

audit (6 percent), but the cross over in years 2 and 3 and 4 is not considerably lower (4 to 5 percent). These results strengthen evidence that larger customers take longer to implement audit recommendations and/or a longer life of audit recommendations for larger customers. Cross over from the Local Program to SPC is relatively weak, suggesting that improved marketing of SPC within those Audits should be considered.

Table 4-18: Cross Program Participation Summary, Audit Participants Going on to SPC Program, Medium and Large Customers

Utility	Audit Type	NRA 2002-2005 (current, valid, sites)	Match to SPC 2002-2005	Participation Rate, Years After the Audit			
				First Year	Second Year	Third Year	Fourth Year
PGE	On-Site	1,114	5%	3%	2%	3%	4%
	Phone	379	1%	1%	1%	1%	0%
	Mail	60	0%	0%	0%	0%	0%
	Online	-	-	-	-	-	-
	CD ROM	863	1%	1%	1%	1%	0%
SCE	On-Site	4,418	13%	10%	8%	8%	7%
	Phone	26	0%	0%	0%	0%	0%
	Mail	5	0%	0%	0%	0%	-
	Online	30	3%	0%	4%	0%	-
	CD ROM	58	3%	2%	2%	4%	0%
SCG	On-Site	1,119	0%	0%	0%	0%	0%
	Phone	34	0%	0%	0%	0%	-
	Mail	40	0%	0%	0%	0%	0%
	Online	2	0%	0%	0%	-	-
	CD ROM	3	0%	0%	0%	-	-
SDG&E	On-Site	315	3%	2%	3%	3%	0%
	Phone	76	0%	0%	0%	0%	-
	Mail	3	0%	0%	0%	0%	0%
	Online	1	0%	0%	0%	-	-
	CD ROM	11	0%	9%	-	-	-
Statewide	On-Site	6,966	12%	7%	5%	5%	5%
	Phone	515	1%	0%	1%	0%	0%
	Mail	108	0%	0%	0%	0%	0%
	Online	33	3%	0%	3%	0%	-
	CD ROM	935	2%	1%	1%	1%	0%
Total NRA		8,557	10%	6%	4%	5%	4%
N		8,557	8,557	8,557	6,155	3,752	1,722
Local Program		521	2%	4%	4%	-	-
N		521	521	521	157	-	-

Cross Program Participation Patterns over Time by Customer Size and End-Use

Table 4-19 below shows patterns of cross-over from the NRA program to the Express Efficiency rebate program by customer size and end-use. The upper panel shows results for the NRA program, and the lower panel shows the Local Program results. The Table shows a very significant concentration of cross over to the lighting end use among very small and small customers. There is more diversity in end-use adoptions among the medium and large customers, especially for the Local Program, though there remains concentration in the lighting end-use. The Table also shows that among medium and large customers, adoptions in the cooling end-use are flat for the first four years following the audit. This is consistent with a more drawn out program effect for this end-use. Data for refrigeration indicates a minimal or negligible cross over effect for this end-use.

Table 4-19: Cross Program Participation Summary, Audit Participants Going on to Express Efficiency, By End Use and Customer Size

Audit Program	Customer Size	End Use	Match to Express 2002-2005	Participation rate, Years After the Audit			
				First Year	Second Year	Third Year	Fourth Year
NRA Program	Very Small and Small	Lighting	7%	5%	2%	1%	1%
		Cooling	2%	1%	1%	1%	1%
		Refrigeration	0%	0%	0%	0%	0%
		All	8%	6%	3%	2%	2%
		N	57,102	57,102	37,397	19,105	5,867
	Medium and Large	Lighting	11%	7%	5%	4%	3%
		Cooling	5%	3%	2%	2%	2%
		Refrigeration	1%	1%	1%	0%	0%
		All	20%	11%	8%	9%	8%
		N	8,557	8,557	6,155	3,752	1,722
Local Program	Very Small and Small	Lighting	23%	23%	13%	N/A	N/A
		Cooling	0%	0%	0%	N/A	N/A
		Refrigeration	0%	0%	0%	N/A	N/A
		All	32%	32%	13%	N/A	N/A
		N	22	22	14	-	-
	Medium and Large	Lighting	25%	21%	25%	N/A	N/A
		Cooling	9%	8%	9%	N/A	N/A
		Refrigeration	3%	3%	3%	N/A	N/A
		All	31%	25%	31%	N/A	N/A
		N	521	521	157	-	-

Table 4-20 below shows patterns of cross-over from the NRA program to the SPC incentive program by end-use. Analysis is limited to the medium/large customer segment because the SPC program is not targeted to very small/small customers. The Table shows a relatively even distribution across the end-uses, with Process installations drawing the highest cross-over among NRA participants. In addition, cross-over rates are mostly flat over the four year period, though there is a small spike in the first year. As stated earlier, the flat cross-over rates may indicate a longer lifetime of the Audit for medium and large customers, and/or a greater lag time between receiving recommendations and implementing them.

Table 4-20: Cross Program Participation Summary, Medium and Large Audit Participants Going on to the SPC Program, By End Use

Audit Program	End Use	Match to SPC 2002-2005	Participation Rate, Years After the Audit			
			First Year	Second Year	Third Year	Fourth Year
NRA Program	Lighting	5%	3%	2%	2%	2%
	Cooling	2%	2%	1%	1%	1%
	Process	4%	3%	2%	2%	2%
	All	10%	6%	4%	5%	4%
	N	8,557	8,557	6,155	3,752	1,722
Local Program	Lighting	2%	2%	0%	N/A	N/A
	Cooling	1%	1%	3%	N/A	N/A
	Process	2%	2%	2%	N/A	N/A
	All	2%	4%	4%	N/A	N/A
	N	521	521	157	-	-

Cross Program Energy Savings Patterns by Program and Measure

Table 4-21 below shows the distribution of electric energy impact by measure for the Express Efficiency program, and the subset of measures installed by participants who were previously NRA participants. The Table does not show a remarkable contrast in measure distributions between these two populations, indicating that NRA participants are not choosing systematically different measures to purchase through the Express program. There does appear to be a somewhat greater propensity among cross-over participants to install programmable thermostats.

In addition, we note that Audit participants account for 20 (very small and small companies) to 21 (medium/large companies) percent of total participating sites over the 2002 – 2005 period. Over the same period, Audit participants make up 15 (very small/small) and 21 (medium/large) percent of total Express Efficiency kWh impact, providing evidence against the proposition that Audit customers tend to make more significant investments in energy efficiency.

Table 4-21: Cross Program Measure Distribution Summary, Audit and Express Efficiency Cross Program Participants, Program Years 2002 through 2005, MWh and kW Impact

Customer Size	Technology Category	Distribution of MWh Impact, PY 2002-2005		Cross Program as a Percent of Express Efficiency	Distribution of kW Impact, PY 2002-2005		Cross Program as a Percent of Express Efficiency
		Express Efficiency	Cross Program		Express Efficiency	Cross Program	
Medium/Large	Agriculture	0%	0%	39%	0%	0%	49%
	Bldg Shell	1%	1%	18%	0%	0%	17%
	Food Service	0%	0%	18%	0%	0%	1%
	HVAC-A/Cs	3%	1%	10%	6%	4%	14%
	HVAC-Programmable Thermostat	12%	18%	30%	-	-	-
	HVAC-Other	2%	2%	20%	7%	3%	10%
	Lighting-CFL	35%	36%	21%	32%	41%	27%
	Lighting-T-8/T-5	23%	20%	19%	37%	32%	18%
	Lighting-Other	13%	15%	25%	13%	17%	27%
	Motors	1%	1%	24%	0%	0%	28%
	Refrigeration	10%	6%	12%	3%	2%	13%
	Water Heating	0%	0%	0%	0%	-	0%
	Total Impact	592,762	122,807	21%	851,687	181,480	21%
Small/Very Small	Agriculture	1%	0%	4%	1%	0%	1%
	Bldg Shell	1%	0%	11%	0%	0%	10%
	Food Service	0%	0%	8%	0%	0%	1%
	HVAC-A/Cs	3%	1%	7%	6%	8%	8%
	HVAC-Programmable Thermostat	6%	10%	26%	-	-	-
	HVAC-Other	3%	2%	12%	4%	5%	7%
	Lighting-CFL	62%	64%	16%	41%	57%	9%
	Lighting-T-8/T-5	14%	11%	12%	26%	19%	5%
	Lighting-Other	6%	6%	15%	13%	6%	3%
	Motors	1%	0%	6%	5%	0%	0%
	Refrigeration	3%	4%	22%	2%	4%	13%
	Water Heating	0%	0%	13%	1%	0%	2%
	Total Impact	484,649	73,633	15%	598,921	40,589	7%

Table 4-22 below shows the distribution of gas energy impact by measure for the Express Efficiency program, and the subset of measures installed participants who were previously NRA participants. For small and very small customers, similar to electric results shown above, the Table does not show a remarkable contrast in measure distributions between these two populations. Again, indicating that NRA participants are not choosing systematically different measures to purchase through the Express program. There does appear to be a somewhat greater propensity among medium and large cross-over participants to install building shell and agriculture measures. However, considering all of the evidence together, there is nothing compelling suggesting a measure choice effect stemming from Audit participation.

Table 4-22: Cross Program Measure Distribution Summary, Audit and Express Efficiency Cross Program Participants, Program Years 2002 through 2005, Therm Impact

Customer Size	Technology Category	Distribution of Therm Impact, PY 2002-2005		Cross Program as a Percent of Express Efficiency
		Express Efficiency	Cross Program	
Medium/Large	Agriculture	21%	28%	48%
	Bldg Shell	17%	22%	49%
	HVAC-Programmable Thermostat	29%	18%	23%
	HVAC-Other	3%	5%	52%
	Water Heating	30%	28%	35%
	Total Impact	13,297,762	4,938,679	37%
Small/Very Small	Agriculture	3%	7%	41%
	Bldg Shell	6%	6%	23%
	HVAC-Programmable Thermostat	38%	38%	21%
	HVAC-Other	22%	14%	13%
	Water Heating	30%	35%	24%
	Total Impact	9,977,582	2,078,799	21%

Table 4-23 below shows the distribution of electric energy impact for the SPC program as a whole, and for the subset of SPC participants that had an Audit prior to SPC participation. Again, there is no compelling evidence of a substantive difference in program measure selection from Audit participants. There is a higher rate of adoption in the "other" category among Audit participants. Though Audit participants are 33 percent of all SPC participants over the 2002-2005 period, their measure adoptions make up 38 percent of the SPC kWh impact over the same period, indicating a tendency to make larger-than-average adoptions.

Table 4-23: Cross Program Measure Distribution Summary, Audit and SPC Cross Program Participants, Program Years 2002 through 2005, MWh and kW Impact

Technology Category	Distribution of MWh Impact, PY 2002 - 2005		Cross Program as a Percent of SPC	Distribution of kW Impact, PY 2002-2005		Cross Program as a Percent of SPC
	SPC	Cross Program		SPC	Cross Program	
HVAC - Chillers	4%	2%	18%	4%	2%	18%
HVAC - Controls	3%	3%	37%	1%	1%	42%
HVAC - Equipment	2%	5%	72%	2%	2%	56%
HVAC - Other	4%	2%	25%	2%	1%	19%
HVAC - Packaged Units	1%	0%	26%	0%	0%	24%
Total HVAC	**18%**	**13%**	**28%**	**9%**	**6%**	**27%**
Lighting - Controls	9%	8%	34%	13%	11%	36%
Lighting - Fluorescent	14%	15%	41%	22%	22%	41%
Lighting - HID	1%	1%	31%	2%	2%	38%
Lighting - Other	5%	2%	14%	6%	3%	18%
Total Lighting	**29%**	**26%**	**33%**	**42%**	**37%**	**36%**
Process - Compressors	3%	3%	40%	3%	4%	50%
Process - Controls	2%	1%	20%	1%	0%	18%
Process - Equipment	15%	16%	40%	16%	13%	34%
Process - Motors	1%	0%	29%	1%	1%	55%
Process - Other	10%	11%	43%	12%	17%	56%
Process - VSD	7%	8%	46%	5%	5%	36%
Total Process	**37%**	**40%**	**41%**	**38%**	**40%**	**43%**
Refrigeration - Controls	1%	1%	23%	0%	-	-
Refrigeration - Equipment	5%	6%	42%	5%	6%	47%
Refrigeration - Other	1%	0%	5%	1%	-	-
Total Refrigeration	**7%**	**6%**	**34%**	**6%**	**6%**	**40%**
Other - Controls	3%	4%	58%	1%	2%	77%
Other - Equipment	5%	10%	82%	4%	8%	87%
Other - Other	1%	0%	1%	0%	-	-
Other - VSD	1%	0%	4%	0%	-	-
Total Other	**9%**	**14%**	**62%**	**5%**	**10%**	**79%**
Total Savings	**1,120,536**	**423,405**	**38%**	**146,293**	**58,741**	**40%**

We have examined the cross-over rate from the Audit program to Express Efficiency in the Tables presented above, and viewed patterns of participation and cross-over from multiple perspectives. However, we have thus far been unable to assess how the participation rates compare to general population participation rates. Table 4-24 below shows Express Efficiency market penetration rates for the whole population and among the Audit participants. The Table shows a marked difference between the Audit group and the general population. Audit participants are four times more likely to participate in Express Efficiency than a member of the general population. Viewed by IOU service territory and customer size segment, the results are most dramatic for PG&E and for customers in the smaller size categories. Both of these high performing segments demonstrate Express Efficiency penetration within the Audit participant population equal to more than five times the respective general population penetration rate.

Table 4-24: Express Efficiency Market Penetration Comparison, Audit Participants versus the General Population, Program Years 2002 through 2005

Utility	Customer Size	Express Market Penetration, PY 2002-2005		Ratio of Audit to General Pop Penetration Rates
		Audit Participants	General Population	
PG&E	Large	30.4%	11.8%	2.6
	Medium	27.7%	11.2%	2.5
	Small	15.7%	1.8%	8.9
	Very Small	10.4%	2.0%	5.1
	Total	13.5%	2.5%	5.4
SCE	Large	15.1%	27.1%	0.6
	Medium	16.6%	7.9%	2.1
	Small	14.4%	3.7%	3.9
	Very Small	8.5%	1.7%	5.2
	Total	11.6%	2.8%	4.1
SCG	Large	13.6%	9.3%	1.5
	Medium	17.4%	15.3%	1.1
	Small	8.1%	4.8%	1.7
	Very Small	0.6%	0.2%	3.6
	Total	2.9%	0.9%	3.3
SDG&E	Large	15.9%	13.8%	1.1
	Medium	14.6%	10.3%	1.4
	Small	9.8%	3.4%	2.8
	Very Small	2.2%	1.2%	1.7
	Total	4.1%	2.3%	1.8
Total	Large	20.5%	15.6%	1.3
	Medium	20.2%	9.7%	2.1
	Small	13.0%	2.8%	4.6
	Very Small	6.1%	1.5%	4.1
	Total	9.2%	2.3%	3.9

Table 4-25 below compares SPC market penetration of the Audit Program population and the general population. Both the Audit program and the SPC program population are the 2002 through 2005 program years combined. Overall, the rate of SPC participation among Audit participants is 2.5 times the rate found in the general population, falling quite a bit short of the difference found in Express Efficiency program penetration. PG&E shows the greatest relative success in using the Audit as a tool to recruit SPC participants, with over five times the participation found among the Audit participants than the general population. The Table shows that within the SCE service territory the Audit effect is greater among the medium customers relative to large (5.5 versus 1.3 respectively). Note that SPC participation rates in general are much greater among large companies, but the difference between Audit participant- and general population- participation rates tend to be greater among medium sized customers.

Table 4-25: SPC Market Penetration Comparison, Audit Participants versus the General Population, Program Years 2002 through 2005

Utility	Customer Size	SPC Market Penetration, PY 2002 - 2005		Ratio of Audit to General Pop Penetration Rates
		Audit Participants	General Population	
PG&E	Large	8.3%	5.0%	1.7
	Medium	1.6%	1.0%	1.6
	Total	14.5%	2.7%	5.4
SCE	Large	26.7%	20.6%	1.3
	Medium	4.4%	0.8%	5.5
	Total	14.3%	3.9%	3.6
SDG&E	Large	15.9%	15.0%	1.1
	Medium	2.8%	2.1%	1.3
	Total	5.5%	4.3%	1.3
Total	Large	17.6%	9.7%	1.8
	Medium	2.6%	1.0%	2.6
	Total	8.5%	3.4%	2.5

4.6 Tracking System Assessment Conclusions and Recommendations

The Tracking System Assessment explored participation patterns, verified program accomplishments, assessed current tracking system content and compared it with previous tracking systems, examined follow-up program tracking systems, and leveraged marketing databases and tracking databases to assess marketing performance and efficacy. The cross program component of the tracking system assessment compiled tracking data from a variety of statewide nonresidential programs and analyzed rates of cross-over from the audit program. These were examined by utility, delivery mechanism, customer size, end-use, energy savings, measure and time elapsed since the audit. What follows is a brief summary of the conclusions and recommendations that flow from the data analyses that were completed.

Program Verification and Tracking System Content Assessment.

Program verification results indicate that each utility exceeded their Audit participation goals, and quarterly reports were generally consistent with the statewide tracking system, SCG accomplishments stand out, at nearly twice the goal that was set.

Analysis of the 2004/2005 tracking system shows that account numbers are well populated for onsite and phone audits across all four IOU tracking systems. Moreover, relative to previous tracking systems, significant improvements were shown by all four utilities in maintaining account numbers with audit tracking records.

Overall, account numbers are populated for 93 percent of all tracking records over the 2004/2005 period, versus 71 percent for the 2003 program year. SCG and SDG&E showed the highest gain, at about 25 percent each. PG&E and SCE improved by about 15 percent each. Mail, CD ROM and Online audits had the most to gain from these improvements in record keeping, and are now exhibiting much improved record keeping.

The story for contact information is not as positive as for account number. Statewide contact information is present in 62 percent of all audit tracking records, down from 83 percent in 2003.

Follow-Up Programs Tracking System Content Assessment. Three of the four investor owned utilities (IOUs) provided follow-up services to Audit participants during program years 2004 and 2005. These IOUs were PG&E, SCE and SDG&E. The tracking systems maintained for these follow-up programs are generally well populated with key data, including account numbers and dates of follow-up phone calls, though SDG&E should better track the follow up date.

Marketing Activities and Participation Assessment. The efficacy of specific program marketing efforts was assessed for SCE and PG&E. These two IOU's were able to provide lists of customers targeted in specific mail marketing campaigns in 2004 and 2005. For PG&E, the mailings correspond to spikes in mail audit participation, and also generally precede periods of growth in participation, indicating that the mail is an effective marketing approach for this program. SCE completed size-specific and business type targeted mail marketing campaigns. The size specific mailing were fairly successful among small and very small customers. The business type specific mailers seem to have had a positive effect for all customer sizes. It is recommended that marketing efficacy studies continue to be conducted in order to refine and improve marketing approaches where feasible.

Cross Program Tracking System Assessment. Analysis of statewide nonresidential tracking system databases for the program years 2002 through 2005 yield some striking findings. First, it seems that among very small and small customers, the on-site audit is much more effective at recruiting for rebate program participation than the remote audit delivery mechanisms. Interestingly, the medium and large company data did not exhibit a similar pattern, however there were few remote audit participants in this section from which to draw conclusions. Of course onsite delivery is more expensive than remote delivery channels, and therefore no conclusions can be drawn at this time concerning the most cost-effective delivery mix. Such an analysis should be considered for future studies.

The lighting end-use was by far the most popular among audit participants, a finding that fits nicely with this and previous NRA program impact analyses which find a majority of program impacts originating in the lighting end-use.

Our investigation of patterns of cross-over from the Audit program to the rebate programs as time passes yield some important findings. First, among participants of all sizes and for all end-uses the cross-over rate is highest in the first year following the Audit. Among very small/small customers the cross-over rate declines markedly after the first year, while among the medium/large customers the decline is more modest over the first four years.

5

Impact Assessment

This chapter presents the results of the Impact Assessment, which is made up of four components. The components are: Gross Impact Analysis, Net Impact Analysis, Cross Program Analysis, Participant Measure Adoption Summary, and Gap Analysis.

The primary objective of the Impact Assessment is to document kW, kWh and therm savings that result from participation in the Audit Programs above and beyond those accomplished through rebate programs. To this end, Gross and Net Impact Analyses are presented first. The Gross Impact Analysis results show the energy savings achieved through the installation of non-rebated energy efficient measures by Audit program participants as collected in the impact surveys. The Net Impact Analysis adjusts gross impacts to represent energy savings only from those measure adoptions attributed to NRA/Local Program Participation.

In this report gross and net impacts achieved through rebate programs are not counted towards the NRA and Local Program accomplishments to eliminate the potential for double counting of rebated measures within the portfolio of Statewide programs. Nonetheless, the Audit program design (as detailed in the Logic Model presented in Section 6.1) dictates that the program's primary function is to provide information and referrals to customers for accomplishing measure installations *through incentive programs*. The effectiveness of the audits in leading to incentive program participation is quantitatively characterized in Section 5.3 Cross Program Impact Assessment. Attribution findings and other findings specifically related to the relationship between the NRA/Local Program and the incentive programs is presented in that section.

Section 5.4, the Participant Measure Adoption Summary is similar to previous NRA Evaluation Impact Analysis studies. This section provides summaries of participant measure adoption rates by end-use, and compares these adoption rates to those of nonparticipants. This section also summarizes participant and nonparticipant adoptions by technology, efficiency, installation size, and rebate program participation status. Self-reported conservation practice adoptions are also explored here.

The “Gap Analysis” seeks to examine the content and efficacy of Audit report recommendations. It identifies “gaps” in the portfolio of recommendations and “gaps” between recommendation rates and adoption rates.

5.1 Gross Impact Results

The Gross Impact Analysis results presented in this section are the impacts achieved through the adoption of *non-rebated* energy efficient measures by program participants. These gross impacts do not include measures rebated through other statewide programs such as Express Efficiency and the SPC program that were identified through tracking system merges, nor do they include measures self-reported to have a rebate. Nonetheless, non-Express and non-SPC rebated measure adoptions that were reported by participants are separately reported in Sections 5.1 and 5.2 to provide an indication of NRA program effectiveness in generating rebate program activity beyond the IOU primary offerings. By claiming only the un-rebated portion of impact, the results presented in this report are a very conservative estimate of the value of the NRA program within the IOU portfolio of programs, with significant value being derived from NRA as a feeder mechanism to an array of rebate programs. The NRA feeder effect is explored in greater detail in the Section 5.3 Cross Program Assessment.

Methods applied to arrive at the gross impact results are detailed in Chapter 3 Methods, Section 3.2. A more detailed summary of impact results is presented in Appendix C and D.

Gross Impact results are only partially represented for the “Process” and “Other” end-uses for the Medium/Large segment. Survey data reveal a large portion of these adoptions would not be included in net program impacts. For this reason the gross impact assessment focuses on those installations that had a positive probability of contributing to program net impacts.

Table 5-1 below shows the adjusted gross annual electric (kWh) impacts for the 2004/2005 NRA and Local Program audits. Again, the estimates presented for the Medium/Large companies in the “Other” and “Process” end-uses are a lower bound to the true gross impacts[33].

The Table below shows that despite a great emphasis on lighting in the audit recommendations, there is nearly as much savings generated from cooling installations as for

[33] For very small and small customers, recall that the ‘other’ end use impacts were not detected in the SAE billing analysis. Thus, for the small and very small companies, the gross adjusted impacts for the ‘other’ end-use are zero, and the process end-use is not applicable.

lighting installations. As discussed in Section 5.2 Net Impact Analysis, the lighting measures have a higher net-to-gross ratio associated with them, and so are ultimately responsible for most of the program impacts. However, as is discussed in Section 5.5, Gap Analysis (page 5-78) cooling measure recommendations generally lag behind adoptions. That is, the relative frequency of cooling equipment adoptions in the population is greater than that of cooling equipment recommendations. Thus, it seems the NRA program would benefit from an increased emphasis on cooling recommendations. This may be more easily implemented in the Medium/Large segment where recommendations are more readily customized and the program already demonstrates an ability to achieve lower free ridership rates for cooling measures. At the same time, there is a lot of potential for increased net impacts in the Very Small/Small segment, as illustrated by the relatively high gross adjusted impacts and low net impacts.

Table 5-1: Adjusted Gross kWh Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism					Medium/Large On-Site	Local Program
			On-Line	CD-ROM	Mail	Phone	On-Site		
PG&E	Lighting	7,102,817	208,917	1,656,225	0	1,093,682	3,136,332	1,007,659	1,255,224
	Cooling	4,073,461	0	460,759	0	606,289	2,701,681	304,733	1,226,706
	Process	278,915	0	0	0	0	0	278,915	0
	Other	14,508	0	0	0	0	0	14,508	0
	Total	11,469,701	208,917	2,116,984	0	1,699,971	5,838,013	1,605,815	2,481,929
SCE	Lighting	13,000,286	1,659,207	0	1,255,588	294,401	6,573,462	3,217,626	0
	Cooling	8,081,942	1,492,613	0	73,188	12,289	3,648,080	2,855,772	0
	Process	6,131,857	0	0	0	0	0	6,131,857	0
	Other	0	0	0	0	0	0	0	0
	Total	27,214,086	3,151,821	0	1,328,777	306,690	10,221,542	12,205,256	0
SCG	Lighting	7,032,541	205,225	298,765	2,852,790	504,943	834,403	2,336,415	0
	Cooling	18,338,308	8,578,176	0	6,483,017	1,122,922	848,055	1,306,137	0
	Process	1,070,387	0	0	0	0	0	1,070,387	0
	Other	0	0	0	0	0	0	0	0
	Total	26,441,236	8,783,402	298,765	9,335,807	1,627,866	1,682,458	4,712,939	0
SDG&E	Lighting	5,919,484	835,670	0	1,238,915	208,121	3,636,778	0	0
	Cooling	455,805	0	72,429	0	149,869	177,986	55,522	0
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	6,375,289	835,670	72,429	1,238,915	357,990	3,814,764	55,522	0
Statewide	Lighting	33,055,128	2,909,020	1,954,990	5,347,294	2,101,148	14,180,976	6,561,700	1,255,224
	Cooling	30,949,517	10,070,789	533,187	6,556,206	1,891,369	7,375,802	4,522,164	1,226,706
	Process	7,481,159	0	0	0	0	0	7,481,159	0
	Other	14,508	0	0	0	0	0	14,508	0
	Total	71,500,312	12,979,809	2,488,178	11,903,499	3,992,517	21,556,778	18,579,531	2,481,929

Table 5-2 below shows the adjusted gross annual electric (kWh) per-unit impacts for the NRA on-site audits and local program audits. The statewide average adjusted gross per-unit impact for small and very small company on-site audits is just over 1,000 kWh. For Medium/Large companies, the statewide average adjusted gross impacts is just over 4,000 kWh. These results are lower than those found in the program year 2002 and 2003

Evaluations. For program year 2002, the average on-site audit was estimated to yield 4,500 kWh, regardless of company size. For program year 2003 the average on-site audit was estimated to yield nearly 4,000 kWh per audit for smaller companies, and 36,000 kWh per audit for Medium/Large companies.

Table 5-2: Adjusted Gross Per-Unit kWh Impacts, On-Site Audits and Local Program[34]

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	354.8	700.6	440.4	3,781.9	672.8
	Cooling	305.6	388.8	447.6	185.1	349.9
	Total	**660.5**	**1,089.4**	**888.0**	**3,967.0**	**1,022.7**
Medium/ Large	Lighting	1,295.6	1,060.2	4,717.0	0.0	1,430.1
	Cooling	391.8	941.0	2,637.0	198.0	985.6
	Process	358.6	2,020.4	2,161.0	0.0	1,630.5
	Other	18.7	0.0	0.0	0.0	3.2
	Total	**2,064.7**	**4,021.6**	**9,515.1**	**198.0**	**4,049.3**
Medium						**2,956.1**
Large						**9,922.1**
Local Program		**3,169.8**	N/A	N/A	N/A	**3,169.8**

There are multiple explanations for these dramatic changes. They include the substantial reduction in gross impacts applied as a result of the SAE bill analysis for lighting, as well as the exclusion of certain measures such as programmable thermostats[35] and lighting delay timers. By far the most dramatic change has been in the number of self-reported rebated adoptions. Impacts associated with adoptions for which the respondent claims to have received a rebate are shown in Table 5-3. The inclusion of these values, particularly for the Medium/Large customer on-site audits, brings the total adjusted gross impacts much nearer to earlier levels, particularly in light of the SAE adjustments that have been applied to these impacts. These impacts and other relevant impact tables reported in sections 5.1 and 5.2 refer to non-Express and non-SPC adoptions that fall under a generic "rebate program" reported by participants. The impacts associated with these two varieties of rebate programs are explored in greater detail in the Section 5.3 Cross Program Assessment.

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[34] Excluding Process and Other End-Use Impacts for Medium and Large Companies. Unadjusted gross impacts were not estimated due to the decision to concentrate engineering follow up work among measures with expected net benefits.

[35] Programmable thermostats were approximately 4 to 6 percent of gross program impacts in 2002 and 2003.

In past evaluations, self-reported rebates excluded roughly 33 percent[36] of impacts associated with NRA participant measure adoptions. For this 2004/2005 Evaluation 54 percent of overall adjusted gross impacts are excluded due to self-reported rebates, and more importantly, **84 percent** of Medium/Large company impacts are excluded due to self-reported rebates.

Table 5-3: Adjusted Gross Per-Unit kWh Impacts Associated with Measures Self-Reported to Have been Rebated[37]

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	282.6	96.2	99.3	57.0	172.9
	Cooling	21.5	5.4	0.0	0.0	11.4
	Total	**304.1**	**101.7**	**99.3**	**57.0**	**184.3**
Medium/ Large	Lighting	6,527.3	13,844.0	10,610.5	2,718.0	11,574.9
	Cooling	519.0	2,087.0	1,832.1	0.0	1,666.2
	Process	0.0	0.0	0.0	0.0	0.0
	Other	0.0	13,861.4	0.0	0.0	9,168.5
	Total	**7,046.3**	**29,792.3**	**12,442.6**	**2,718.0**	**22,409.5**
Local Program		**11,624.9**	N/A	N/A	N/A	**11,624.9**

Table 5-4 below shows the adjusted gross per unit kWh impacts from statewide NRA remote audits. There is notable variability by delivery mechanism, with online audits providing a substantially higher impact per unit than the others. CD-ROM stands out as the lowest primarily due to the adjustment made for rates of CD-ROM installation[38].

[36] This is an unweighted result of combined 2002/2003 participant impact survey data.

[37] These impacts are not counted towards NRA program accomplishments, nor Local Program accomplishments. They are shown for illustrative purposes only.

[38] Seventy percent of CD-ROM recipients we spoke to on the phone that recalled receiving the Audit tool did not install or run the software.

Table 5-4: Adjusted Gross Per-Unit kWh Impacts, Remote Audits

End Use	Remote Audits: On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	851.3	233.4	359.0	236.3	346.0
Cooling	2,947.3	63.7	440.2	212.7	535.5
Gas	0.0	0.0	0.0	0.0	0.0
Total	**3,798.6**	**297.1**	**799.2**	**449.0**	**881.5**

Table 5-5 below summarizes total 2004/2005 NRA and Local Program estimated gross summer kW impacts. On-site audits make up nearly half of all gross kW impacts. Online and mail audits make up another 40 percent of total kW impacts. The Local Program is estimated to have a gross demand impact of 1,380 kW.

Table 5-5: Adjusted Gross kW Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism: On-Line	CD-ROM	Mail	Phone	On-Site	Medium/Large On-Site	Local Program
PG&E	Lighting	3,334	78	964	0	555	1,299	437	522
	Cooling	4,640	0	504	0	861	2,889	386	857
	Process	40	0	0	0	0	0	40	0
	Other	164	0	0	0	3	155	5	0
	Total	8,178	78	1,468	0	1,419	4,344	868	1,380
SCE	Lighting	5,407	810	0	749	125	2,216	1,506	0
	Cooling	6,559	1,687	0	76	9	2,960	1,827	0
	Process	466	0	0	0	0	0	466	0
	Other	43	41	0	2	0	0	0	0
	Total	12,475	2,538	0	826	134	5,177	3,800	0
SCG	Lighting	3,076	102	139	2,201	218	351	64	0
	Cooling	11,964	4,455	0	4,096	1,081	1,491	840	0
	Process	0	0	0	0	0	0	0	0
	Other	20	0	0	20	0	0	0	0
	Total	15,059	4,557	139	6,317	1,300	1,843	904	0
SDG&E	Lighting	2,327	313	0	316	57	1,640	0	0
	Cooling	452	0	65	0	133	186	68	0
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	2,779	313	65	316	190	1,826	68	0
Statewide	Lighting	14,143	1,304	1,103	3,267	955	5,506	2,007	522
	Cooling	23,615	6,142	570	4,171	2,084	7,527	3,121	857
	Process	507	0	0	0	0	0	507	0
	Other	227	41	0	21	3	155	5	0
	Total	38,491	7,487	1,673	7,460	3,043	13,189	5,640	1,380

Table 5-6 below shows the per-unit gross summer peak demand impacts for on-site audits and the Local Program audits. Not surprisingly, the Table shows per-unit impacts lower than those found in the 2003 evaluation. In 2003 on-site audits were estimated to have an impact of 1.2 kW per audit for smaller customers and 6.2 kW[39] per audit for medium and large customers. In 2002, on-site audits were found to have an impact of 0.8 per audit, regardless of size, which is reasonably consistent with these 2004/2005 results.

Table 5-6: Gross Per-Unit Summer Peak Demand (kW) Impacts, On-Site Audits and Local Program

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	0.1	0.2	0.2	1.7	0.3
	Cooling	0.3	0.3	0.8	0.2	0.4
	Total	**0.5**	**0.6**	**1.0**	**1.9**	**0.6**
Medium/ Large	Lighting	0.6	0.5	0.1	0.0	0.4
	Cooling	0.5	0.6	1.7	0.2	0.7
	Process	0.1	0.2	0.0	0.0	0.1
	Other	0.0	0.0	0.0	0.0	0.0
	Total	**1.1**	**1.3**	**1.8**	**0.2**	**1.2**
Medium						**1.3**
Large						**2.1**
Local Program		**1.8**	N/A	N/A	N/A	**1.8**

Table 5-7 below shows the per-unit gross summer peak demand impacts estimated for remote audit delivery channels. Online audits are estimated to produce the highest per-unit gross kW savings, at 2.2 kW per audit.

Table 5-7: Adjusted Gross Per-Unit Summer Peak Demand (kW) Impacts, Remote Audits

End Use	Remote Audits				
	On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	0.4	0.1	0.2	0.1	0.2
Cooling	1.8	0.1	0.3	0.2	0.4
Total	**2.2**	**0.2**	**0.5**	**0.3**	**0.6**

[39] This estimate is based on an 84 point survey of medium and large NRA participants.

Table 5-8 below shows the statewide NRA and Local Program adjusted gross annual natural gas (therm) impacts[40] for program years 2004 and 2005. The Table shows that phone audits in the PG&E service territory produced a high relative therm impact. Medium/Large company on-site audits also produced a significant share of gross therm impacts.

It is important to note that more than any other service territory, the SCG on-site audit emphasizes therm-saving measures. The reader will also notice that the adjusted gross impacts presented in this section do not reveal substantial SCG service territory accomplishments in this end-use. This is because the majority of the therm saving installations reported by SCG participants were self-reported to have been rebated. In fact, 58 percent of the therm impacts measured in SCG service territory were excluded based on rebate status.

Table 5-8: Adjusted Gross Therm Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism: On-Line	CD-ROM	Mail	Phone	On-Site	Medium/Large On-Site	Local Program
PG&E	Lighting	-685	-17	-184	0	-73	-321	-91	-133
	Cooling	2,782	0	0	0	2,782	0	0	7,132
	Gas	8,977,532	107,942	702,178	0	6,662,714	891,035	613,664	181,571
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	8,979,629	107,925	701,994	0	6,665,423	890,713	613,573	188,570
SCE	Lighting	-1,654	-523	0	-42	-57	-956	-75	0
	Cooling	1	0	0	1	0	0	0	0
	Gas	8,003,388	245,000	0	38,193	1,972	607,316	7,110,908	0
	Process	1,487	0	0	0	0	0	1,487	0
	Other	0	0	0	0	0	0	0	0
	Total	8,003,222	244,476	0	38,152	1,915	606,359	7,112,320	0
SCG	Lighting	-615	-30	-105	-366	-81	-33	0	0
	Cooling	33,683	29,450	0	4,233	0	0	0	0
	Gas	2,939,706	196,590	0	1,127,691	577,940	994,675	42,810	0
	Process	148	0	0	0	0	0	148	0
	Other	0	0	0	0	0	0	0	0
	Total	2,972,921	226,010	-105	1,131,558	577,859	994,642	42,957	0
SDG&E	Lighting	-993	-67	0	0	-8	-919	0	0
	Cooling	0	0	0	0	0	0	0	0
	Gas	2,515,543	40,769	1,021,284	0	0	1,453,490	0	0
	Process	206,540	0	0	0	0	0	206,540	0
	Other	0	0	0	0	0	0	0	0
	Total	2,721,090	40,703	1,021,284	0	-8	1,452,571	206,540	0
Statewide	Lighting	-3,948	-637	-289	-408	-219	-2,229	-166	-133
	Cooling	36,466	29,450	0	4,234	2,782	0	0	7,132
	Gas	22,436,169	590,301	1,723,462	1,165,884	7,242,627	3,946,515	7,767,381	181,571
	Process	208,174	0	0	0	0	0	208,174	0
	Other	0	0	0	0	0	0	0	0
	Total	22,676,862	619,114	1,723,173	1,169,710	7,245,190	3,944,286	7,975,389	188,570

[40] Recall these impacts are adjusted by the SAE coefficient estimated for cooling measures. This was done because of the similarity in assumptions regarding efficiency that were made in the estimation of gross impacts for both cooling and gas equipment.

Table 5-9 below shows the per-unit adjusted gross therm impacts for NRA on-site audits and the Local Program audits. The Table shows that NRA program Medium/Large on-site audits produce substantially more per-unit therm impacts than Very Small/Small on-site audits and Local Program audits. This effect is traced back to SCE service territory, where therm saving measures create an estimated impact of 2,343 therms.

Table 5-9: Adjusted Gross Per-Unit Therm Impacts, NRA On-Site and Local Program Audits

Customer Size	End Use	On-Site Audits PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	0.0	-0.1	0.0	-1.0	-0.1
	Cooling	0.0	0.0	0.0	0.0	0.0
	Gas	100.8	64.7	525.0	1,511.5	187.2
	Total	**100.8**	**64.6**	**525.0**	**1,510.5**	**187.1**
Medium/ Large	Lighting	-0.1	0.0	0.0	0.0	0.0
	Cooling	0.0	0.0	0.0	0.0	0.0
	Gas	789.0	2,343.0	86.4	0.0	1,692.8
	Process	0.0	0.5	0.3	736.7	45.4
	Other	0.0	0.0	0.0	0.0	0.0
	Total	**788.9**	**2,343.5**	**86.7**	**736.7**	**1,738.2**
Medium						**395.6**
Large						**3,441.6**
Local Program		**240.8**	N/A	N/A	N/A	**240.8**

Table 5-10 below presents the per-unit therm impacts associated with NRA remote audit delivery channels. Remote audits, and phone audits in particular, generate therm savings to rival that of the on-site audits shown above.

Table 5-10: Adjusted Gross Per-Unit Therm Impacts, Remote Audits

End Use	Remote Audits On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	-0.2	0.0	0.0	0.0	0.0
Cooling	8.6	0.0	0.3	0.3	1.0
Gas	172.8	205.8	78.3	814.5	301.4
Total	**181.2**	**205.7**	**78.5**	**814.8**	**302.3**

5.2 Net Impact Results

The objective of the net impact analysis is to estimate the subset of gross kW/kWh and therm impact that is attributable to the NRA program. As discussed above, the gross impact estimates are based on the population of *all* efficient measures installed by program participants following their audit. Some participant adoptions would have occurred in the absence of the Audit program. Impact from these adoptions is part of a ”free ridership” effect and removed from gross impacts to arrive at net impacts.

Of course, the audit program does not deliver fixed and known measures with known ex-ante gross impacts. As such, the traditional concepts of “net-to-gross ratio” and “free ridership” have to be redefined for the audit programs’ unique status and delivery. For this evaluation we define net impacts as the subset of efficient participant adoptions which are analytically attributed to the Audit. The net-to-gross ratio provides an indication of the relative importance of the audit, by segment, to the identification and adoption of efficient measures. A high net-to-gross ratio indicates that little activity would occur *at all* without the audit program. A low net-to-gross ratio does not necessarily indicate a low value or impact associated with audit participation, but should instead be interpreted to mean that efficient adoptions are taking place motivated by influential forces other than the audit. When assessing the value of the audit, the per unit net impact figures are at least as important as the net-to-gross ratios.

Also, the net impacts that are estimated and reported in this section are associated with non-rebated items only. As articulated in detail in Chapter 1, “Key Impact Findings” and Section 5.5, the true benefits of the NRA program lie primarily in its role as a ”feeder” to the incentive programs.

The reader may notice that there are net impacts presented in this section for the ”Process” and ”Other” end-use categories. At the same time, no impacts in these categories are specified in the adjusted gross impact tables presented in Section 5.1. Recall that detailed engineering impact assessments in these measure categories were limited to those measures that were expected to yield some positive net impact. Thus, only net impacts are estimated for medium and large company “Process” and “Other” adoptions.

Table 5-11 below shows the net program kWh impacts from the 2004/2005 NRA and Local Program. Overall the NRA program contributes 22,710 MWh in savings through measures not associated with rebates. Medium/Large customers make-up about one-third of the total net kWh savings, at 6,625 MWh. Another segment result to notice is the lighting end-use result, which is two-thirds of aggregate net kWh impacts. The Local Program produced about 305 MWh of net impact[41].

Table 5-11: Net kWh Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism					Medium/Large On-Site	Local Program
			On-Line	CD-ROM	Mail	Phone	On-Site		
PG&E	Lighting	3,394,392	0	413,485	0	647,117	1,958,527	375,263	191,048
	Cooling	1,111,990	0	189,068	0	108,087	715,335	99,500	114,076
	Process	247,914	0	0	0	0	0	247,914	0
	Other	12,090	0	0	0	0	0	12,090	0
	Total	4,766,385	0	602,553	0	755,204	2,673,862	734,766	305,123
SCE	Lighting	6,348,790	487,107	0	981,612	108,463	3,484,661	1,286,947	0
	Cooling	2,469,635	419,860	0	4,003	0	754,698	1,291,075	0
	Process	2,297,429	0	0	0	0	0	2,297,429	0
	Other	0	0	0	0	0	0	0	0
	Total	11,115,854	906,967	0	985,615	108,463	4,239,359	4,875,450	0
SCG	Lighting	2,472,956	23,300	122,903	1,198,001	198,781	226,387	703,584	0
	Cooling	965,958	144,670	0	401,915	362,788	56,585	0	0
	Process	312,178	0	0	0	0	0	312,178	0
	Other	0	0	0	0	0	0	0	0
	Total	3,751,092	167,970	122,903	1,599,915	561,569	282,972	1,015,763	0
SDG&E	Lighting	2,953,602	382,987	0	1,238,915	58,676	1,273,023	0	0
	Cooling	122,676	0	36,214	0	38,494	47,968	0	0
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	3,076,278	382,987	36,214	1,238,915	97,170	1,320,991	0	0
Statewide	Lighting	15,169,740	893,394	536,388	3,418,528	1,013,037	6,942,598	2,365,794	191,048
	Cooling	4,670,260	564,530	225,282	405,918	509,369	1,574,585	1,390,575	114,076
	Process	2,857,520	0	0	0	0	0	2,857,520	0
	Other	12,090	0	0	0	0	0	12,090	0
	Total	22,709,609	1,457,925	761,670	3,824,446	1,522,406	8,517,184	6,625,979	305,123

Table 5-12 below shows the net per-unit kWh impacts for the on-site audit delivery channel, and the Local Program. From a per-unit perspective, the Medium/Large segment of the NRA program produces about four times the net impact of the Very Small/Small segment. The Local Program per-unit results are quite small due to the fact that the vast majority of efficient measures installed by these participants were rebated[42]. Further, those measures adopted by Local Program participants, but not associated with a rebate, have a very high free ridership rate. The stark difference between rebated and non-rebated impacts and free

[41] To better understand this result, refer to Section 5.5, The Cross Program Attribution and Net Impact Assessment. Here the reader will find that Local Program generated significant gross and net impact, but the vast majority of these impacts were achieved through rebated measures, excluded from the program impact accomplishments presented here.

[42] An additional per-unit net impact of 5,332 MWh is associated with Local Program participation, but excluded from program impact calculations due to rebate status.

ridership rates for Local Program participants indicates a strong relationship between this program and the PG&E incentive programs. This finding is supported by the cross program tracking system assessment which identified 31 percent of participants purchase a measure through the Express Efficiency program within the first two years following Local Program participation.

Table 5-12: Per-Unit Net kWh Impacts for NRA On-Site and Local Program Audits

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	221.6	371.4	119.5	1,323.8	329.4
	Cooling	80.9	80.4	29.9	49.9	74.7
	Total	**302.5**	**451.8**	**149.4**	**1,373.7**	**404.1**
Medium/ Large	Lighting	482.5	424.0	1,420.5	0.0	515.6
	Cooling	127.9	425.4	0.0	0.0	303.1
	Process	318.8	757.0	630.3	0.0	622.8
	Other	15.5	0.0	0.0	0.0	2.6
	Total	**944.7**	**1,606.4**	**2,050.7**	**0.0**	**1,444.1**
Medium						**778.6**
Large						**4,134.4**
Local Program		**389.7**	N/A	N/A	N/A	**389.7**

Table 5-13 below shows the per-unit net kWh impacts associated with measures self-reported to have been rebated. These impacts are shown purely for illustration; it is recommended that they are not counted towards program impact accomplishments because they are already being counted in rebate program impacts and accomplishments. However, net-to-gross studies for those rebate programs may not specifically address the NRA program contribution, leaving program attributable impacts uncounted from a statewide perspective. This is an area for potential refinement in future Evaluation cycles, as discussed in Chapter 1, Key Recommendations.

In the Medium/Large segment, the NRA on-site result is more than 6 times the per-unit result from non-rebated measures. The Local Program result is also quite extreme, with rebated per-unit impacts about 17 times as high as non-rebated per-unit impacts.

Table 5-13: Per-Unit Net kWh Impacts for NRA On-Site and Local Program Audits Associated with Measures Self-Reported to Have Been Rebated[43]

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	82.1	68.8	17.9	42.5	68.6
	Cooling	19.3	3.5	0.0	0.0	9.7
	Total	**101.4**	**72.4**	**17.9**	**42.5**	**78.3**
Medium/ Large	Lighting	1,094.2	6,264.0	7,386.5	0.0	5,126.1
	Cooling	0.0	1,021.5	407.1	0.0	719.6
	Process	0.0	0.0	0.0	0.0	0.0
	Other	0.0	6,995.7	0.0	0.0	4,627.3
	Total	**1,094.2**	**14,281.2**	**7,793.6**	**0.0**	**10,472.9**
Local Program		**6,809.5**	N/A	N/A	N/A	**6,809.5**

Table 5-14 below presents the per-unit kWh net impact achieved by remote audit delivery channels. On a per unit basis, the channels are similar, with the exception of CD-ROM. However, the lower performance of CD-ROM audits relates more to the correction factor for non-installation than to the behavior following the completion of a CD-ROM audit.

Table 5-14: Per-Unit Net kWh Impacts for Remote Audits

Customer Size	End Use	Remote Audits				
		On-Line	CD-ROM	Mail	Phone	Statewide Average
All	Lighting	261.5	64.0	229.5	113.9	164.7
	Cooling	165.2	26.9	27.3	57.3	47.9
Total		**426.7**	**90.9**	**256.8**	**171.2**	**212.7**

Table 5-15 below presents statewide NRA and Local Program net summer peak demand (kW) impacts. About 40 percent of net demand impacts arise from cooling measures. Mail audits contribute a relatively large share of total kW impacts, at 23 percent. On-site audits in SCE service territory are also substantial contributors to the total.

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[43] These net impacts are not directly attributable to the NRA program and Local Program. They are shown for illustrative purposes only.

Table 5-15: Net kW Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism					Medium/Large On-Site	Local Program
			On-Line	CD-ROM	Mail	Phone	On-Site		
PG&E	Lighting	1,469	0	227	0	353	764	126	64
	Cooling	1,296	0	208	0	169	791	127	17
	Process	36	0	0	0	0	0	36	0
	Other	53	0	0	0	0	49	4	0
	Total	2,854	0	435	0	522	1,604	293	81
SCE	Lighting	2,682	216	0	544	49	1,136	737	0
	Cooling	1,631	454	0	4	0	595	578	0
	Process	233	0	0	0	0	0	233	0
	Other	0	0	0	0	0	0	0	0
	Total	4,546	670	0	548	49	1,731	1,548	0
SCG	Lighting	801	14	57	550	81	92	8	0
	Cooling	966	170	0	421	318	57	0	0
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	1,767	184	57	970	399	149	8	0
SDG&E	Lighting	1,058	144	0	316	22	575	0	0
	Cooling	113	0	33	0	33	47	0	0
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	1,171	144	33	316	56	622	0	0
Statewide	Lighting	6,009	373	284	1,410	505	2,567	871	64
	Cooling	4,007	624	241	425	520	1,491	706	17
	Process	269	0	0	0	0	0	269	0
	Other	54	0	0	0	0	49	4	0
	Total	10,338	997	525	1,835	1,025	4,107	1,849	81

Table 5-16 below presents the per-unit net kW impacts for NRA on-site and Local Program audits. The Table shows that the on-site audits delivered to the medium and large customer segments generally outperform remote audits and on-sites delivered to small and very small customers. The Local Program, at 0.1 kW per-unit, has lower performance due to the exclusion of rebated adoptions, which are the vast majority of adoptions undertaken by these participants.

Table 5-16: Per-Unit Net kW impacts for NRA On-Site and Local Program Audits

Customer Size	End Use	On-Site Audits PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	0.1	0.1	0.0	0.6	0.1
	Cooling	0.1	0.1	0.0	0.0	0.1
	Total	**0.2**	**0.2**	**0.1**	**0.6**	**0.2**
Medium/ Large	Lighting	0.2	0.2	0.0	0.0	0.2
	Cooling	0.2	0.2	0.0	0.0	0.2
	Process	0.0	0.1	0.0	0.0	0.1
	Other	0.0	0.0	0.0	0.0	0.0
	Total	**0.4**	**0.5**	**0.0**	**0.0**	**0.4**
Medium						**0.2**
Large						**0.9**
Local Program		**0.1**	N/A	N/A	N/A	**0.1**

Table 5-17 below presents the per-unit net impacts for NRA remote audit delivery channels. The Table shows modest kW impacts statewide, with an average of 0.1 kW per unit. Delivery channel comparisons reveal higher than average net impact through the online audits, at 0.3 kW each.

Table 5-17: Per-Unit Net kW Impacts for Remote Audits

End Use	Remote Audits On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	0.1	0.0	0.1	0.1	0.1
Cooling	0.2	0.0	0.0	0.1	0.1
Total	**0.3**	**0.1**	**0.1**	**0.1**	**0.1**

Table 5-18 below summarizes total net therm impacts associated with the 2004/2005 NRA and Local Programs. The Table shows that over half the NRA impacts originate in PG&E's service territory where phone audits are estimated to have generated nearly 1.3 million therms.

Table 5-18: Net Therm Impacts

Utility	End Use	Total NRA	Very Small/Small Audit Delivery Mechanism: On-Line	CD-ROM	Mail	Phone	On-Site	Medium/Large On-Site	Local Program
PG&E	Lighting	-414	0	-92	0	-27	-264	-31	-17
	Cooling	1,252	0	0	0	1,252	0	0	1,585
	Gas	1,299,827	0	153,112	0	748,281	390,298	8,136	9,324
	Process	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0
	Total	1,300,664	0	153,020	0	749,506	390,034	8,104	10,892
SCE	Lighting	-645	-209	0	-29	-21	-333	-53	0
	Cooling	0	0	0	0	0	0	0	0
	Gas	2,432,645	0	0	12,264	0	89,212	2,331,169	0
	Process	606	0	0	0	0	0	606	0
	Other	0	0	0	0	0	0	0	0
	Total	2,432,605	-209	0	12,234	-21	88,879	2,331,722	0
SCG	Lighting	-298	-1	-47	-190	-51	-9	0	0
	Cooling	0	0	0	0	0	0	0	0
	Gas	593,854	12,015	0	369,253	4,931	207,655	0	0
	Process	43	0	0	0	0	0	43	0
	Other	0	0	0	0	0	0	0	0
	Total	593,600	12,015	-47	369,063	4,880	207,646	43	0
SDG&E	Lighting	-352	-31	0	0	-5	-317	0	0
	Cooling	0	0	0	0	0	0	0	0
	Gas	223,517	20,385	113,465	0	0	89,668	0	0
	Process	45,893	0	0	0	0	0	45,893	0
	Other	0	0	0	0	0	0	0	0
	Total	269,058	20,354	113,465	0	-5	89,351	45,893	0
Statewide	Lighting	-1,710	-241	-139	-219	-103	-923	-85	-17
	Cooling	1,252	0	0	0	1,252	0	0	1,585
	Gas	4,549,843	32,400	266,576	381,516	753,212	776,833	2,339,304	9,324
	Process	46,542	0	0	0	0	0	46,542	0
	Other	0	0	0	0	0	0	0	0
	Total	4,595,927	32,159	266,438	381,297	754,361	775,911	2,385,762	10,892

Table 5-19 below shows per-unit net therm impacts for on-site and Local Program audits. Overall, the NRA on-site audits produce an average per-unit net impact statewide of 27 therms per-unit for the small/very small company segment and 520 therms for the combined medium/large segment. Notable performers include the SCE medium/large on-site audits which produces net impacts of 770 therms per-unit, and statewide results for large company audits, at 907 therms per-unit. The Local Program is not associated with substantial therm impacts.

Table 5-19: Per-Unit Net Therm Impacts for NRA On-Site and Local Program Audits

Customer Size	End Use	On-Site Audits PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	0.0	0.0	0.0	-0.3	0.0
	Cooling	0.0	0.0	0.0	0.0	0.0
	Gas	44.2	9.5	109.6	93.2	36.9
	Total	**44.1**	**9.5**	**109.6**	**92.9**	**36.8**
Medium/ Large	Lighting	0.0	0.0	0.0	0.0	0.0
	Cooling	0.0	0.0	0.0	0.0	0.0
	Gas	10.5	768.1	0.0	0.0	509.8
	Process	0.0	0.2	0.1	163.7	10.1
	Other	0.0	0.0	0.0	0.0	0.0
	Total	**10.4**	**768.3**	**0.1**	**163.7**	**520.0**
Medium						**69.1**
Large						**906.8**
Local Program		**13.9**	N/A	N/A	N/A	**13.9**

SCG's program accomplishments as shown in Table 5-19 are not as successful was expected given the emphasis on therm-saving measures in this service territory's on-site audit reports. However, an examination of the net impacts that were excluded from these tables for having been rebated reveals significant accomplishments in SCG service territory for Medium/Large customers, with per-unit impacts of about 1,600 therms, a result that far outperforms other delivery channels and service territories. These per-unit rebated impacts are presented in Table 5-20. Again, the rebate feeder effect is explored in greater detail in the Section 5.3 Cross Program Assessment.

Table 5-20: Per-Unit Net Therm Impacts for NRA On-Site and Local Program Audits Self-Reported to have been Rebated[44]

Customer Size	End Use	On-Site Audits PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	0.0	0.0	0.0	0.0	0.0
	Cooling	1.2	0.0	0.0	0.0	0.5
	Gas	0.6	0.0	28.7	0.0	2.8
	Total	**1.8**	**0.0**	**28.7**	**0.0**	**3.3**
Medium/ Large	Lighting	-0.1	-1.1	-2.6	0.0	-1.0
	Cooling	0.0	0.0	0.0	0.0	0.0
	Gas	0.0	18.8	1,639.5	0.0	189.4
	Process	0.0	0.0	0.0	0.0	0.0
	Other	0.0	0.3	0.0	0.0	0.2
	Total	**-0.1**	**18.0**	**1,637.0**	**0.0**	**188.6**
Local Program		**-0.1**	N/A	N/A	N/A	**-0.1**

Table 5-21 below shows the per-unit net therm impacts associated with NRA program remote audit delivery channels. The phone audit within PG&E's service territory generated a large portion of total net therm impacts, and also produces a relatively high per-unit net therm impact result for this delivery channel.

Table 5-21: Per-Unit Net Therm Impacts for Remote Audits

End Use	Remote Audits On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	-0.1	0.0	0.0	0.0	0.0
Cooling	0.0	0.0	0.0	0.1	0.0
Gas	9.5	31.8	25.6	84.7	40.3
Total	**9.4**	**31.8**	**25.6**	**84.8**	**40.3**

5.2.1 Net-to-Gross Ratios

This section presents net-to-gross ratios by key program segment, and for the program overall. Recall that for this Evaluation, gross impacts are defined as the impacts associated with *all* non-rebated measure adoptions reported by program participants. The application of the net-to-gross ratio adjustment reduces these program gross impacts to reflect only those

[44] It is not recommended that these impacts be counted as accomplishments of the NRA or Local Program impacts.

impacts resulting from program activities. As is documented in detail in Section 5.3, Cross Program Assessment, net-to-gross ratios and NRA and Local Program accomplishments are generally greater for measures rebated through Express Efficiency, SPC and/or other incentive programs. Adoptions made through rebate programs are not part of NRA and Local Program net impacts, due to the potential for double counting. The way the Audit program is set up to function (as detailed in the Logic Model presented in Section 6.1) involves providing information and referrals to customers for accomplishing measure installations through incentive programs. Thus, by removing all rebated adoptions from the program impacts, we fail to report the mainstay activities and effects of the NRA and Local Program.

Table 5-22 presents net-to-gross ratios for equipment installed following participation in the on-site audit delivery of the NRA and Local Program. The ratios are generally somewhat higher within the small/very small company segment then the medium/large segment. The Local Program result is 12 percent, though an examination of the cross program total impact attribution results shows a much high net-to-gross ratio for the Local Program rebated measures.

Table 5-22: kWh Impact Net-to-Gross Ratios for On-Site Audits

Customer Size	End Use	On-Site Audits				
		PG&E	SCE	SCG	SDG&E	Statewide Average
Very Small/ Small	Lighting	62%	53%	27%	35%	49%
	Cooling	26%	21%	7%	27%	21%
	Total	**46%**	**41%**	**17%**	**35%**	**40%**
Medium/ Large	Lighting	37%	40%	30%	-	36%
	Cooling	33%	45%	0%	0%	31%
	Total	**36%**	**42%**	**19%**	**0%**	**34%**
Local Program		**12%**	N/A	N/A	N/A	**12%**

Table 5-23 shows the net-to-gross ratio results for NRA Program remote audit delivery channels. Overall, the remote audits have relatively comparable net-to-gross ratios in comparison with on-site delivery channel.

Table 5-23: kWh Impact Net-to-Gross Ratios for Remote Audits

End Use	Remote Audits				
	On-Line	CD-ROM	Mail	Phone	Statewide Average
Lighting	31%	27%	64%	48%	48%
Cooling	6%	42%	6%	27%	9%
Total	**11%**	**31%**	**32%**	**38%**	**24%**

Table 5-24 below shows the net-to-gross ratios estimated for therm saving measures. The highest net-to-gross ratio is found in the mail audit, where SCG mail audits provide impacts with relatively low free ridership.

Table 5-24: Therm Net-to-Gross Ratios

Program Segment	Net-to-Gross Ratio for Gas Measures
Very Small/Small On-Site	20%
Medium/Large On-Site	30%
Online	5%
CD-ROM	15%
Mail	33%
Phone	10%
All Remote Audits	13%
Local Program	6%

5.2.2 NRA and Local Program 20 Year Annual Net Savings Projections

The projected annual MWh, MW and Therms resulting from the 2004/2005 Statewide Nonresidential Audit program are shown in Table 5-25 for the years 2004 through 2023. These are the net program impacts above and beyond any contribution the NRA program had to rebated measure installations.

Table 5-25: Annual NRA Program Net Impacts, 2004 through 2023

Program IDs:	CPUC 1122-04, 1248-04, 1358-04, 1465-04				
Program Name:	2004/2005 Nonresidential Audit				
	Year	**Calendar Year**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	2,144	2.0	1,159,737
	2	2005	8,289	6.1	2,516,613
	3	2006	16,579	8.8	3,466,304
	4	2007	21,449	9.9	4,495,639
	5	2008	22,358	10.3	4,594,994
	6	2009	22,710	10.3	4,595,927
	7	2010	22,710	10.3	4,595,927
	8	2011	22,710	10.3	4,595,927
	9	2012	22,039	10.3	4,595,927
	10	2013	19,503	9.6	4,595,927
	11	2014	18,109	8.5	4,595,927
	12	2015	17,424	8.2	4,593,805
	13	2016	17,198	8.0	4,593,612
	14	2017	17,083	8.0	4,572,627
	15	2018	17,083	8.0	4,509,671
	16	2019	16,816	8.0	3,461,404
	17	2020	13,981	7.3	2,293,226
	18	2021	8,015	4.9	1,866,300
	19	2022	4,172	2.5	1,492,190
	20	2023	645	1.0	1,415,486
	TOTAL	**2004-2023**	311,015	152.5	72,607,171

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

Table 5-26 below shows the annual MWh, MW and Therm net impacts resulting from the 2004/2005 PG&E Local Program. These impacts are associated with *unrebated* measures, excluding any contributions this program may have made to the net impacts of rebated measure installations. Contributions to rebated measure installations are discussed in detail in Section 5.3 Cross Program Assessment.

Table 5-26: Annual PG&E Local Program Net Impacts, 2004 through 2023

Program Name:	2004/2005 PG&E Local Program				
	Year	**Calendar Year**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	1	0.0	0
	2	2005	72	0.0	-7
	3	2006	159	0.1	4,645
	4	2007	223	0.1	10,100
	5	2008	296	0.1	10,892
	6	2009	305	0.1	10,892
	7	2010	305	0.1	10,892
	8	2011	305	0.1	10,892
	9	2012	305	0.1	10,892
	10	2013	258	0.1	10,892
	11	2014	211	0.1	10,892
	12	2015	211	0.1	10,892
	13	2016	211	0.1	10,892
	14	2017	211	0.1	10,892
	15	2018	211	0.1	10,892
	16	2019	211	0.1	10,892
	17	2020	210	0.1	10,892
	18	2021	186	0.1	10,899
	19	2022	90	0.0	10,116
	20	2023	25	0.0	9,324
	TOTAL	**2004-2023**	4,007	1.2	186,674

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

5.3 Cross-Program Attribution and Net Impact Assessment

This section presents results of an investigation into the effects of the Audit Program on energy saving activities taking place through incentive programs. One of the primary functions of the Audit program is to act as a ‘feeder’ to the statewide incentive programs. The Audit Program energy impacts as presented in Sections 5.1 and 5.2 address measures adopted by participants *outside* the rebate programs. The impacts achieved through the incentive programs are already counted in the tabulating of incentive program impacts. Nonetheless, by examining the success of the Audit in gaining incentive program impacts, we allow the program’s success to be more closely tied to its most basic objectives—the adoption of energy efficient measures through rebate programs.

This section begins with an overview of self-report responses to questions addressing the relative importance of the rebate program and the audit program in motivating customers to purchase energy saving equipment. Next, self-report based attribution analysis results are presented. This analysis utilizes self-report data to allocate net impacts achieved by cross-program participants to the rebate and the audit programs. Finally, NRA program benefits from all sources, rebated and non-rebated, are estimated and the relative contribution from rebated and non-rebated sources are specified and compared.

5.3.1 Cross Program Survey Results

As discussed in Chapter 3, this Study included the completion of a 200 point cross-program survey with customers that had an Audit and then went on to purchase measures through the Statewide Express Efficiency or SPC incentive programs. One-hundred and fifty of these 200 customers are very small and small companies that participated in Express Efficiency. The remaining 50 customers are medium and large companies. Of these 50, 17 participated in SPC and the remaining 33 participated in Express Efficiency.

Figure 5-1 below illustrates cross program participant responses to the question, "Which Program was most influential in the decision to adopt <rebated measure>?" The Figure presents results weighted by ex-ante rebate program kWh impacts. A little over half of both the very small/small customers and the medium/large customer impacts are, in a sense, attributed to the rebate program. That is, customers indicated the rebate program was most important in their purchase decision. However, another 30 to 40 percent indicated that either the audit was more important, or that both programs were equally important. Clearly, the Audit plays an important role for many participants in the decision to install rebated measures.

Another interesting finding from the Figure below is that the Audit contribution appears to be more important in the medium and large customer segment than the very small and small segment.

Figure 5-1: Summary of Participant Response to Survey Query, "Which Program was Most Influential in the Decision to Adopt <Rebated Measure>?" kWh Impact Weighted

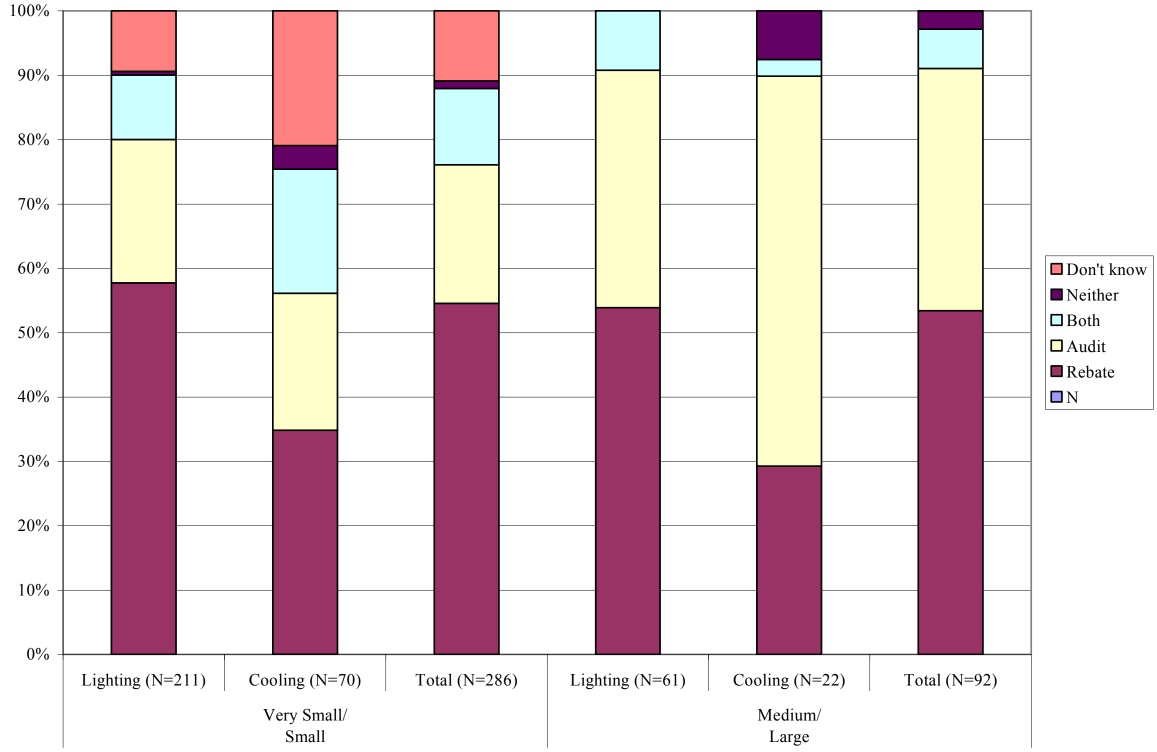
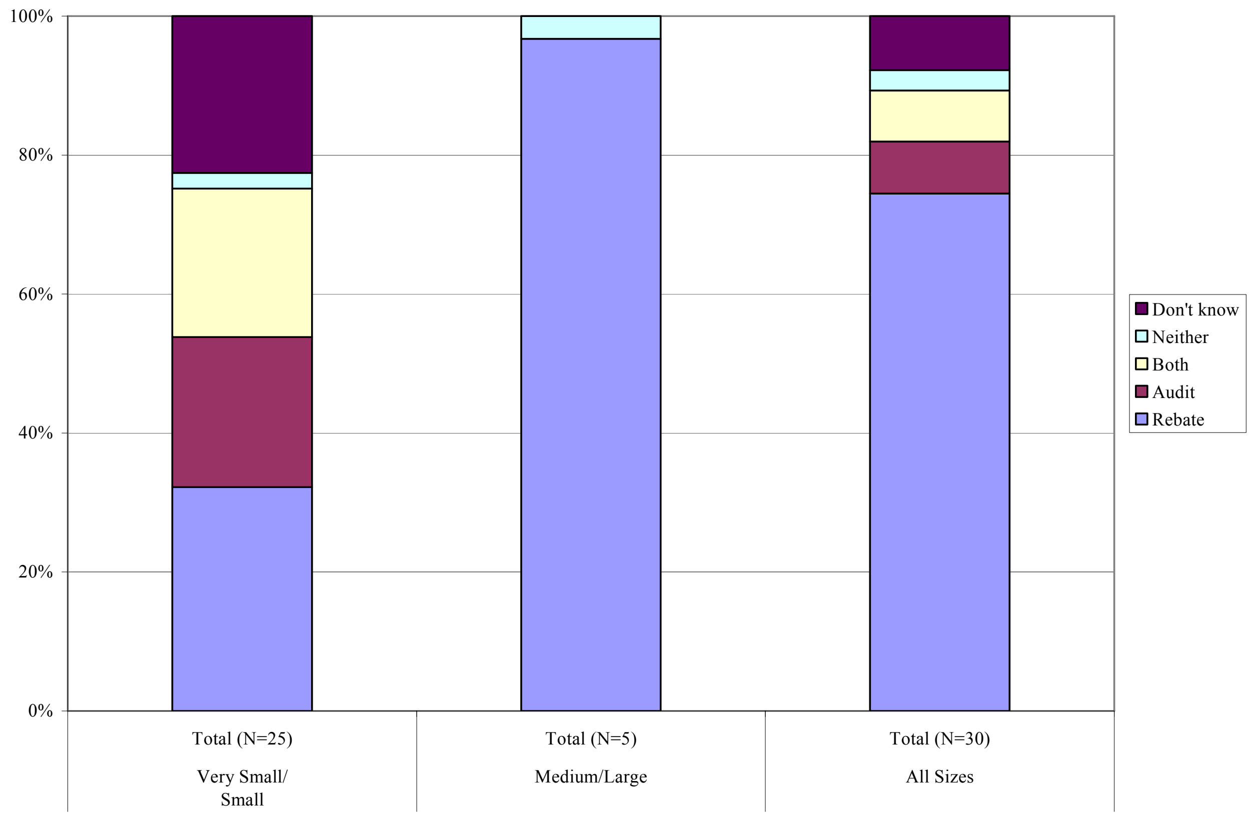


Figure 5-2 below is analogous to Figure 5-1, except that the response frequencies are calculated using ex-ante therm impact weights. The sample sizes become much smaller when focused on therm impacts. The Figure indicates that the role of the Audit is not as strong for therm saving measures as it is for kWh saving measures.

Figure 5-2: Summary of Participant Response to Survey Query, "Which Program was Most Influential in the Decision to Adopt <Rebated Measure>?" Therm Impact Weighted



Next, the analysis goes beyond simple survey response frequencies with the application of self-report-based algorithms designed to measure net impacts[45] and apportion them across the audit and rebate programs. As detailed in Section 3.2.4, the first step in the approach is to assign a net-to-gross[46] ratio that reflects the combined affects of both programs. Then the net impacts are divided over the rebate and audit programs depending on specific survey responses.

To derive the total net-to-gross ratios for cross-program measures, the following method is used. First, the self report algorithm, as described in detail in Section 3.2.4, is applied separately and analogously to each program. In this way two net-to-gross ratios are created,

[45] These are actually "net-of-free-ridership" impacts, not "net-impacts" because they do not take into account spillover, which is likely positive for the incentive programs.

[46] Again, this is a net-of-free-ridership ratio, because it does not account for incentive program spillover effects.

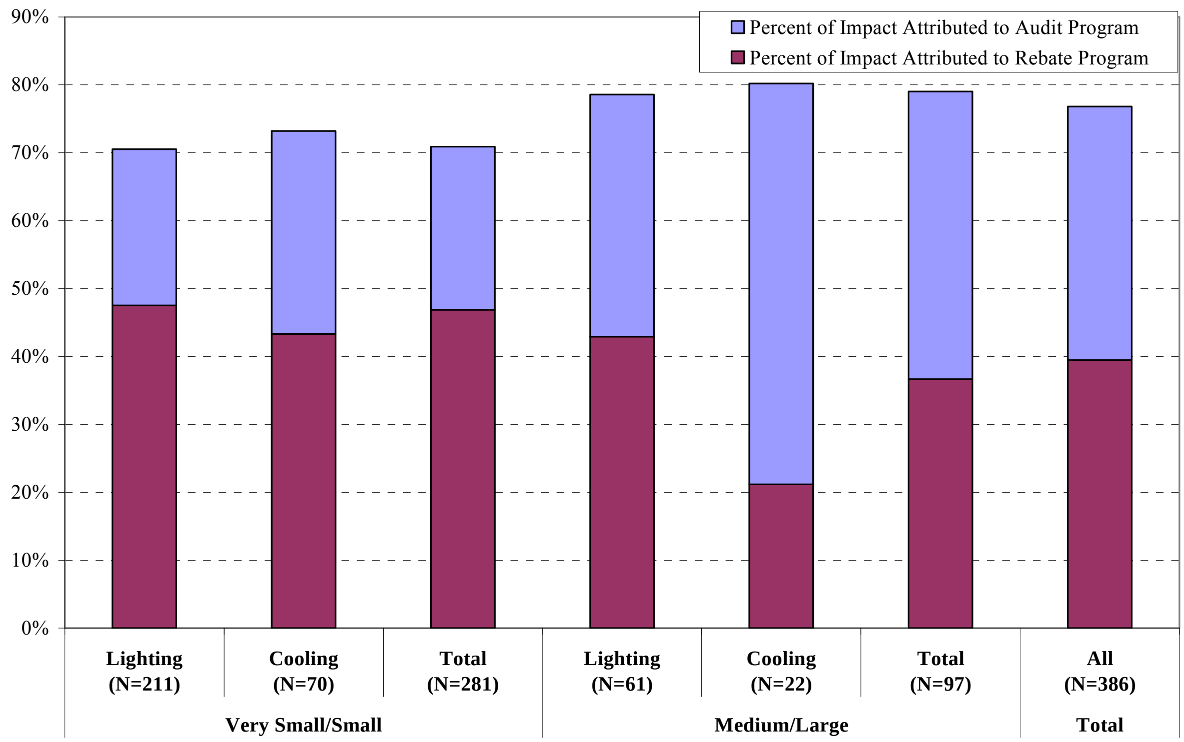
one for the audit program and one for the rebate program. The total net-to-gross ratio is taken as the *maximum* of the two ratios.

Next, the survey response to the question, "Which program was most important in the decision to purchase the <rebated measure>?" is used to allocate the net-to-gross ratio across the programs. If the respondent stated the rebate program was more important, the entire net impact is allocated to the rebate program. If the respondent stated the audit program was more important, the entire net impact is allocated to the audit program. If the respondent said "both were equally important" or they "don't know" which was more important than the net impacts are split. A response of "neither program was important" sets the net-impact to zero.

Figure 5-3 below presents the results of applying this method to our population of surveyed cross-program participants. The height of each bar represents the kWh weighted net-to-gross ratio of cross-program measures for the combined programs. Again, the measures included in these calculations are *rebated* through the Express Efficiency or SPC programs. The top section of the bar shows the portion of total net kWh impacts[47] attributed to the Audit program, and the lower section represents the portion attributed to the rebate program. The role of the Audit program in the decision to adopt rebated measures appears to be substantial, particularly among larger customers. Among medium and large customers, over half of net impacts are attributed to the audit program using the above-described technique.

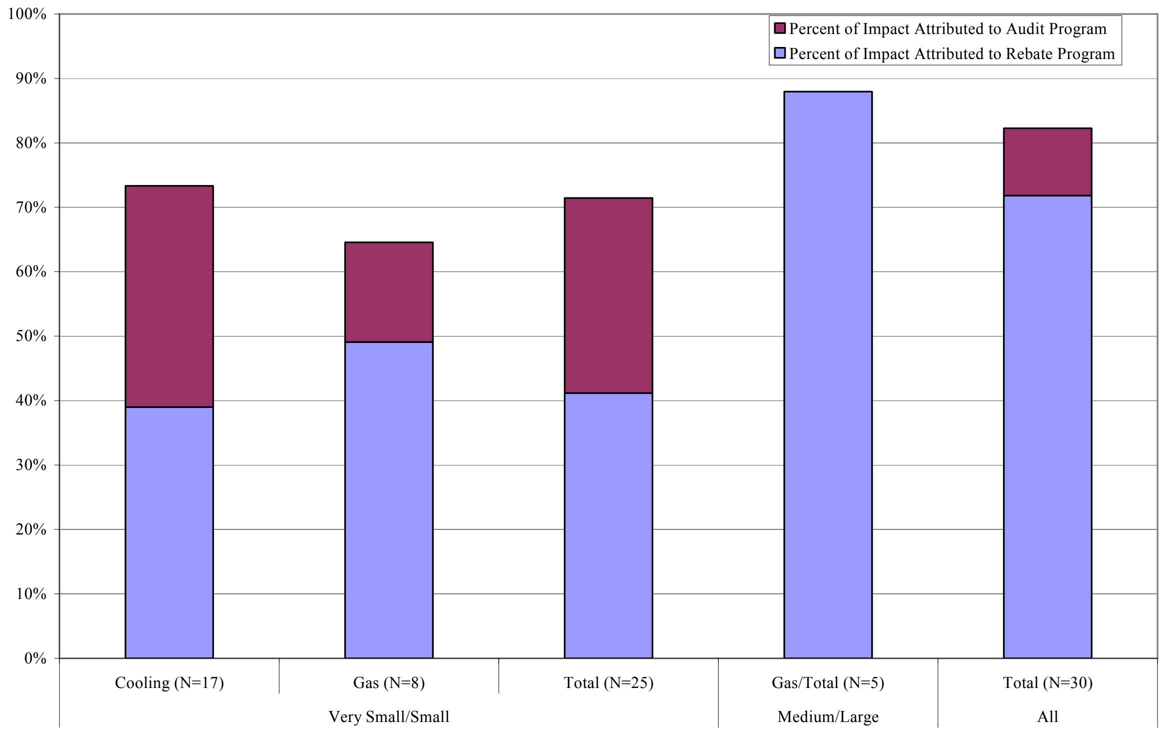
[47] The gross kWh impacts invoked here are unadjusted ex-ante gross program impacts, as found in the Express Efficiency or SPC tracking systems.

Figure 5-3: Self Report Based Attribution of Rebated Measure Impacts to the Audit Program and Rebate Programs by Customer Size and End Use, kWh Impacts



A similar exercise is completed using ex-ante therm impacts, and the results are presented below in Figure 5-4. Again, sample sizes are very small, particularly for medium and large customers. Overall, it appears that the contribution to the total net impact from the audit is smaller among therm saving measures than for kWh saving measures.

Figure 5-4: Self Report Based Attribution of Rebated Measure Impacts to the Audit Program and Rebate Programs by Customer Size and End Use, Therm Impacts



The Figure below shows the same self-report based attribution results presented above in Figure 5-4, except this time segmented by delivery mechanism and customer size. The results are dramatic, with nearly all of the Audit program net impacts originating from the on-site audit delivery mechanism. Unfortunately no cross-program participant sample was available for online audits, and the sample sizes for the phone and mail audits are fairly small. Thus, it is reasonable only to acknowledge there is some evidence that the cross program net impact is larger among the on-site audit recipients than remote audit recipients. Further, these net impacts are more substantial among medium and large companies receiving on-site audits than very small and small customers.

Figure 5-5: Self Report Based Attribution of Rebated Measure Impacts to the Audit Program and Rebate Programs by Delivery Mechanism and Size, kWh Impact Weighted[48]

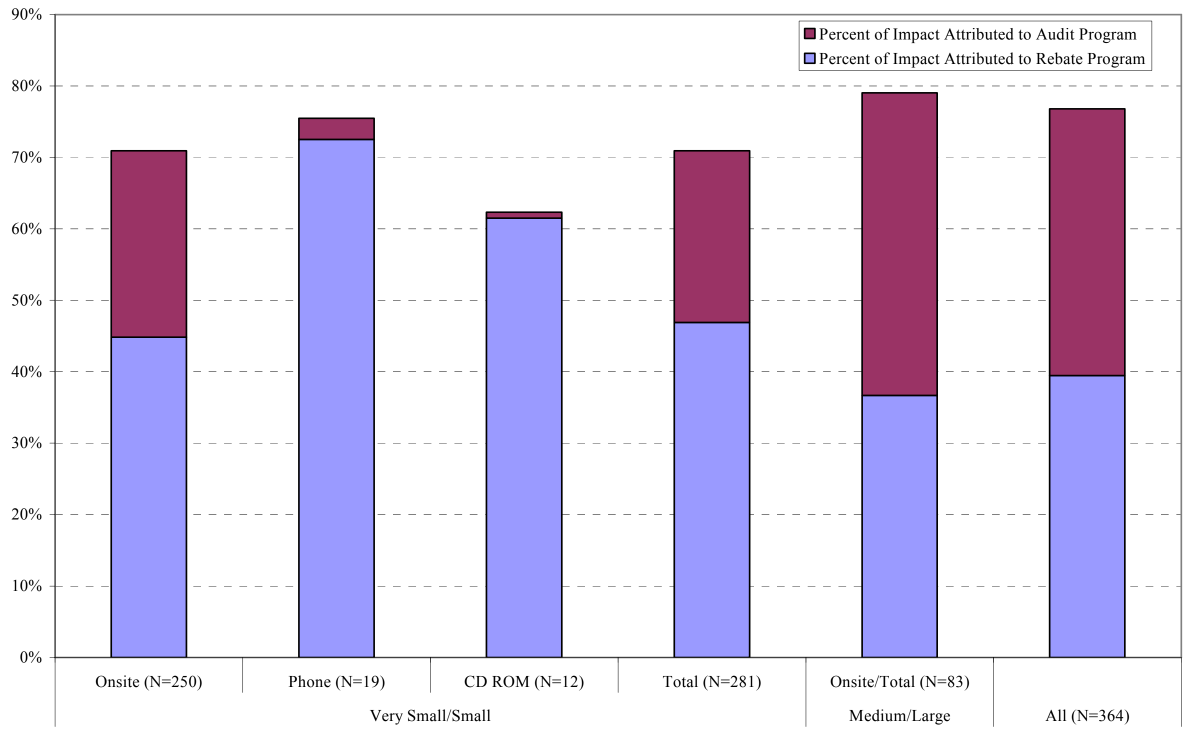


Figure 5-6 below shows the same self-report based cross-program net-to-gross attribution results segmented by IOU service territory and customer size. Given the bumpy distribution of sample, the conclusion reasonably drawn from this Figure is that all the IOUs are producing measurable value with their Audit programs which are realized through incentivized adoptions.

[48] A similar Figure is not presented for therm saving measures. The sample sizes are too small to garner additional meaning from altering the segmentation.

Figure 5-6: Self Report Based Attribution of Rebated Measure Impacts by IOU Service Territory and Size, kWh Impact Weighted

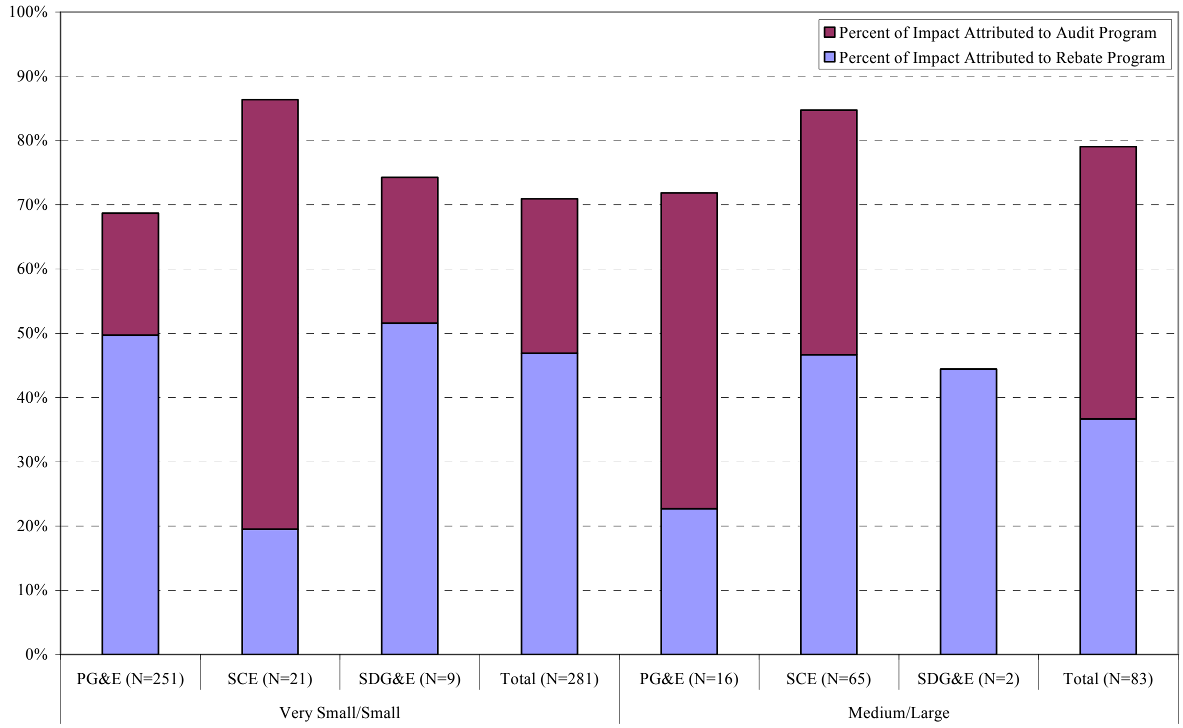
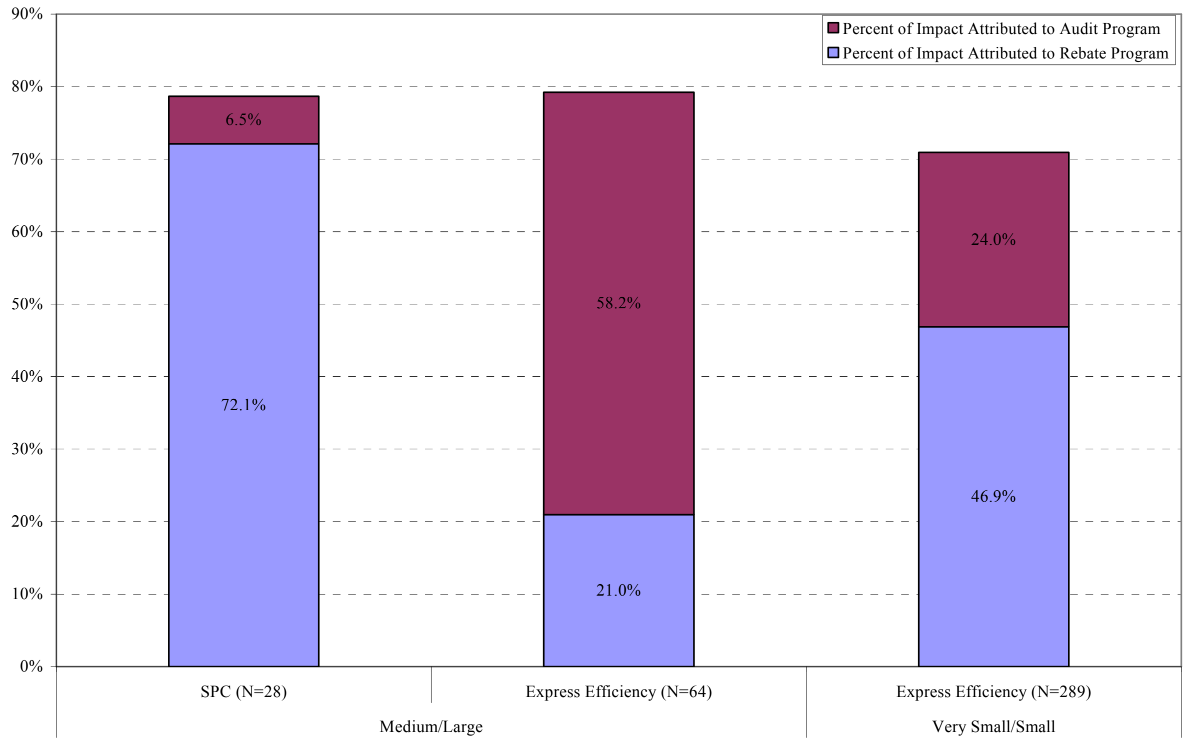


Figure 5-7 below shows the net-to-gross ratios and cross-program attribution results segmented by rebate program. The available sample of SPC measures spans just 17 customers, nonetheless the results are quite dramatic in indicating a closer relationship between the Audit program and Express Efficiency participation than the Audit program with SPC participation. Moreover, the Audit is a particularly strong force in gaining Express Efficiency participation among medium and large customers. It is also encouraging to note that the overall net-to-gross ratio for the SPC program and Express Efficiency programs are generally consistent with historical Evaluation findings.

Figure 5-7: Self Report Based Attribution of Rebated Measure Impacts to the Audit Program and Rebate Programs, by Rebate Program and Customer Size, kWh Impact Weighted



This concludes the self-report based cross-program attribution analysis results. Overall, this investigation of cross program participants yields some important findings. First, the Audit program has a much stronger effect on Express Efficiency measure adoptions than on SPC program adoptions. The Audit program effects are stronger among on-site Audit recipients than remote audit recipients. Similarly, the effects are greater among medium and large company on-site recipients than very small and small company on-site recipients. Finally, the Audit is more effective in gaining kWh saving adoptions than therm saving adoptions.

Specific estimates of the contribution to net impacts vary greatly by segmentation. A focus on the segment where the Audit has the greatest affect shows that three-fourths of net impacts are attributable to the Audit[49]. A focus on the segment where the audit has the least

[49] This segment includes medium and large companies that received on-site audits and completed kWh saving adoptions through the Express Efficiency program. The sample size associated with this segment is 64.

effect, shows a range of 0 to 5 percent[50]. Estimates of the Audit program contribution to net impacts for all measures, reveals that the Audit program contributes 49 percent of total net impacts for measures adopted by Audit program participants through the incentive programs.

5.3.2 Cross-Program Total Net Audit Program Impacts by Rebate Status

This section presents an examination of Audit program net-to-gross ratios across rebate program status. Estimates of the cross-program total net kWh impacts of the Audit program are presented by rebate status. There are three rebate status groups analyzed in this section. The first is nonrebated items. These include measures not known to be rebated, and are not self-reported by the respondent to have had a rebate. The second group includes customers and measures sampled as part of the cross-program survey. These customers were identified through merges of the Audit and rebate program databases. The rebated measures addressed in this group are associated with rebate program tracking systems (Express Efficiency and SPC) and have associated ex-ante program gross impacts. The final group includes measures adopted by customers that *self-report* the receipt of a rebate. These measures were *not* associated with a rebate program tracking system and have no ex-ante tracking system impacts associated with them. However, adjusted gross impact estimates were generated for these measures through this Audit program Evaluation.

It is important to keep in mind that the Audit cross-program total net impacts presented in this section are purely for illustrative purposes. The only impacts that are to be claimed by the NRA or Local Program include the non-rebated items as detailed in Sections 5.1 and 5.2.

Figure 5-8 below displays net-to-gross ratios for very small and small customers by end-use and rebate status. Based upon customers' self-reported behavior in the absence of the Audit program, the Audit appears to have a greater effect on the purchase of rebated measures than non-rebated measures. Net-to-gross ratios for the Express Efficiency rebated measures are stable and relatively high, ranging from the high 50's to mid-60s. The NTG ratios for measures with a self-reported rebated are less stable – though on average are higher than those of nonrebated measures (43 versus 30 percent). Many of the Audit reports intentionally emphasize rebate program measures, further increasing the probability that customers who are motivated by the audit will adopt the recommended measures through the recommended vehicle – the rebate program.

[50] These segments include SPC program measures and Express Efficiency measures adopted by remote audit recipients.

Figure 5-8: Very Small and Small Customer Comparison of Net-to-Gross Ratios by Measure Rebate Status, kWh Impact Weighted

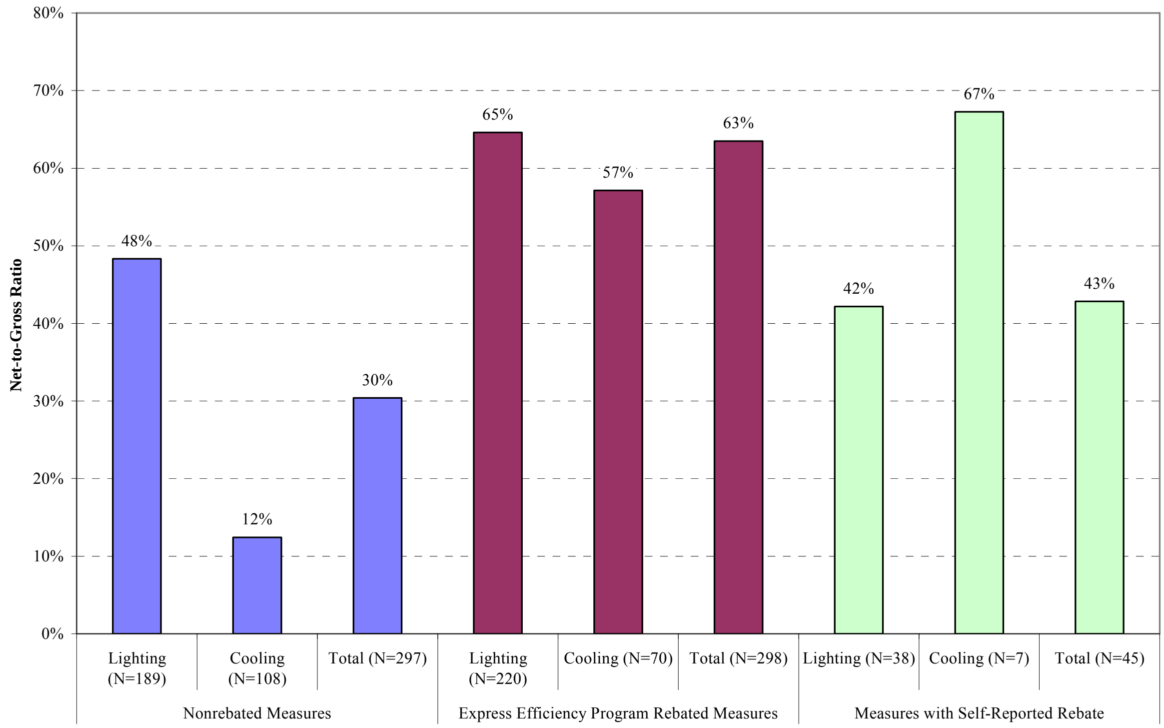


Figure 5-9 shows the relative magnitude of cross-program total net impacts originating from rebated and non-rebated sources in the small and very small company segment. The Figure shows that a significant portion of rebated impacts are attributable to the Audit program, and moreover, nearly half of the net impacts of the Audit program lie in the contribution to the adoption of rebated measures.

Figure 5-9: Very Small and Small Company Net Impact by Rebate Status

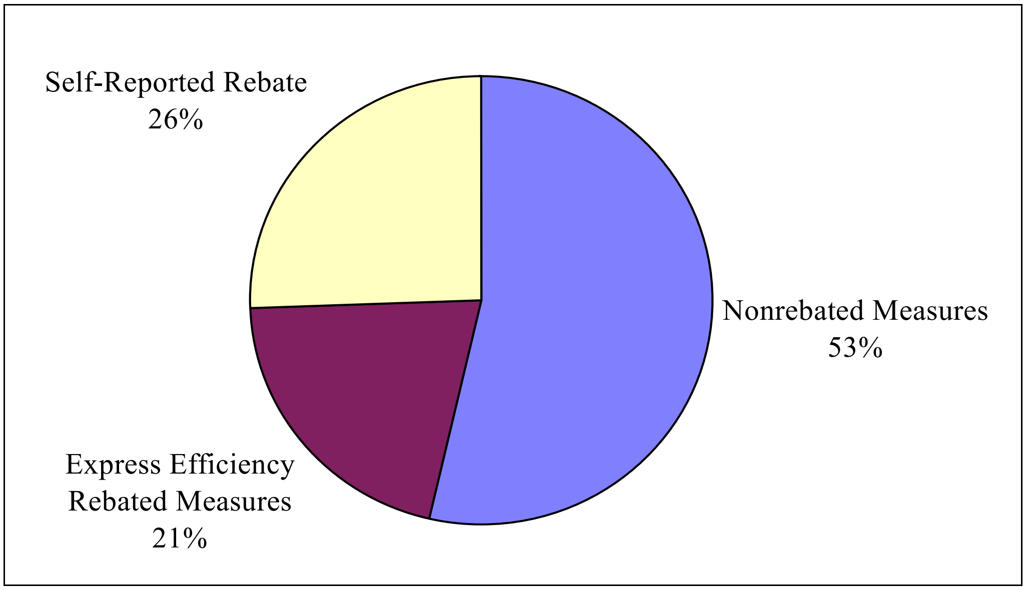


Figure 5-10 below shows the self-report based net-to-gross ratios for medium and large customers by end-use and rebate status. Again the net-to-gross ratios for cross-program measures are higher than for non-rebated measures.

Figure 5-10: Medium and Large Customer Comparison of Net-to-Gross Ratios by Measure Rebate Status, kWh Impact Weighted[51]

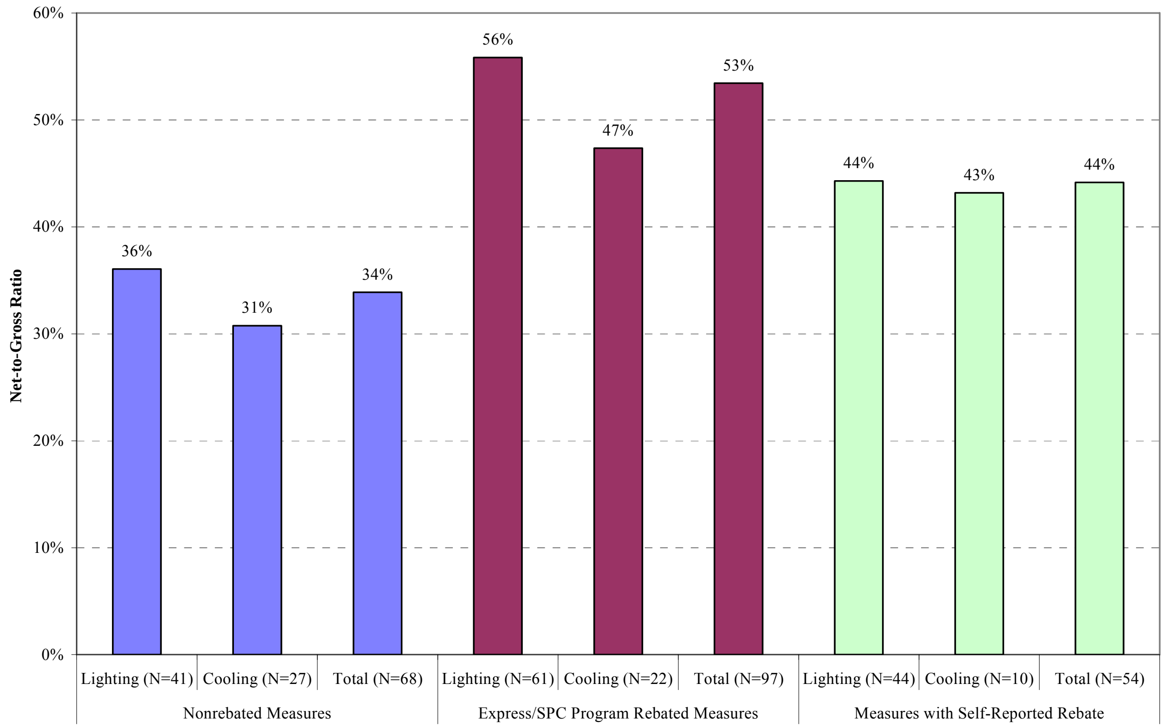


Figure 5-11 below displays the distribution of cross-program total net kWh impact by rebate status. The Figure shows that about 82 percent of the estimated impact comes from measures adopted through rebate programs. Particularly among medium and large customers where more dollars are generally at stake, it is unlikely that the informed customer would purchase a program qualifying measure and knowingly forego an available incentive. The Audit helps to ensure these customers are fully informed, thus purchases of program qualifying measures outside the rebate programs by Audit participants should be a relatively infrequent occurrence. This does appear to be the case, and is even more dramatically illustrated by the Local Program results shown next.

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[51] Net-to-gross estimates do not include "Process" and "Other" end-use items for self-reported rebate measures and non-rebated measures. While net impact estimates are available for these items, gross adjusted impact estimates are not. Gross impact estimates for the 'Process' and 'other' end-uses were constructed only for those measures where a positive net impact was expected.

Figure 5-11: Medium and Large Company Net Impact by Rebate Status

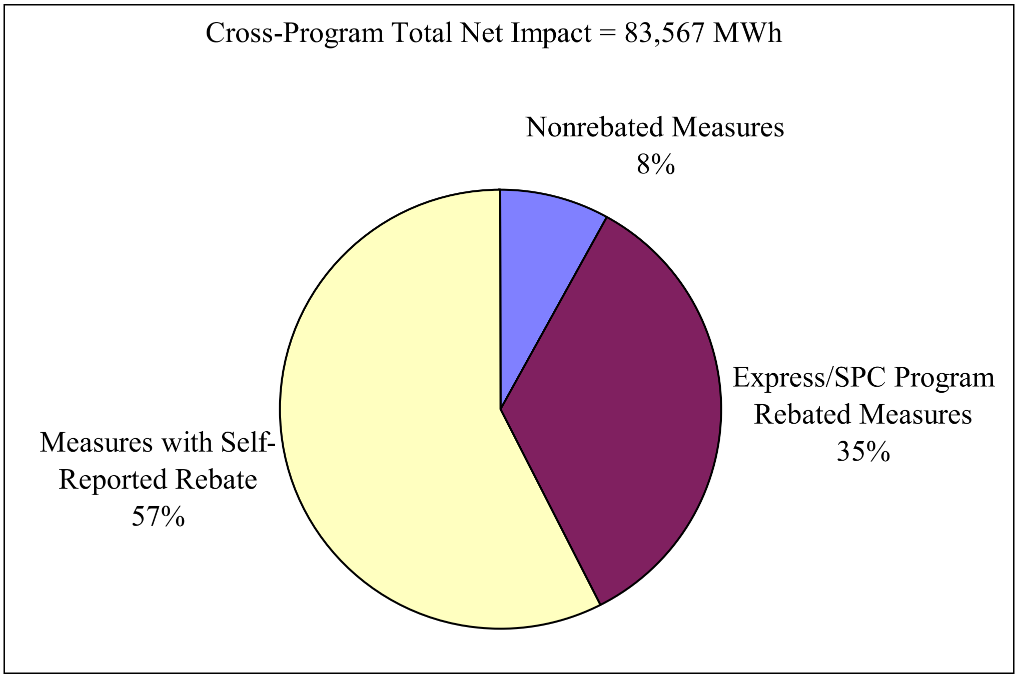
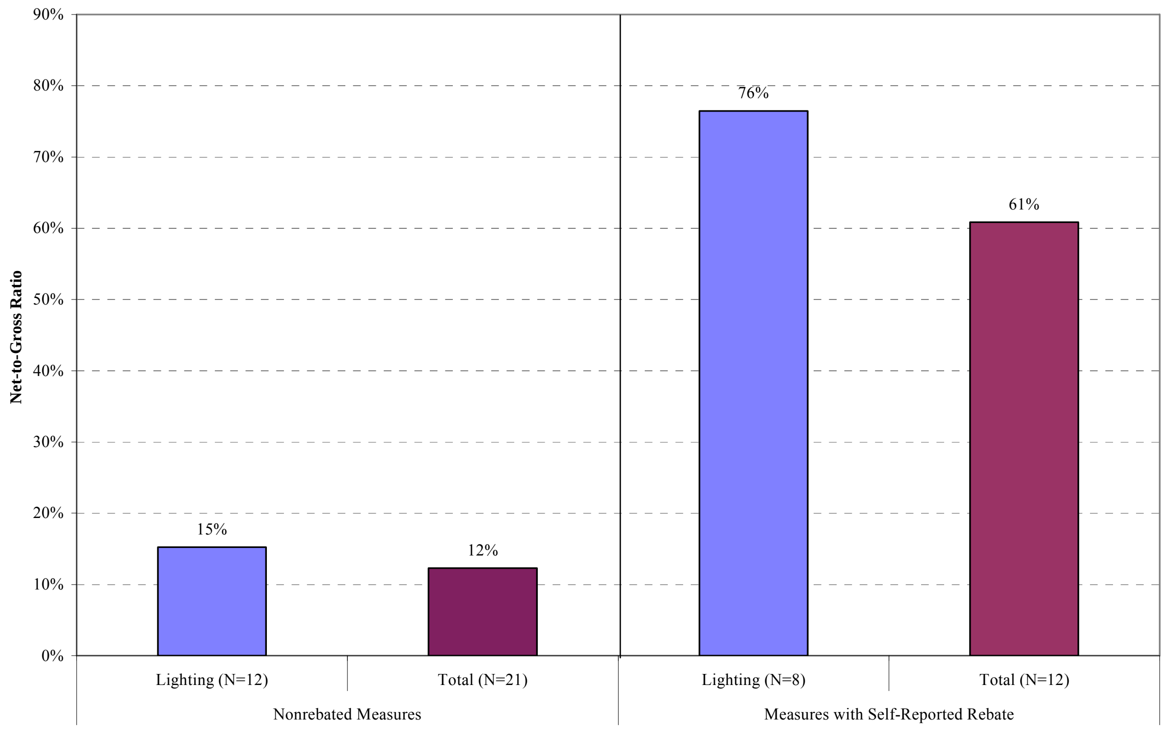


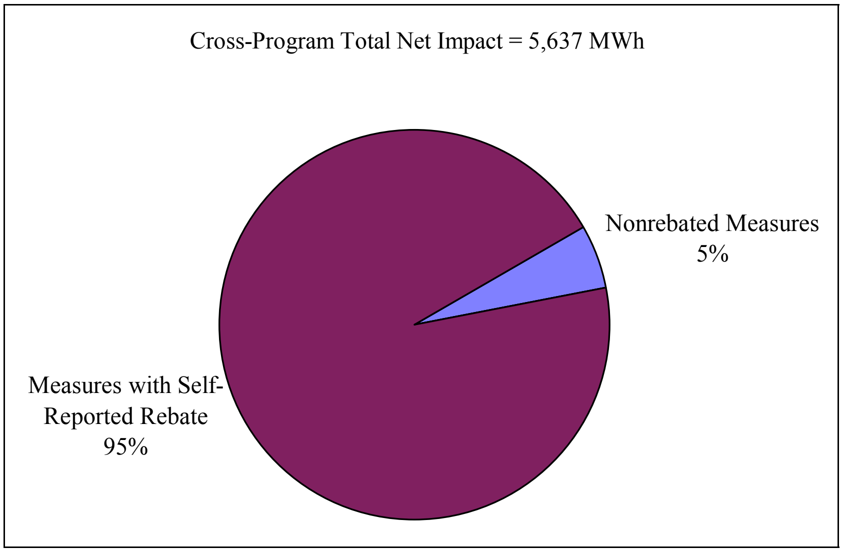
Figure 5-12 below shows net-to-gross ratios among Local Program participants for rebated and nonrebated measures. As demonstrated in the Cross Program Tracking System Assessment, the Local Program is particularly strong in its ability to successfully refer participants to other programs. Local Program customers that adopted rebated measures were much more likely to state that the program had a measurable role in that decision.

Figure 5-12: Local Program Customer Comparison of Net-to-Gross Ratios by Measure Rebate Status, kWh Impact Weighted



A pie chart of Local Program cross-program total net impacts is shown in Figure 5-13 below. As discussed previously, the cross program sample did not include Local Program participants, so there are only two categories of measures shown: non-rebated and self-reported rebate. The chart shows a very significant majority of the Local Program value comes through rebated actions, with 95 percent of the net program impacts self-reported to have been rebated.

Figure 5-13: Local Program Customer Net Impact by Rebate Status



This concludes the Investigations of Net Audit Program Impacts by Rebate Program Status. The most salient finding is that official reports of Audit program net impacts (those originating from non-rebated measures) do not begin to approach the true magnitude of the cross-program total Audit program net impacts. The Audit program seeks to inform customers not only of retrofit opportunities, but also of incentive programs available to lower first costs to the customer. The Audit program success in this regard is apparent in the figures above, and also by the generally lower free ridership ratios calculated for rebated measures. In summary, this section brings home the importance of cross-program evaluation in understanding the achievements of the Audit program and the true value of the program to the California portfolio of nonresidential programs.

5.3.3 Cross Program Implications of Statistical Choice Model Results

As discussed in Chapter 3, Section 3.2.5, discrete choice models are not selected to generate the final Audit program net-to-gross ratios. There was not enough data to produce a result for SPC, and for most of the technologies in the portfolio of participant measure installations. While the model was able to successfully quantify the combined NRA and Express Efficiency net-to-gross ratio, the ability to attribute portions of the total net-to-gross ratio to each program fall short. This is due primarily to the model's inability to quantify the contribution from the NRA program to customers' probability of becoming aware of Express. Thus, both the awareness of Express Efficiency and the Audit are modeled as acting simultaneously, and we lose the ability to attribute awareness of Express Efficiency to the Audit program.

The model results indicate that the effect on customer behavior of the two programs in combination is marginally larger than the effect of each program individually, but the results are not additive and do not yield separate, additive components of the predicted probability of purchasing high efficiency measures originating from Express and/or NRA participation. Figure 5-14 below compares the net-to-gross ratios for compact fluorescent lights adopted by Audit participants by cross program participation status. The Figure shows a gain in total net impacts when both programs are at play relative to only one.

Figure 5-14: Compact Fluorescent Lighting Discrete Choice Model Net-to-Gross Results by Cross Program Participation Status

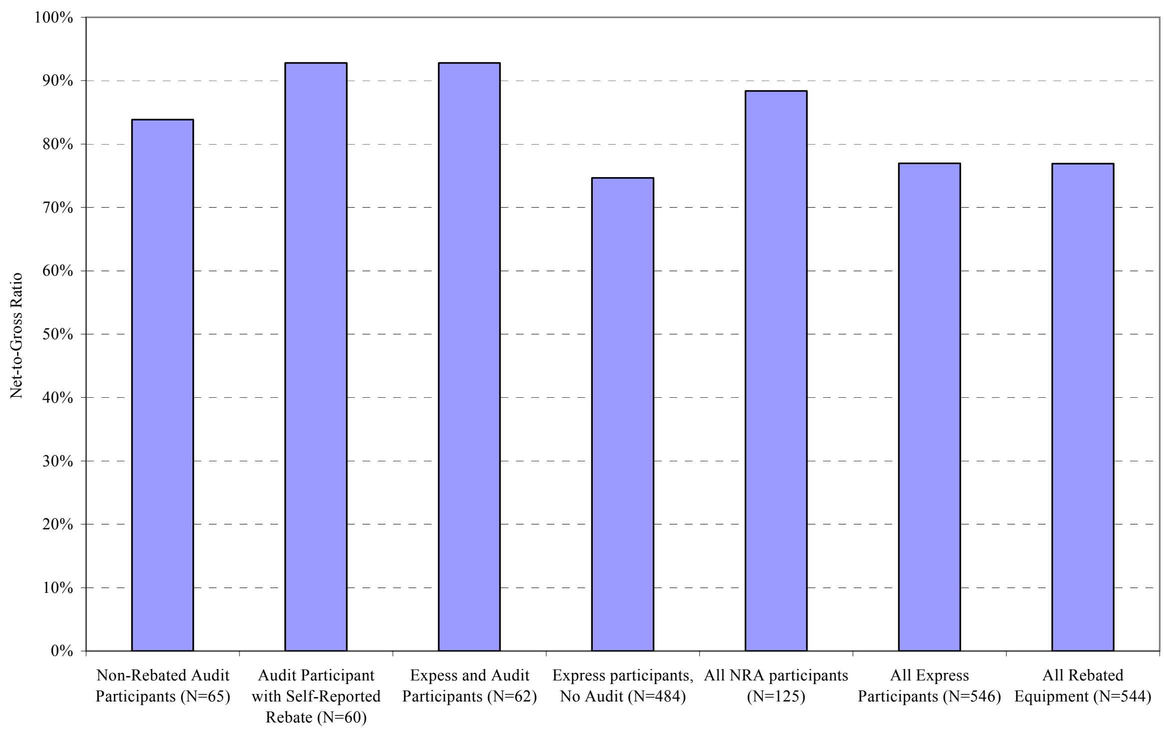
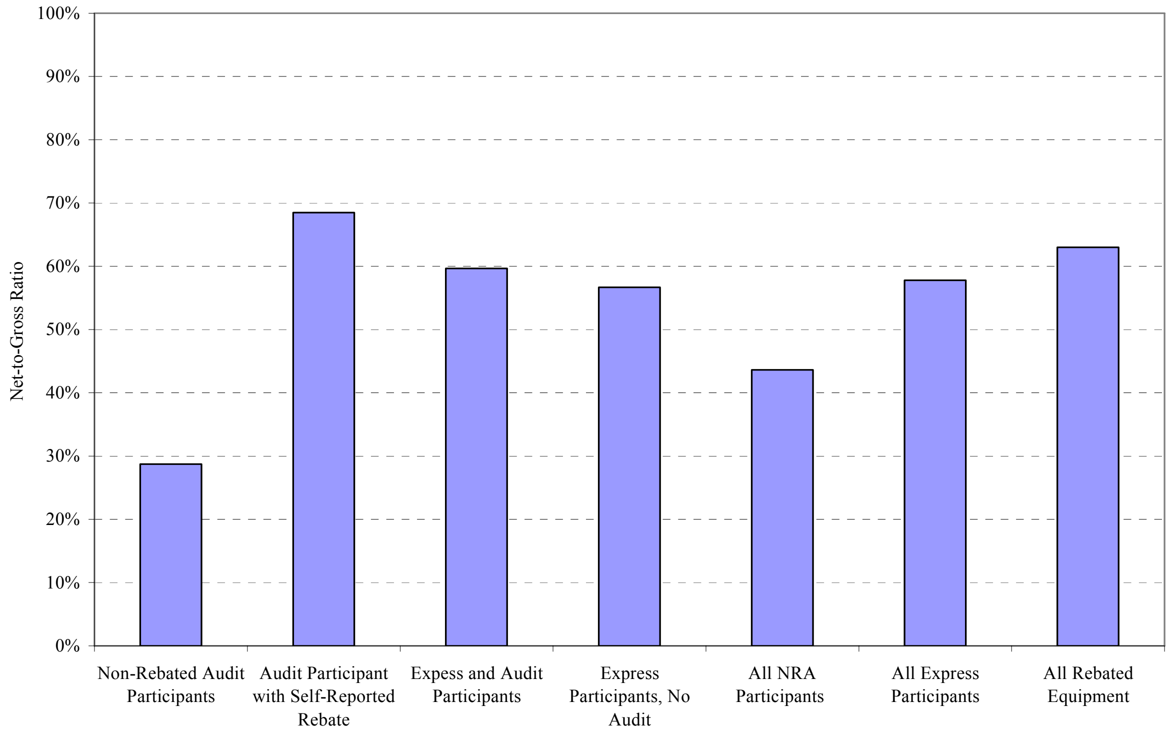


Figure 5-15 below shows the total net-to-gross ratios for customers purchasing split or packaged air conditioning equipment. The Figure again finds a bump in net-to-gross ratios for customers that have had both an Audit and participated in a rebate program.

Figure 5-15: Split/Packaged Air Conditioner Discrete Choice Net-to-Gross Results by Cross Program Rebate Status



5.4 Participant Measure Adoption Summary

This section summarizes self-reported measure adoptions for participant survey respondents and compares them with nonparticipants. All participant installations are reflected in this chapter, regardless of rebate status, though in some exhibits rebated items are presented separately. Measurements of installation frequency, installation size and efficiency are also shown where possible, to provide a more insightful characterization of NRA and Local Program effects. Adoptions for the lighting, cooling, gas appliance, industrial process, and “other” end-use categories are explored one at a time below. In addition, conservation practice adoptions are explored at the end of this section.

Lighting Measure Adoptions

This section discusses the adoption of lighting measures by Audit participants, and compares these adoptions to those of nonparticipants. Consistent with previous Evaluation findings, the lighting end use provides the strongest evidence of program impacts of the five end-use categories explored in this section. As demonstrated below, energy efficient lighting activity in the participant sample is consistently greater than is found among nonparticipants.

Figure 5-16 compares small and very small participant lighting adoption rates to those of the nonparticipant control group. Overall, participant adoptions outpace those of nonparticipants by a sizable margin (27 versus 19 percent). Participant adoption rates by delivery mechanism are varied, but all surpass those of nonparticipants. The on-site and CD ROM results are particularly strong. Mail, perhaps the least interactive of the mechanisms, elicits the lowest response.

Figure 5-16: Lighting Equipment Adoption Rates, Very Small and Small Customers, Participant versus Nonparticipant

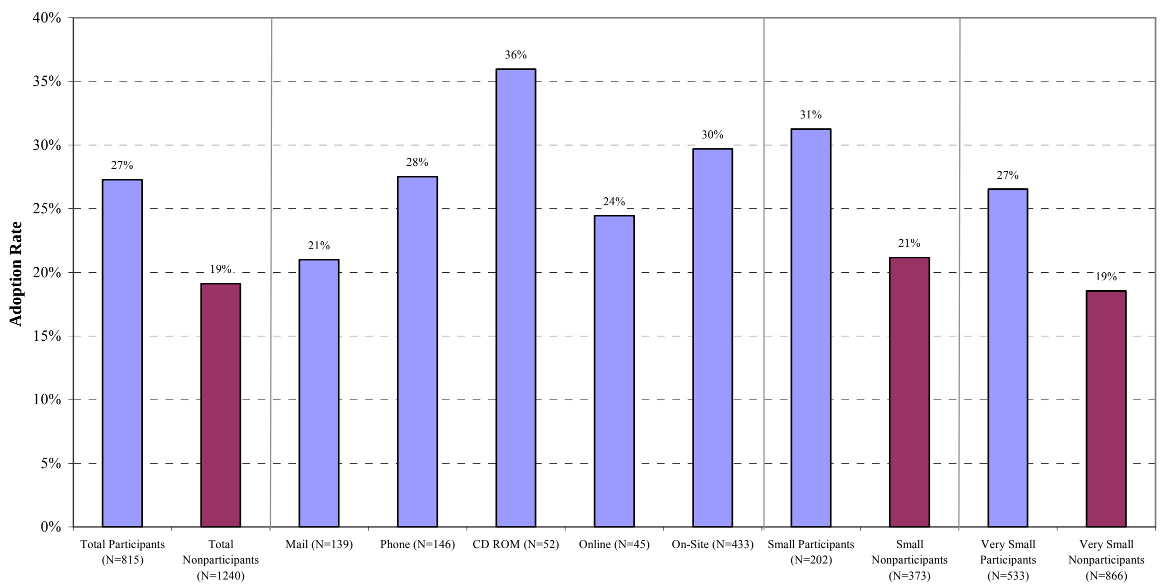
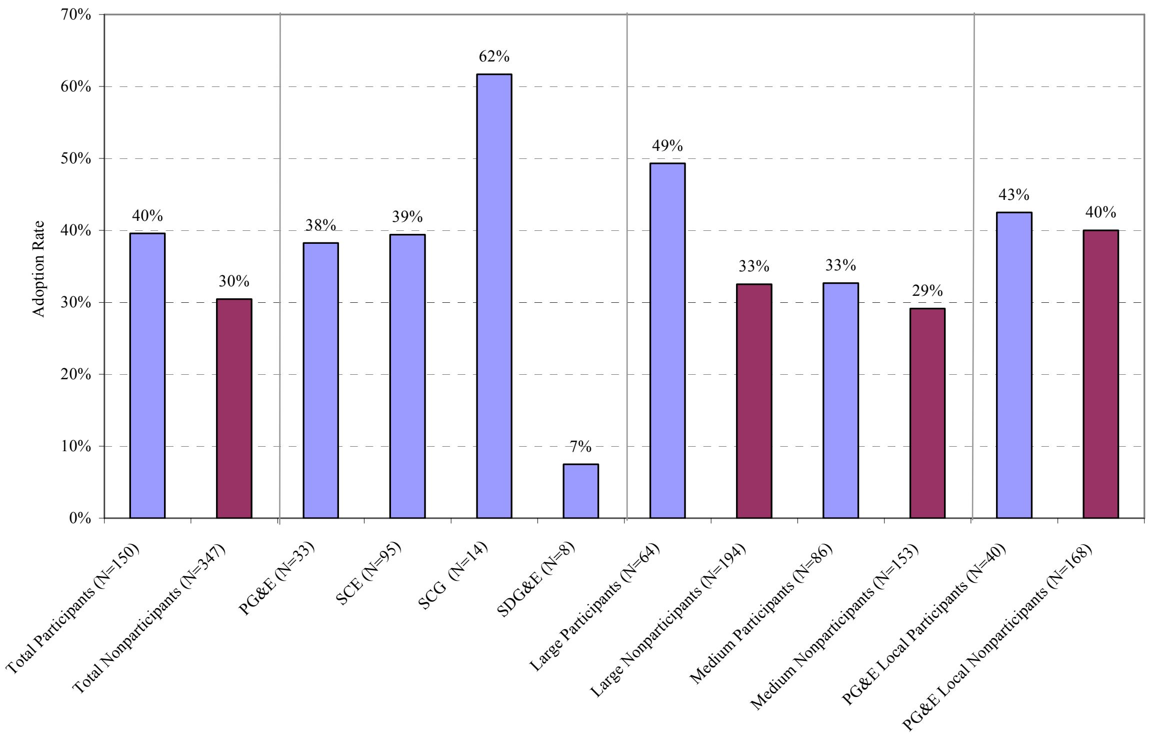


Figure 5-17 compares lighting adoption rates for Medium/Large participants and the Study's similarly sized nonparticipant control group. Although the Local Program participants have a higher overall adoption rate than Medium/Large NRA participants (43 versus 40 percent), Local Program participants outpace their corresponding nonparticipant control[52] group by only a small margin (also 43 versus 40). The large-sized customer segment demonstrates greater program impacts than medium.

Figure 5-17: Lighting Equipment Adoption Rates, Medium and Large Customers, Participant versus Nonparticipant



Next, the pattern of lighting technology adoptions is examined for both participants and nonparticipants. Figure 5-18 shows the Very Small/Small participant lighting technology adoption distribution and Figure 5-19 shows the corresponding nonparticipant adoption distribution. These figures reveal that not only are participants adopting lighting technologies more frequently, they are more likely to adopt high efficiency technologies than nonparticipants. Participants have a higher concentration of CFLs and lighting controls than nonparticipants (26 versus 15 percent). Nonparticipants have higher concentrations of standard efficiency technologies, such as magnetic ballasts, incandescents and T10/T12 linear fluorescents (6 versus 12 percent).

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[52] A customized nonparticipant group is used as a comparison group for the Local Program. These nonparticipants are constructed to be similar in size, service territory and NAICS code distribution to the Local Program participants.

A comparison of these findings to those of the PY 2003 Evaluation, we find that T8/T5 and CFLs remain the most common installations, but also that there has been an increase in the concentration of lighting controls (4 versus 10 percent). Participants have also scaled back on the relative proportion of CFL adoptions (29 versus 16 percent).

Figure 5-18: Participant Lighting Adoptions by Technology, Very Small and Small Customers

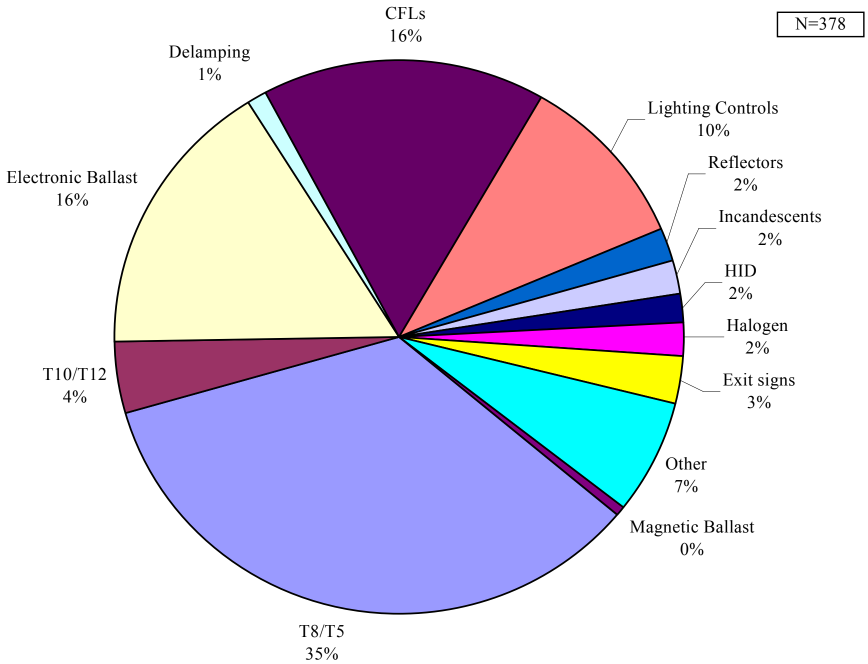
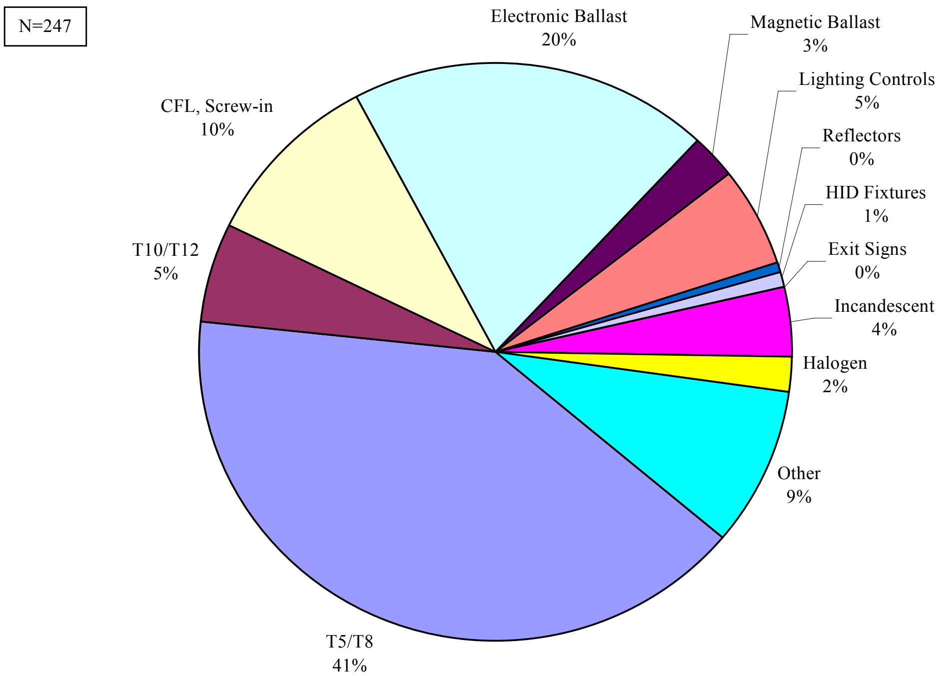


Figure 5-19: Nonparticipant Lighting Adoptions by Technology – Very Small and Small Customers



Next, we examine the pattern of lighting technologies adopted by Medium/Large customers. Figure 5-20 shows the Medium/Large large participant lighting technology distribution; Figure 5-21 shows the corresponding nonparticipant distribution. The story is similar to the Very Small/Small segment results discussed above. The participants have a higher concentration of CFLs and lighting controls than nonparticipants, (25 versus 14 percent). Nonparticipants also have higher concentrations of standard efficiency technologies, such as magnetic ballasts, incandescents and T10/T12 linear fluorescents (3 versus 9 percent).

Figure 5-20: Participant Lighting Adoptions by Technology – Medium and Large Customers

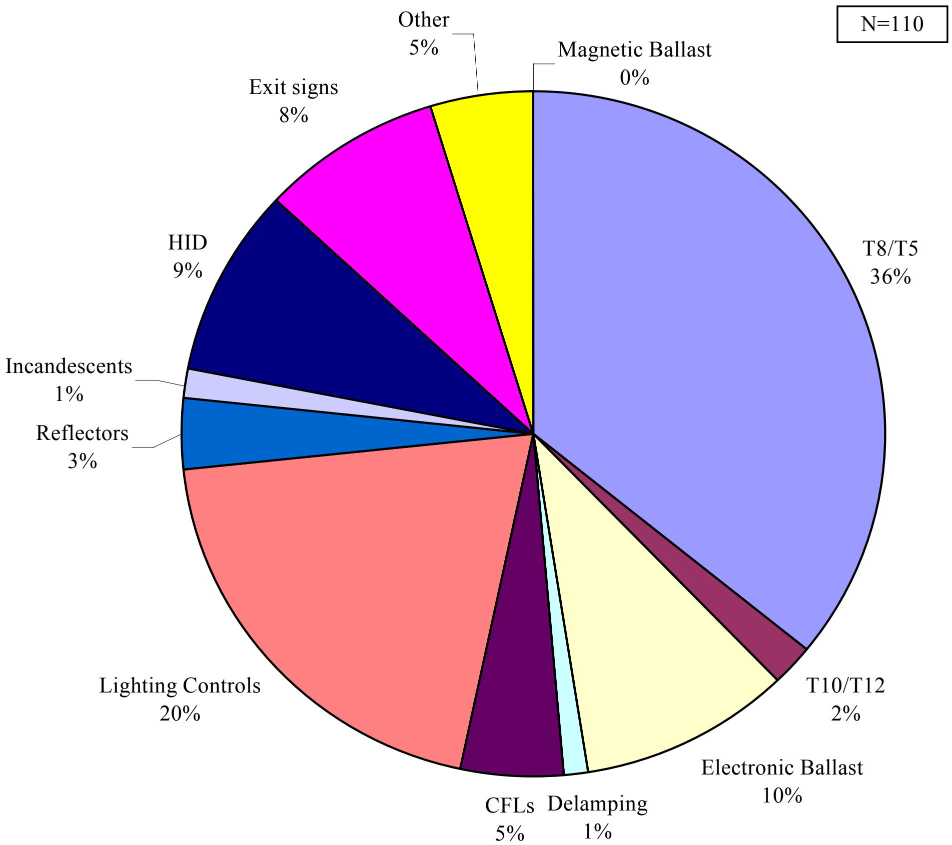
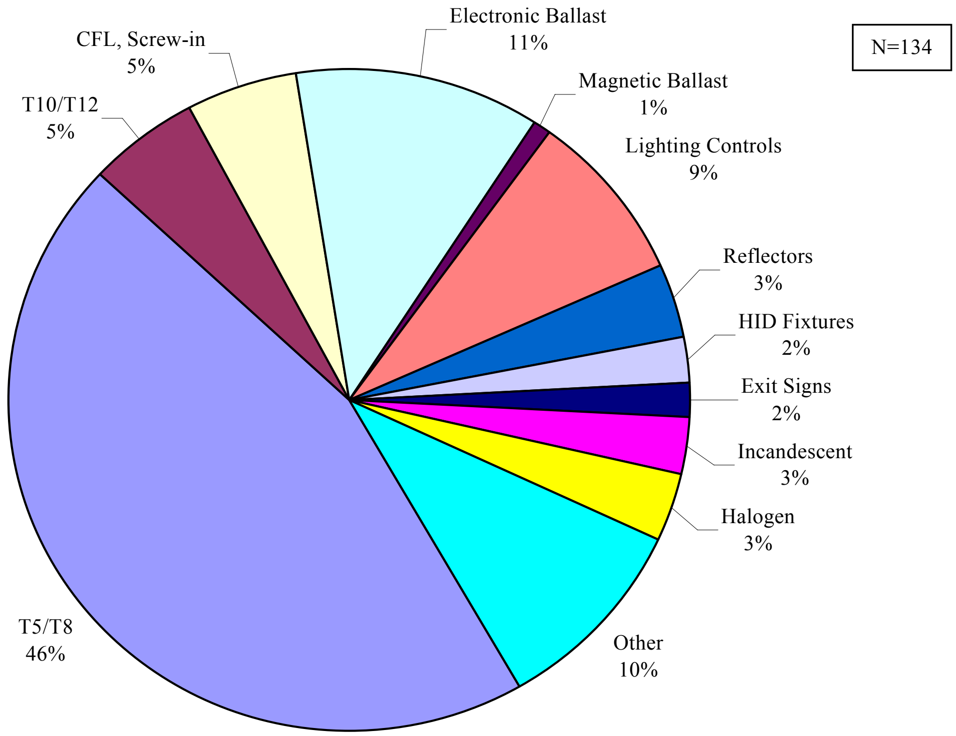


Figure 5-21: Nonparticipant Lighting Adoptions by Technology – Medium and Large Customers



Another essential characteristic of participant lighting impacts is the average size of lighting installations. Table 5-27 below shows the average size of installations made in the participant and nonparticipant samples for the most commonly installed technologies. The Table also goes a level deeper, comparing participant installations completed through the Express Efficiency program to those that were completed outside the Express program.

With the exception of electronic ballasts, participants are typically installing larger numbers of all the lighting technologies. However, when installations are normalized to the size of facilities by dividing installation size by the square feet of the facility, the participants' concentrations are not consistently higher than those of nonparticipants.

Table 5-27 shows that participant installations completed through the Express Efficiency program are typically larger than those completed outside of Express. Even when controlled for facility size, Audit program participant installations are consistently larger when they are completed through the Express Efficiency program. This finding is suggestive of a stronger affect on customer behavior when both programs are at play, relative to just the Audit program.

Table 5-27: Average Size of Lighting Installations – Very Small and Small Customers, Participants versus Nonparticipants

	Express Efficiency Participant Adoptions			Other Participant Adoptions			Participant Adoptions			Nonparticipant Adoptions		
Lighting Measure	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *
CFL	54	78	15.0	61	26	9.4	59	101	11.5	25	31	12.10
T8/T5	241	15	34.9	61	69	13.6	67	84	14.3	33	76	9.60
Electronic Ballast	110	4	32.0	39	40	8.8	40	44	9.2	148	56	70.10
Lighting Controls	22	20	3.0	9	18	1.5	11	39	1.7	6	16	2.60
LED Exit Lights	9	36	1.9	3	2	0.5	9	37	1.8	-	-	-
Reflectors	-	-	0.0	18	3	8.2	18	3	8.2	4	1	0.40
Delamping	66	8	12.8	-	-	0.0	66	8	12.8	16	1	10.70

*Average per square foot installation is the mean of the ratio of the number of items to facility square feet.

Table 5-28 below shows the average size of installations made in the Medium/Large participant and nonparticipant samples for the most frequently installed lighting technologies. The Table also shows the installation sizes for those participants that received rebates through the Express or SPC programs versus participant installations outside these programs.

Average installation sizes are larger among participants than nonparticipants for most measures. On a per square foot basis, participant and nonparticipant installations generally look similar.

Table 5-28 shows that participant installations completed through the incentive programs are consistently larger in size than those completed outside the incentive programs on a per-square foot basis. In the case of T8/T5–the measure with the highest numbers of adopters–the average installation size per square foot is 27 versus 21 for non-rebated installations. When installations are not normalized for facility size, nonrebated installations are smaller for all technologies except T8/T5.

Table 5-28: Average Size of Lighting Installations – Medium and Large Customers, Participants versus Nonparticipants

	SPC/Express Efficiency Participant Adoptions			Other Participant Adoptions			All Participant Adoptions			Nonparticipant Adoptions		
Lighting Measure	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Per 1,000 Sq Ft Install *
CFL	216	5.0	8.2	82	4	1.2	129	9	3.7	61	11	3.8
T8/T5	329	15.0	26.8	516	28	21.1	498	41	21.0	236	71	23.8
Electronic Ballast	-	-	-	153	7	3.1	153	7	3.1	121	23	13.4
Lighting Controls	116	9.0	0.0	112	12	1.7	116	20	4.5	66	22	10.6
Reflectors	-	-	-	378	3	14.2	378	3	14.2	70	6	5.1
HID	184	1.0	0.0	47	6	23.1	54	7	22.0	10	5	1.6
Exit Signs	21	11.0	1.7	12	4	1.0	15	15	1.3	55	1	11.0

*Average per square foot installation is the mean of the ratio of the number of items to facility square feet.

When the rate of adoption is combined with the average size, the result is a proxy for program impacts. The data shown in Figure 5-22 provide a normalized comparison of activity in the small and very small customer participant and nonparticipant populations. As shown in the Table, lighting adoption activity is greater in the participant population, with an average number of high efficiency items installed per participant of 13.6 versus 5.3 for nonparticipants.

Among small and very small customers, high efficiency lighting items are being installed in the participant population at more than twice the rate they are installed in the nonparticipant population. Consistent with previous Evaluation results, the lighting impacts within the very small/small customer segment are generated primarily by T8/T5 installations, where an average of 7 bulbs were installed per participant, versus 2 among nonparticipants. The impact of T8/T5s is followed by CFLs, where participants are installing 3 bulbs for every one installed by a nonparticipant.

Figure 5-22: Lighting Items Installed Per Respondent – Very Small and Small Customers

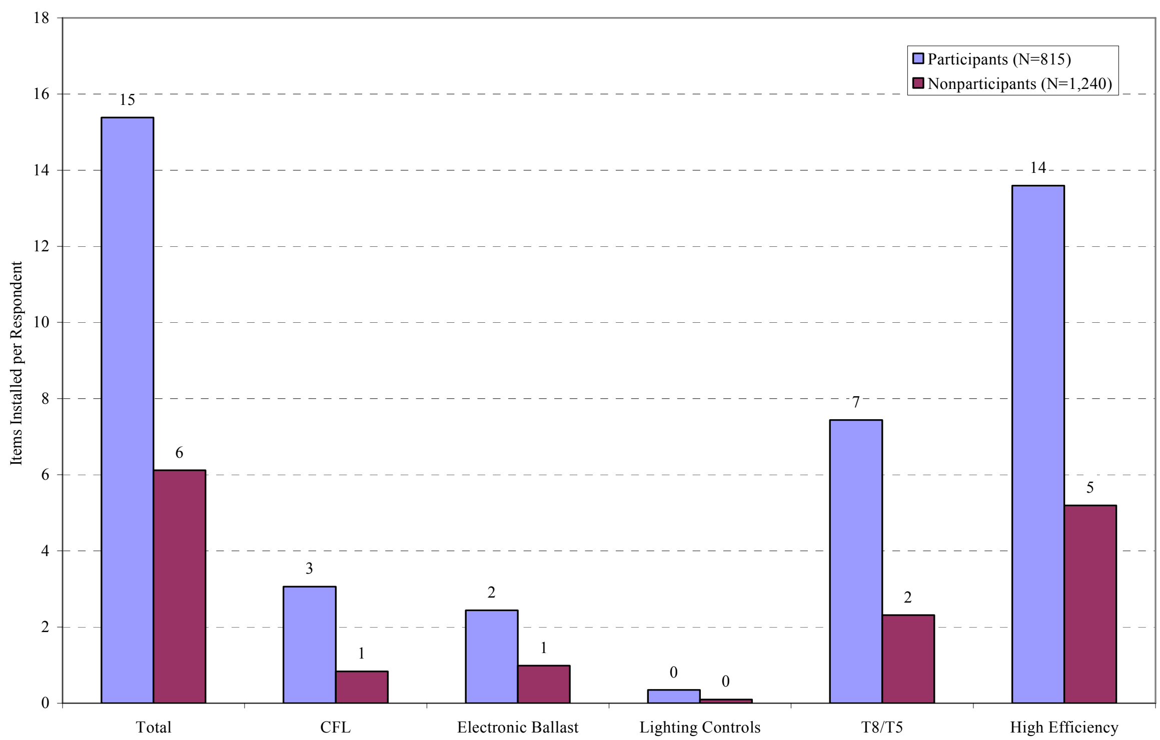
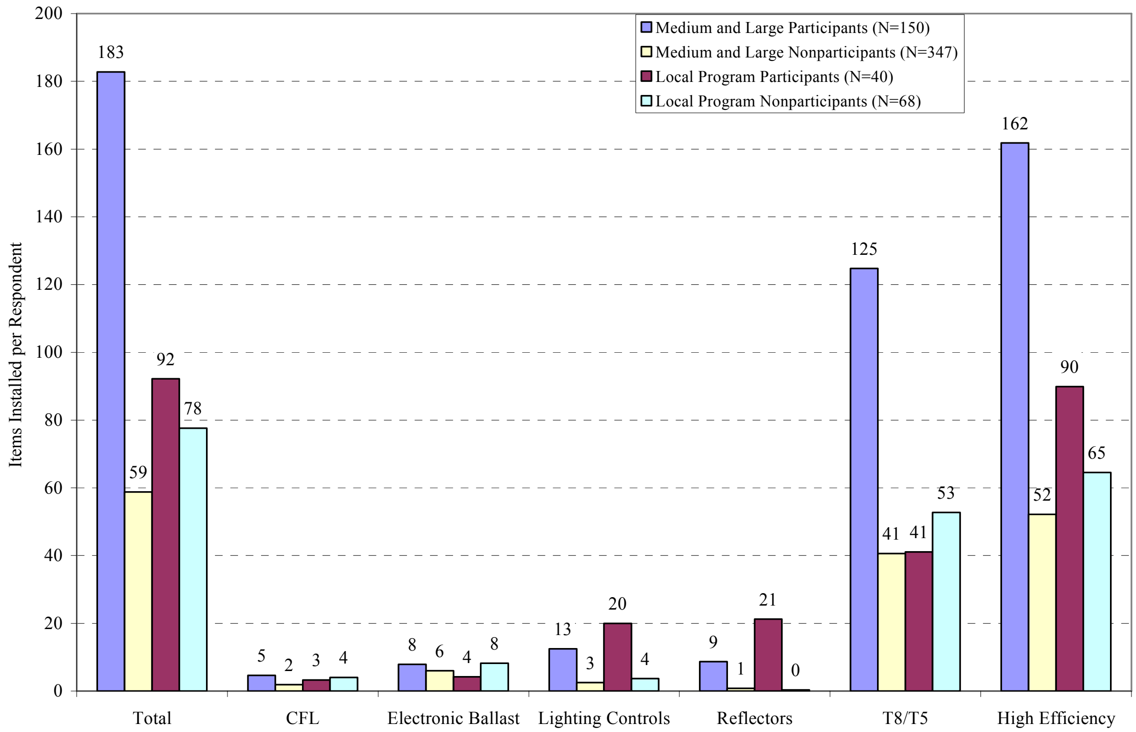


Figure 5-23 below provides a normalized comparison of lighting adoption activity in the medium and large customer segment. Local Program results are also shown. Local Program participants installed more lighting controls and reflectors, but fewer of T8/T5 measures, relative to the group of Local Program nonparticipants[53]. As with the smaller firms, T8/T5 installations dominated the field, with statewide participants installing roughly three times as many high efficiency lighting measures than nonparticipants.

Overall, the statewide program exhibits strong lighting impacts in the medium/large segment with an average of about three times as many efficient lighting items installed per respondent relative to the nonparticipants. There is surprisingly little efficient lighting activity within the Local Program participant population. However, it is important to bear in mind the small sample size relied on in this segment, and the more recent timing of the audit (2004) relative to statewide participants (PY 2003).

Figure 5-23: Lighting Items Installed Per Respondent – Medium and Large Customers, Statewide NRA and PG&E Local Programs



[53] A group of PG&E nonparticipating customers weighted to represent the Local Program population characteristics by NAICS code and size category.

The lighting program effects revealed in Figure 5-23 are larger on an absolute scale than those found in the small and very small population, as shown in Figure 5-22. The estimated program impact in the medium and large population is 110 lighting items per participant, versus 9 items among small and very small participants. On the other hand, impacts measured in the percent difference between participants and nonparticipants are similar across both groups. Ultimately, the program shows success in both markets.

Cooling Equipment Adoptions

As shown in Figure 5-24, 22 percent of small and very small Audit participants adopted cooling equipment, exceeding the nonparticipant adoption rate by 6 percentage point (22 versus 16 percent). The Figure shows a higher adoption rate among small participants relative to very small participants (25 versus 20 percent). The highest adoption rates are found among online and CD-ROM participants where nearly one-third adopted a cooling measure.

Figure 5-24: Cooling Equipment Adoption Rates, Very Small and Small Customers, Participant versus Nonparticipant

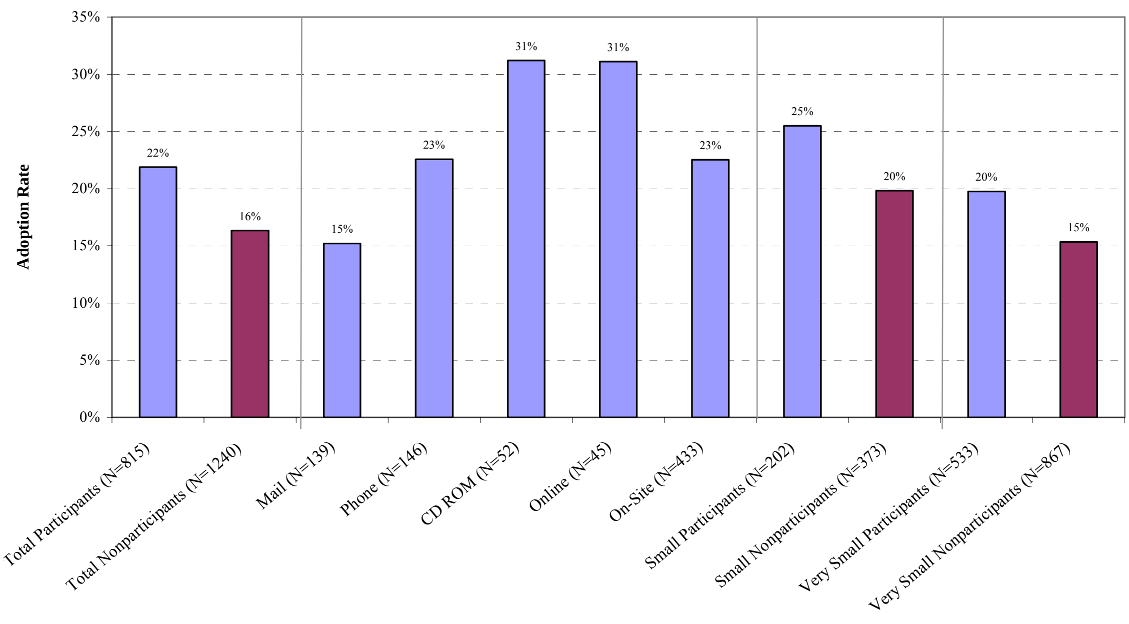
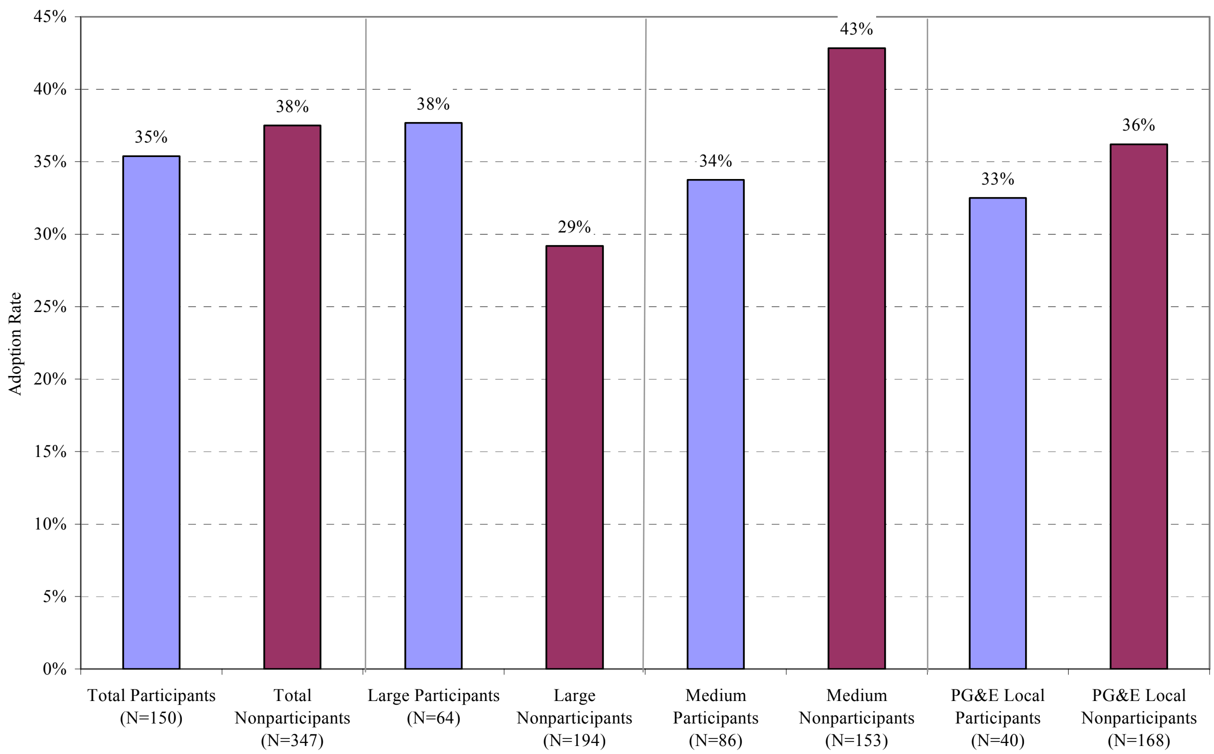


Figure 5-25 below shows Medium/Large customer cooling equipment adoption rates. Overall cooling adoption rates are comparable among Audit Program participants and nonparticipants, with nonparticipants adopting at a marginally higher overall rate (38 versus 35 percent). While large participants adopt at a higher rate than large nonparticipants (38 versus 29 percent) the relationship is reversed among medium sized customers, where the nonparticipants adopt at a higher rate (43 versus 34 percent). Similarly, participants in PG&E's Local Program are not more likely to purchase cooling equipment than similarly profiled nonparticipants. Together, these statistics indicate that Medium/Large customers are not purchasing cooling equipment at a higher rate than nonparticipants as a result of the Audit. However, as is shown later on in this section, participants are adopting more high efficiency cooling equipment than nonparticipants.

Figure 5-25: Cooling Equipment Adoption Rates, Medium and Large Customers, Participant versus Nonparticipant



Next, the types of cooling equipment adopted by technology are examined among participants and nonparticipants. Figure 5-26 and Figure 5-27 below show the distribution of cooling technologies within the respective Very Small/Small participant and nonparticipant samples. In general, the technology distribution among participants and nonparticipants is fairly similar. Controls make up over one-third of cooling adoptions among both groups. Nonparticipants show a somewhat higher propensity to adopt split/packaged or other individual air conditioning unit than participants, 43 versus 36 percent, respectively. The participants were more likely to purchase "other" equipment, which includes evaporative coolers, motors, and economizers among other items.

Figure 5-26: Participant Cooling Adoptions by Technology – Very Small and Small Customers

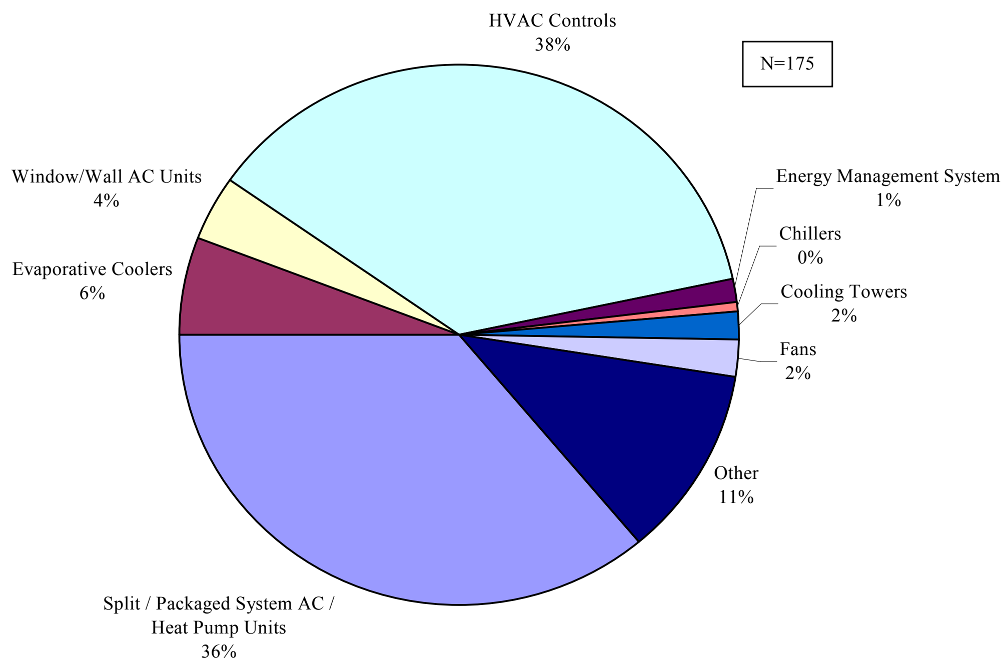


Figure 5-27: Nonparticipant Cooling Adoptions by Technology – Very Small and Small Customers

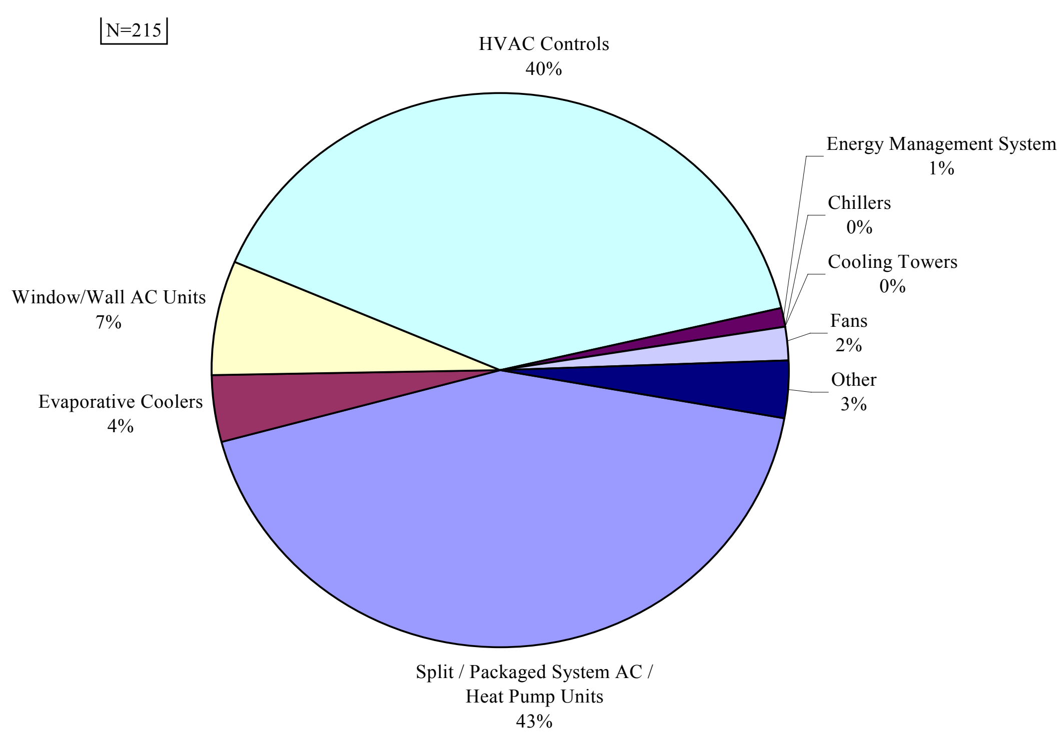


Figure 5-28 and Figure 5-29 below show the distribution of cooling technologies among medium and large customers in the PY 2004-2005 participant and nonparticipating samples. Similar to the very small and small customers, medium and large customer adoptions are concentrated in HVAC controls and split/packaged or individual air conditioning units. Participants show a greater propensity to install controls, while nonparticipants are installing more individual air conditioning units. Evaporative coolers are also more prevalent among participants (8 versus 4 percent).

Figure 5-28: Participant Cooling Adoptions by Technology – Medium and Large Customers

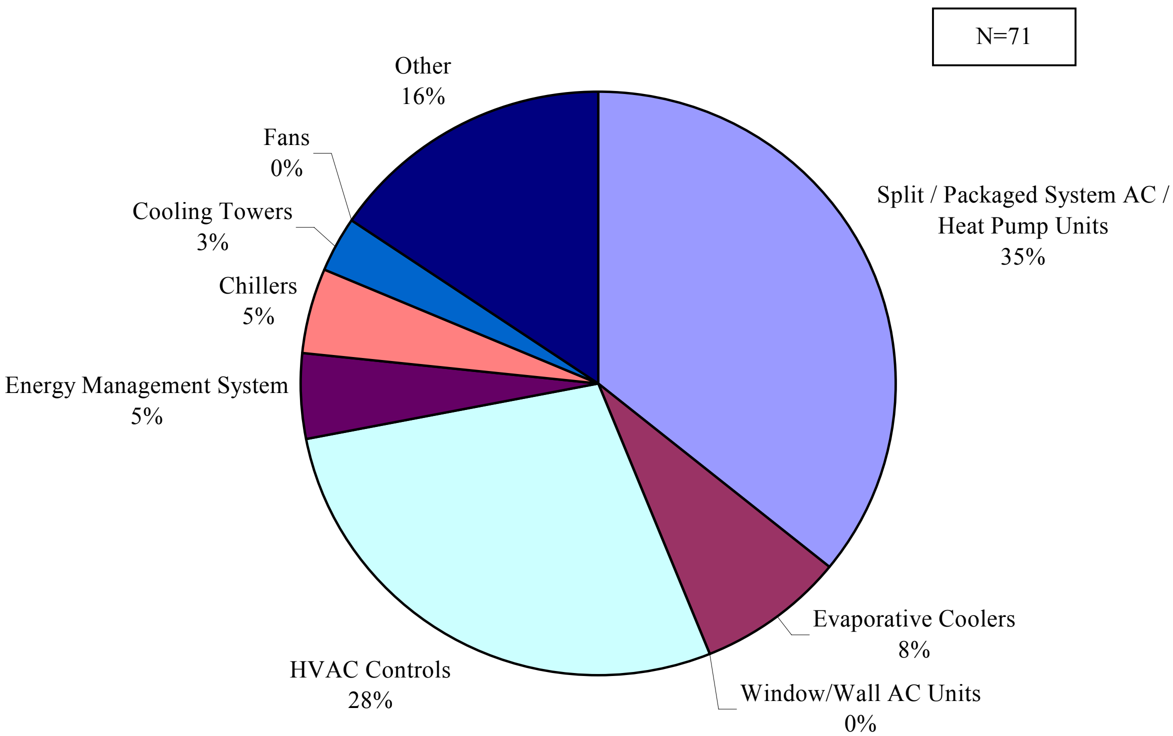
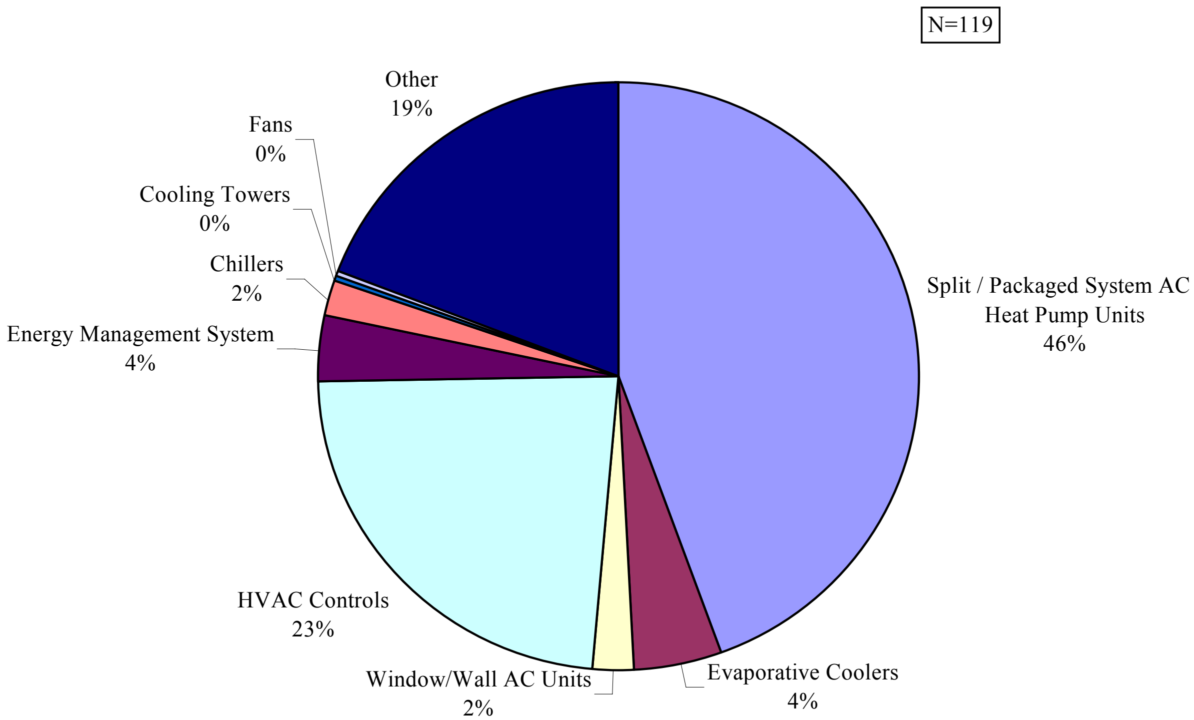


Figure 5-29: Nonparticipant Cooling Adoptions by Technology – Medium and Large Customers



The Figures shown above characterize overall cooling equipment adoption activity, but they don't isolate the efficiency level of adopted equipment. Figure 5-30 and Figure 5-31 present adoption rates of high efficiency cooling equipment among the small/very small and medium/large samples. The efficiency categorization is based on either the technology or the self reported efficiency level of the installed equipment[54].

Figure 5-30 below shows high efficiency cooling equipment adoptions for Very Small/Small customers. The Figure has the same general pattern as the total cooling adoption rates shown earlier, with higher than average adoptions rates in the small (22%), CD-ROM (25%) and Online Audit (22%) segments. Overall, participant adoption rates exceed nonparticipants by six percentage points, 18% versus 12% respectively.

[54] Participants were asked to characterize installed cooling equipment as of "high" or "standard" efficiency. Specific efficiency rating were also asked of respondents but were almost universally unknown.

Figure 5-30: High Efficiency Cooling Equipment Adoption Rates, Very Small and Small Customers

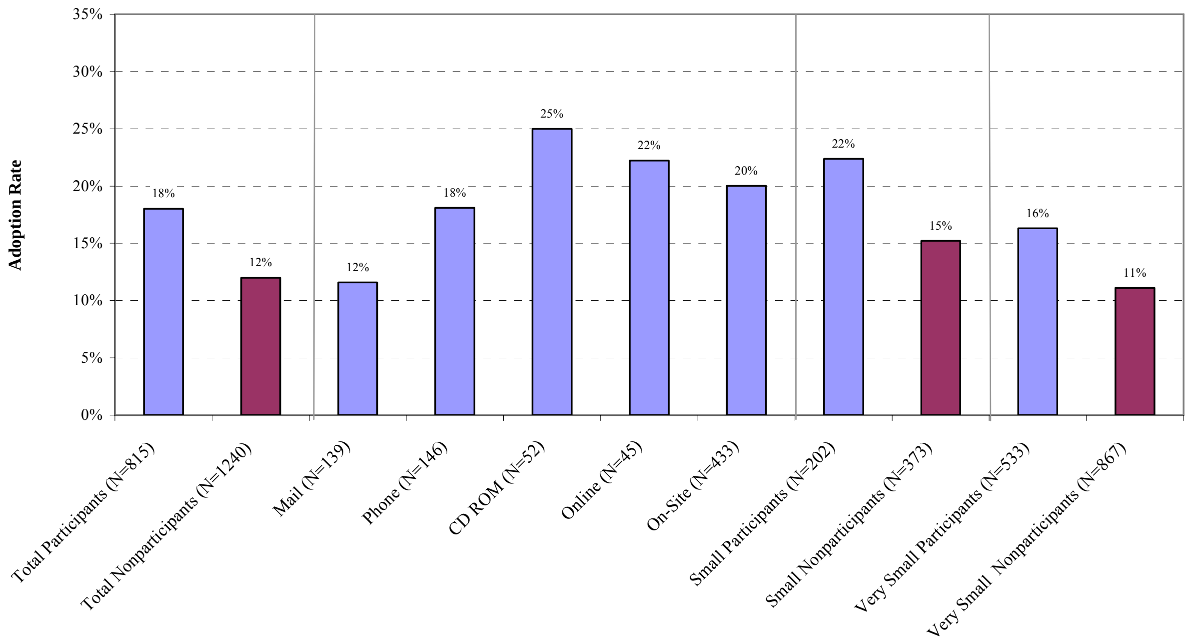
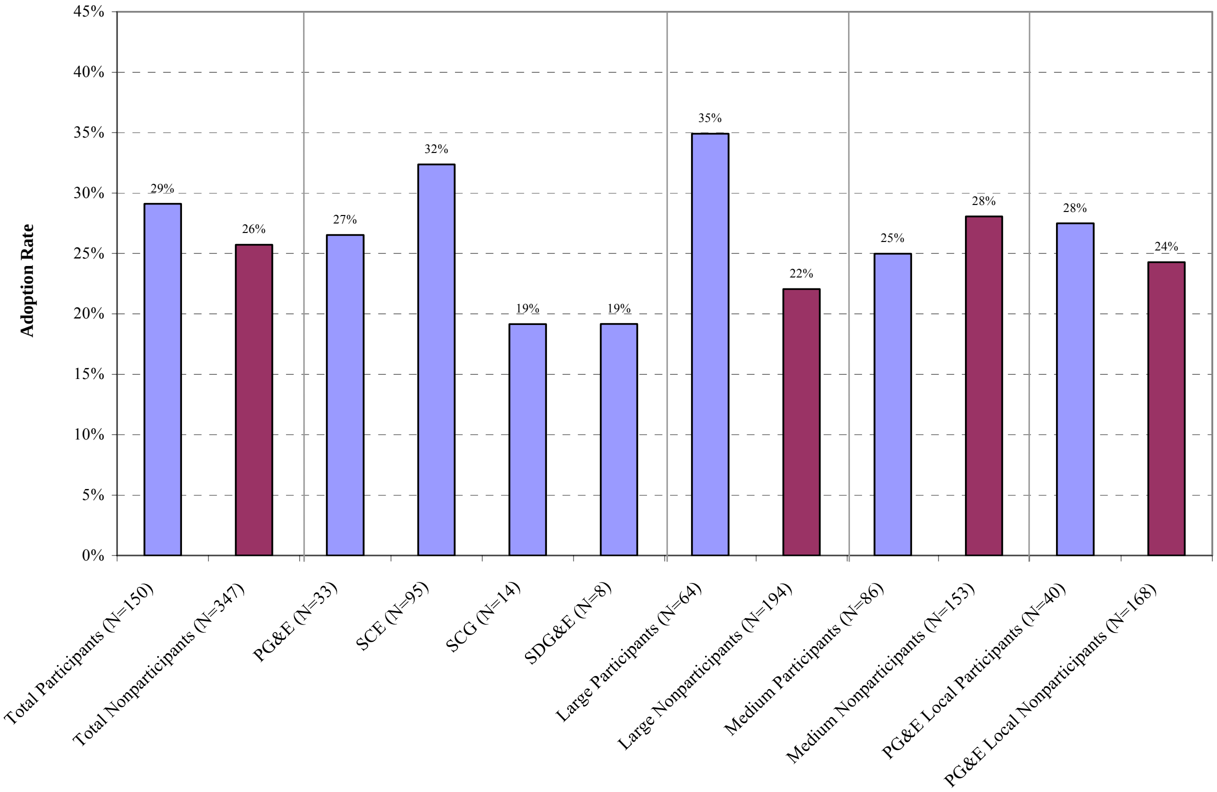


Figure 5-31 below shows high efficiency cooling equipment adoptions for Medium/Large customers. The pattern of high efficiency adoptions does not indicate a clear program effect on cooling adoptions in the medium/large customer segment. However, at a more disaggregated level there do appear to be some effects. Specifically, SCE customers and the large customer segment display notably higher adoption rates than corresponding nonparticipant groups.

Figure 5-31: High Efficiency Cooling Equipment Adoption Rates, Medium and Large Customers



Next, the average size of high efficiency[55] installations occurring in the participant and nonparticipant samples is explored. Table 5-29 and Table 5-30 show the average size of installations for some key technologies. The average installation sizes for evaporative coolers and window/wall A/C units are larger among participants, while installations of HVAC controls and package terminal A/C hotel/motel units are larger among nonparticipants. Installations per square foot are comparable in the two samples for most technologies, although participants had a higher special concentration of window/wall A/C units.

[55] For non-rebated equipment efficiency is based on the type of equipment installed, or on a self-reported characterization of the installed equipment as "high" or "standard" efficiency.

Table 5-29: Average Size of High Efficiency Cooling Equipment Installations by Very Small and Small Customers

	Total Participants				Total Nonparticipants			
Cooling Measures	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *
Evaporative coolers	2.6	13	8042	0.5	2.1	12	6695	0.5
HVAC Controls	3.6	96	8653	0.8	5.5	93	9693	1.0
Package Terminal AC Hotel/Motel Units	3.8	9	31517	0.8	25.4	5	32277	0.7
Packaged or Split system AC / Heat Pump	2.5	47	10248	0.6	2.4	55	11143	0.7
Window/Wall AC Units	6.6	6	4099	1.8	1.8	8	9646	1.0
Other High Efficiency Measures	2.5	7	32295	0.2	1.3	7	4384	0.6

*Average per square foot installation is the mean of the ratio of the number of items to facility square feet, where both square feet and number of items are populated.

Some of the audit participants received incentives for installing equipment. Table 5-30 compares the average installation size of high efficiency cooling equipment by small and very small participants when rebated or unrebated. While there were striking contrasts in average installation size, these were associated with small sample sizes. Average high efficiency cooling measure installations per 1,000 square feet differed little between audit participants who did or did not receive Express Efficiency incentives.

Table 5-30: Average Size of High Efficiency Cooling Equipment Installations by Small and Very Small Participants, Rebated and Unrebated

	Express Participants				Non-Express Participants			
Cooling Measures	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *
Evaporative coolers	-	-	-	-	2.6	13	11402	0.4
HVAC Controls	3.8	18	9872	0.9	3.6	78	14466	0.7
Package Terminal AC Hotel/Motel Units	24.6	5	59766	1.5	3.5	4	31023	0.8
Packaged or Split system AC / Heat Pump	7.8	5	67890	0.4	2.4	42	17081	0.6
Window/Wall AC Units	0.0	0	0	0.0	6.6	6	4099	1.8
Other High Efficiency Measures	1.0	1	7500	0.1	2.5	6	53762	0.2

*Average per square foot installation is the mean of the ratio of the number of items to facility square feet, where both square feet and number of items are populated.

Table 5-31 shows installation size data for medium and large customers. In Table 5-31, we see inconsistent effects of audits on average installation sizes for different high efficiency technologies. Participants installed relatively more evaporative coolers, air conditioners, and adjustable speed drives, while nonparticipants installed more HVAC controls and other categories of high efficiency cooling measures. On a per square foot basis, the medium and large nonparticipants almost universally installed more high efficiency cooling[56].

Table 5-31: Average Size of High Efficiency Cooling Equipment Installations by Medium and Large Customers

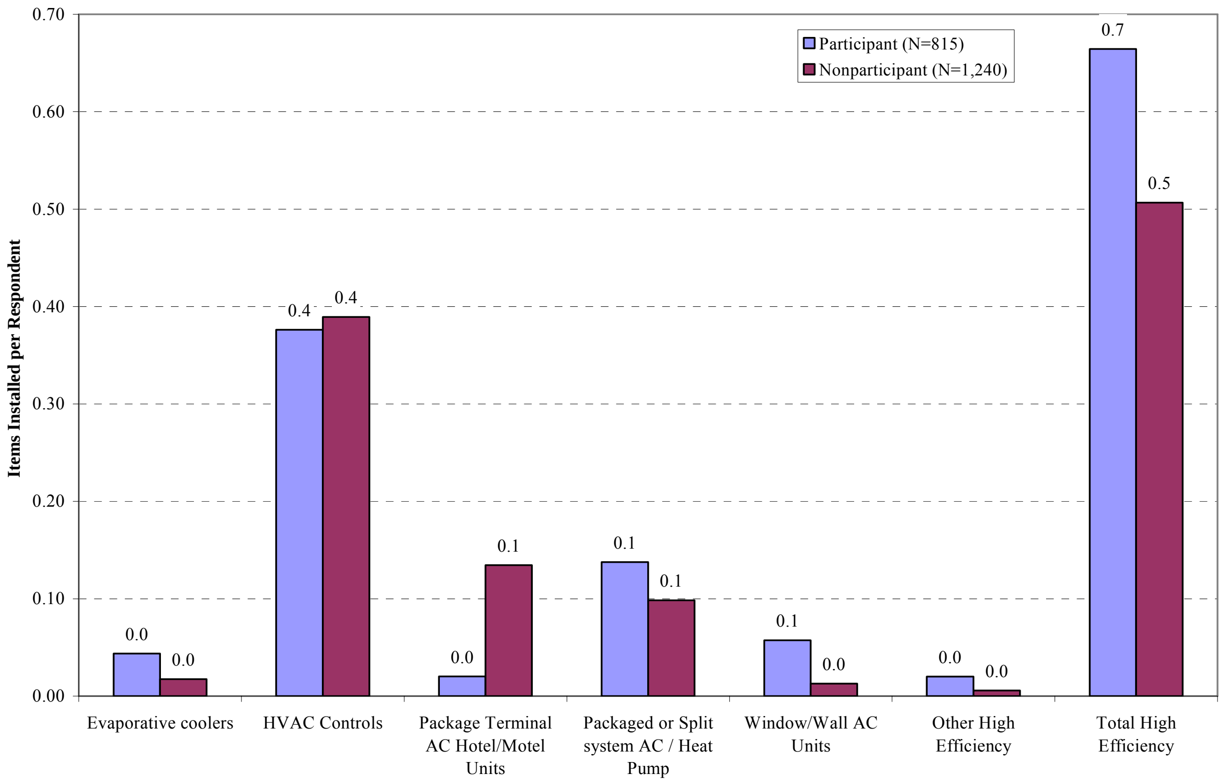
	Total Participants				Total Nonparticipants			
Cooling Measures	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *	Average Install Size	N	Average Sq Ft	Average Per 1,000 Sq Ft Install *
Evaporative coolers	5.7	4	83,866	0.1	2.4	5	33552	0.2
HVAC Controls	12.2	16	63,275	0.2	18.9	23	93800	0.3
Packaged or Split system AC / Heat Pump	14.0	14	45,968	0.3	5.8	32	65012	0.3
EMS	1.0	1	130,000	0.0	1.0	7	99114	0.2
Chiller	1.0	1	500,000	0.0	0.0	0	0	0.0
Adjustable Speed Drives	19.3	4	151,887	0.1	4.4	2	209259	0.0
Other High Efficiency Measures	2.0	3	35,558	0.3	7.8	15	35526	1.3

*Average per square foot installation is the mean of the ratio of the number of items to facility square feet, where both square feet and number of items are populated.

The product of the average size of high efficiency installations and adoption rates results in an estimate of per-capita adoptions within the participant and nonparticipant populations. Figure 5-32 presents these results for small and very small customers, showing adoptions per respondent for key cooling technologies and high efficiency equipment overall. Participants show a greater level of activity in most technology segments, as well as in overall high efficiency adoptions. The greatest positive program impact is seen in the adoption of window/wall AC units and evaporative coolers.

[56] The effect of rebates on average size of high efficiency cooling equipment installations by medium and large participants was explored, but the number of rebated participant adoptions available for analysis was so small as to make this data of little practical use.

Figure 5-32: Average Number of High Efficiency Cooling Items Installed per Respondent as Reported by Very Small and Small Customers



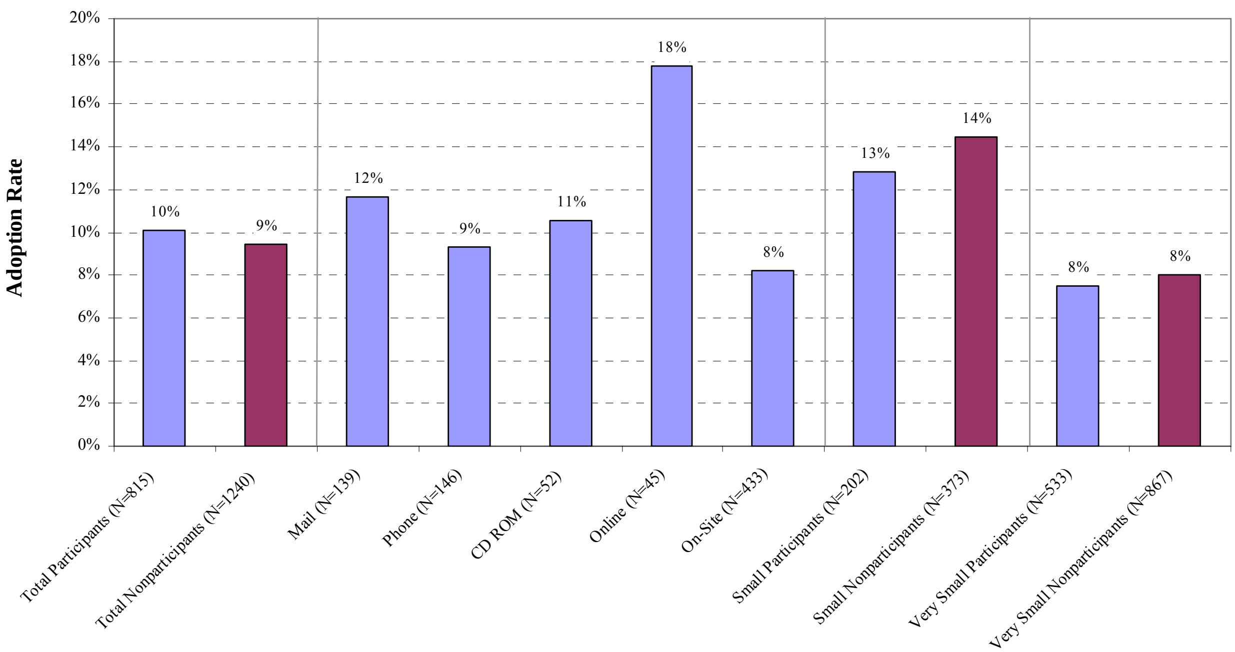
The average number of high efficiency cooling items installed per respondent is not presented for the medium and large segment. Again, small sample sizes and great variability of adoption sizes and technologies leave little upon which to produce meaningful comparisons.

Gas Equipment Adoptions

This section examines the pattern of gas equipment adoptions in the participant and nonparticipant populations. While all four IOUs make some recommendations for therm-saving measures, SCG places a greater emphasis on these measures than the other IOUs. As shown below, this difference is apparent in the participant gas equipment adoption rates.

Figure 5-33 below shows small and very small customer gas equipment adoption rates by audit mechanism and customer size. Neither the small nor very small customer segment shows a positive program effect, with adoption rates nearly equivalent to those of nonparticipants.

Figure 5-33: Gas Equipment Adoption Rates, Very Small and Small Customers, Participant versus Nonparticipant



As discussed above, SCG places a greater emphasis on gas measures in audit reports than other IOUs. In previous evaluations, SCG showed a higher than average impact per audit for the gas end-use. Thus, in Figure 5-34 below, we present gas equipment adoption rates for small and very small customers broken out by IOU service territory. SCG customers in both the small and very small size categories are shown to adopt gas equipment at a rate well in excess of nonparticipants, as well as other IOU service territory participants. PG&E small customers are also adopting gas equipment at a rate in excess of nonparticipants.

Figure 5-34: Gas Equipment Adoption Rates, Very Small and Small Customers, Participant versus Nonparticipant

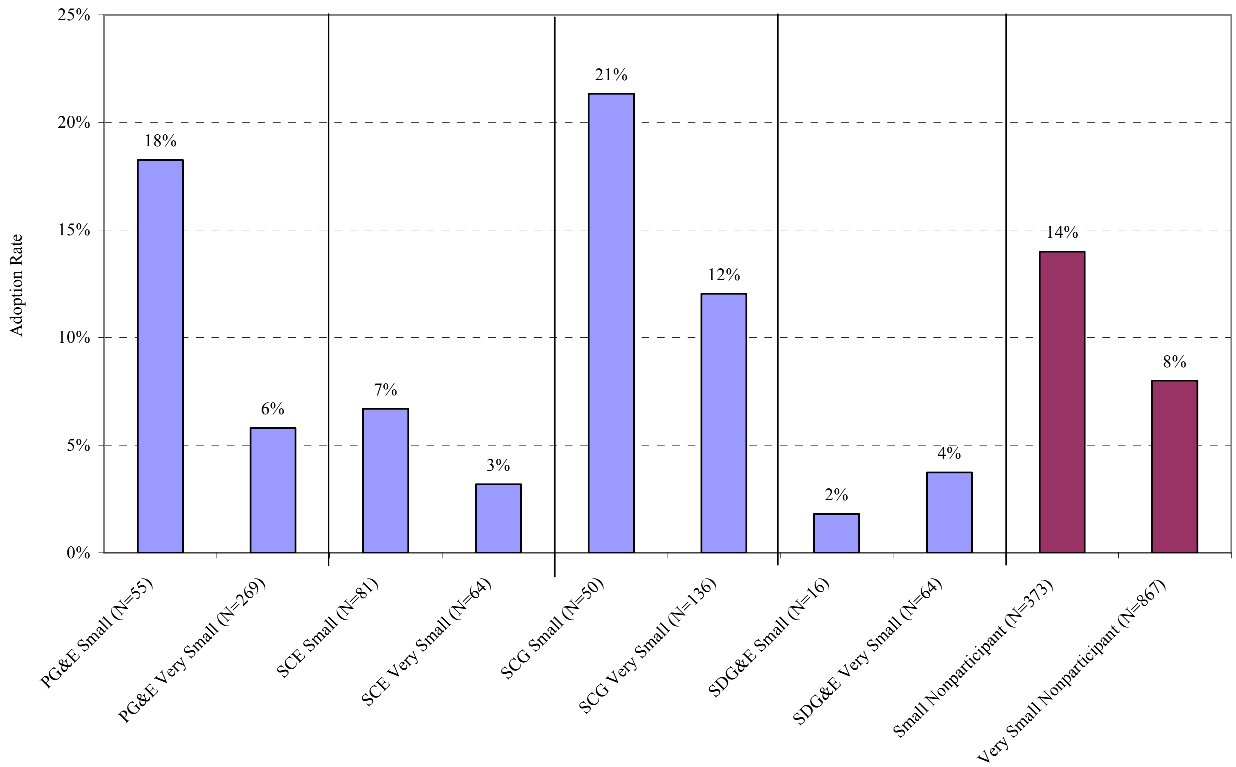
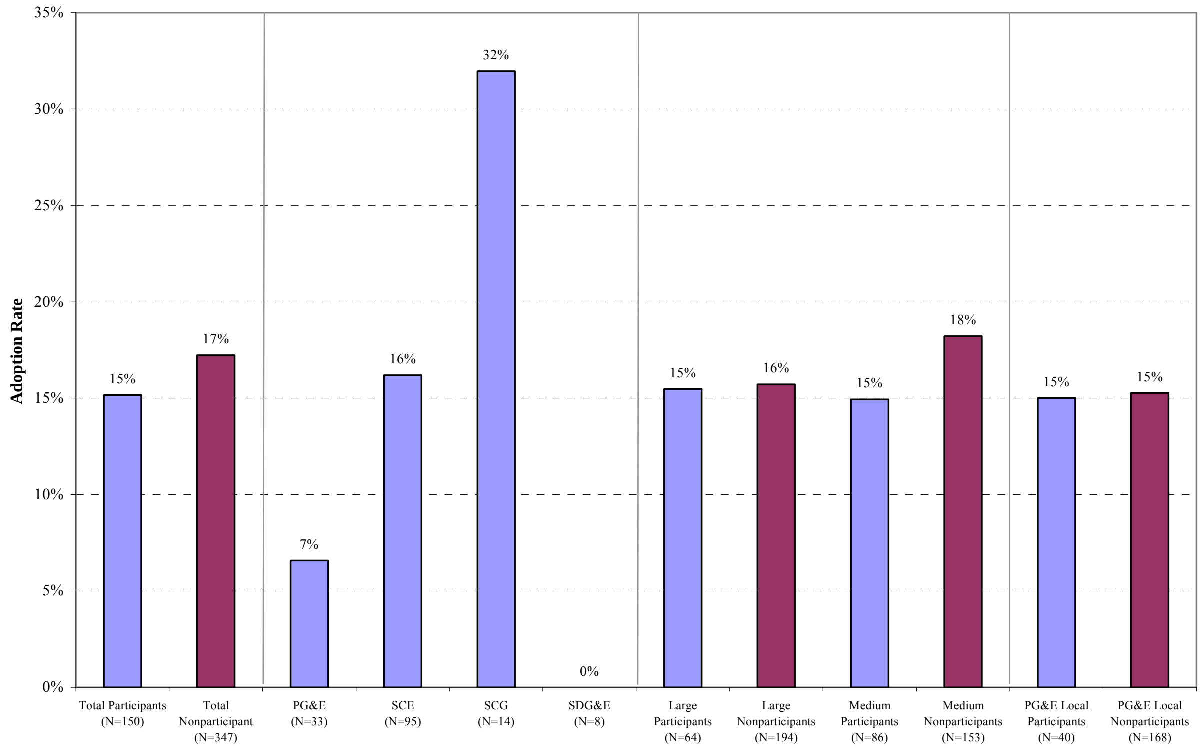


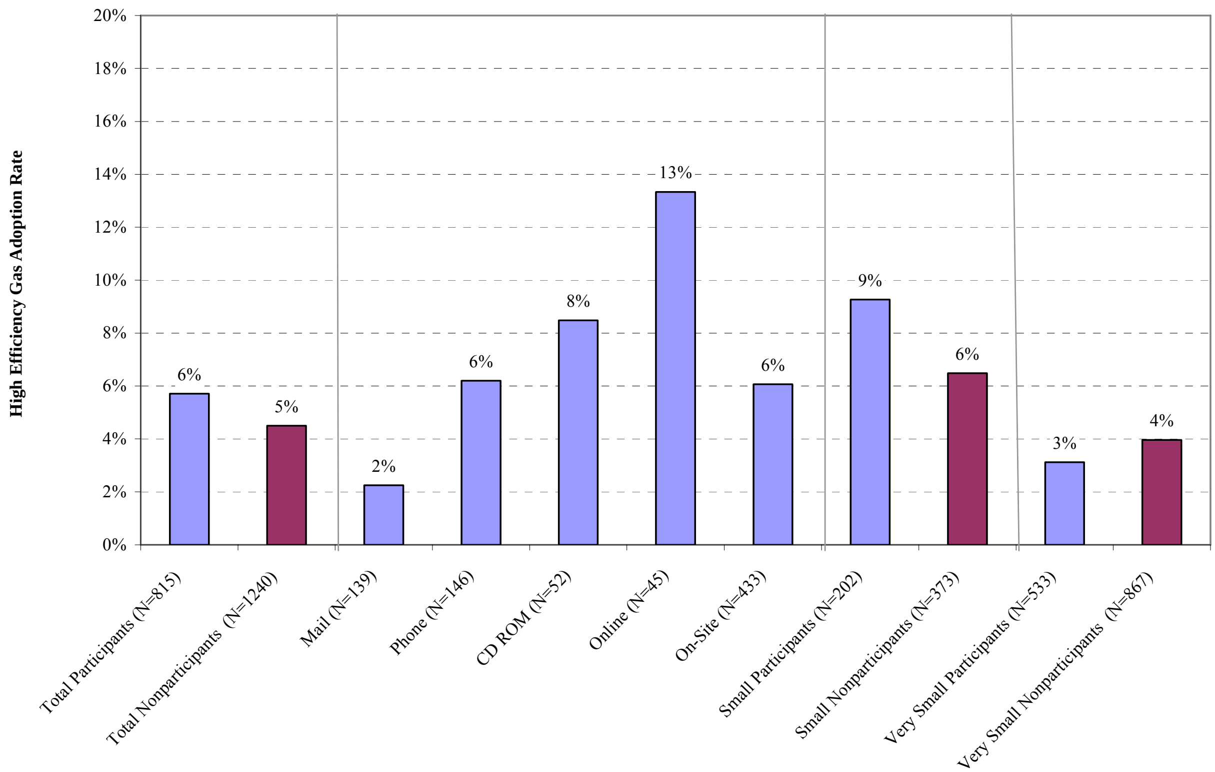
Figure 5-35 below shows medium and large customer gas equipment adoption rates by utility and size segment. With the exception of SCG service territory, neither the Audit Program nor the Local Program show a clear program effect in the gas end-use. The gas equipment adoption rate within the SCG participant sample is very high (32 percent). This is not surprising, given the strong emphasis on gas measures in the SCG audit reports, but should be tempered with the fact that the sample size for this segment result is small (14). Previous NRA program Evaluations have also shown SCG to have good results for the gas end-use.

Figure 5-35: Gas Equipment Adoption Rates, Medium and Large Customers, Participant versus Nonparticipant



Next, we examine high efficiency gas equipment adoption rates. Survey respondents are asked to characterize each gas equipment purchase as either “High” or “Standard” efficiency. Figure 5-36 below show the high efficiency gas equipment adoption rates within the small and very small customer segment. Though the overall participant adoption rate exceeds the nonparticipants, the difference is minimal, 6 versus 5 percent.

Figure 5-36: High Efficiency Gas Equipment Adoption Rates, Small and Very Small Customers, Participant versus Nonparticipant



Due to the expectation of a program effect within the SCG service territory for the gas end-use, we present small and very small customer high efficiency gas adoption rates by IOU service territory in Figure 5-37. The Figure shows that SCG participant adoptions occur at a faster rate than those in the nonparticipant population and the other IOU's participant populations. However, the magnitude of these differences are relatively small. SCG participants outpace nonparticipants by only about 2 percentage points, 7 versus 5 percent.

Figure 5-37: High Efficiency Gas Equipment Adoption Rates, Small and Very Small Customers, by IOU Service Territory

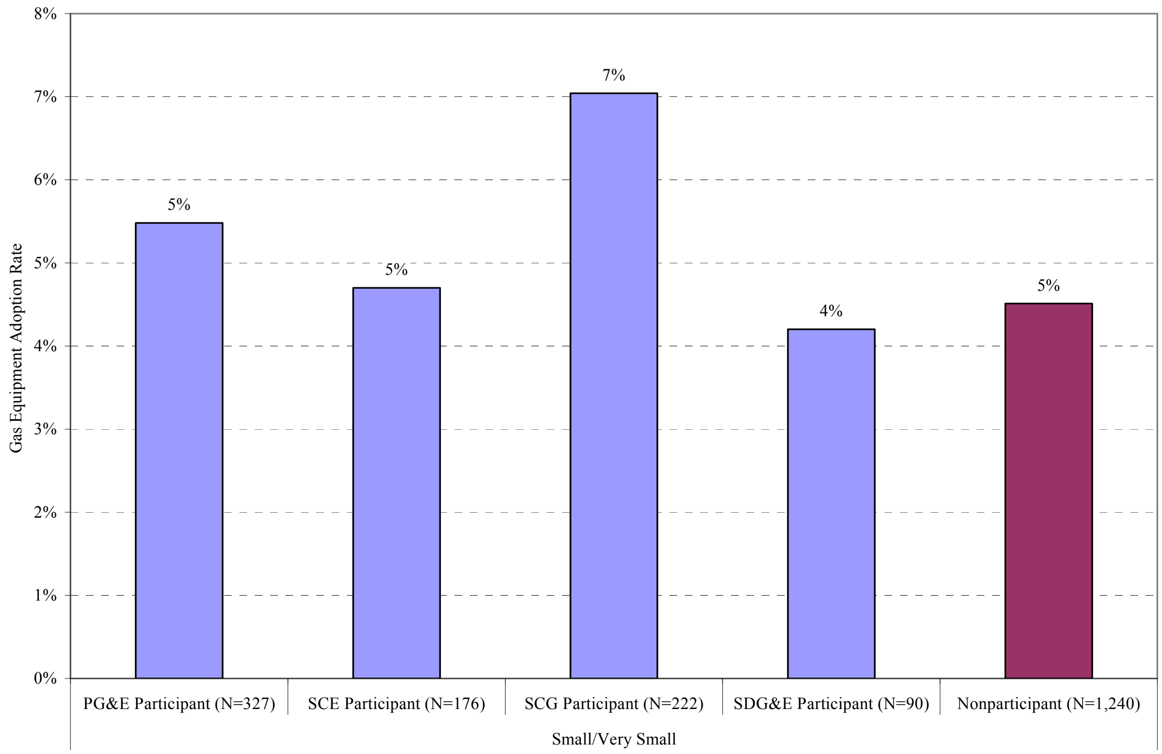
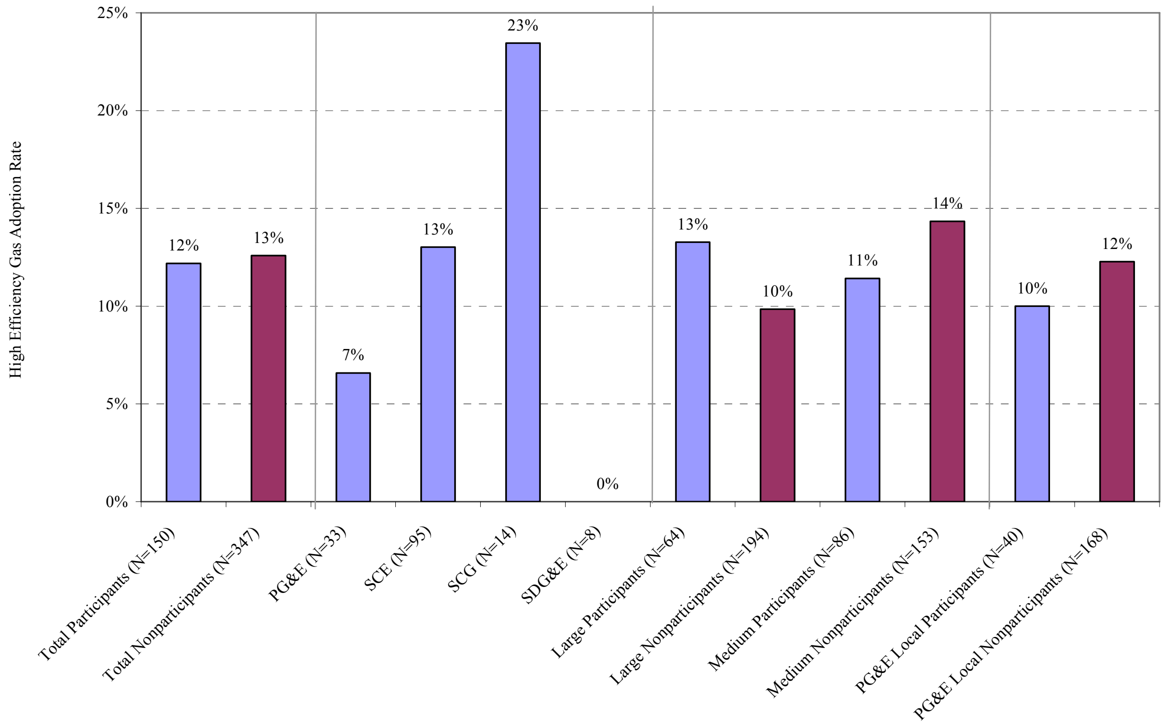


Figure 5-38 below shows high efficiency gas equipment adoption rates within the medium and large customer segment. Neither the Audit Program nor the Local Program exhibits a clear program effect in the gas end-use. However, the SCG service territory segment again shows a positive program effect. The SCG adoption rate is well in excess of nonparticipants (23 versus 13 percent) as well as other participant groups.

Figure 5-38: High Efficiency Gas Equipment Adoption Rates, Medium and Large Customers, Participant versus Nonparticipant



The types of gas equipment adopted by participants and nonparticipants are presented in Table 5-32 below. The Table shows Very Small/Small customer results, as well as Medium/Large customer results. By far the most common gas installations among small and very small participants are water heaters, and this is true among both participants and nonparticipants (67 and 71 percent, respectively). Furnaces are also common among participants, but less so among nonparticipants, at 21 and 7 percent, respectively.

Medium/Large customers are also installing primarily water heaters, followed by boilers. Food service equipment is also a common gas equipment installation among medium and large customers. Participants and nonparticipants exhibit fairly similar technology patterns.

Table 5-32: Gas Equipment Adoptions by Technology, Participant versus Nonparticipant

End Use	Small and Very Small Customers		Medium and Large Customers	
	Participant	Nonparticipant	Participant	Nonparticipant
Boiler	11%	6%	31%	30%
Food Service Equipment	9%	24%	17%	22%
Furnace/Heater	21%	7%	3%	8%
Washer/Dryer	13%	8%	1%	9%
Water Heater	67%	71%	50%	48%
Other Gas Measure	3%	6%	27%	6%
N	56	112	69	54

Overall, the statewide program is not achieving significant program effects in the gas end-use. However, the SCG audit program, with a strong emphasis on gas measures, appears to be an exception, showing a measurable effect in this end-use.

Industrial Process Adoptions

This section discusses the adoption of industrial process equipment by Medium/Large on-site audit participants during the following participation in the NRA or Local Program. These adoptions are compared with similar groups of Medium/Large nonparticipants to reveal program effects over a baseline.

Figure 5-39 shows the rate of adoption of process equipment during the period under study. Audit program participants adopt new processing equipment at a higher rate than nonparticipants—65 versus 54 percent. This difference in adoption rates originates in the medium customer segment, where the participant adoption rate is far greater than the nonparticipant rate, 77 versus 47 percent. Adoption rates within PG&E's Local Program and large participants in the NRA program do not indicate program effect for the process end-use. In fact, no final net impacts are claimed for the Local Program in the Process end-use in Section 5.2.

Figure 5-39: Process Adoption Rates, Medium and Large Customers

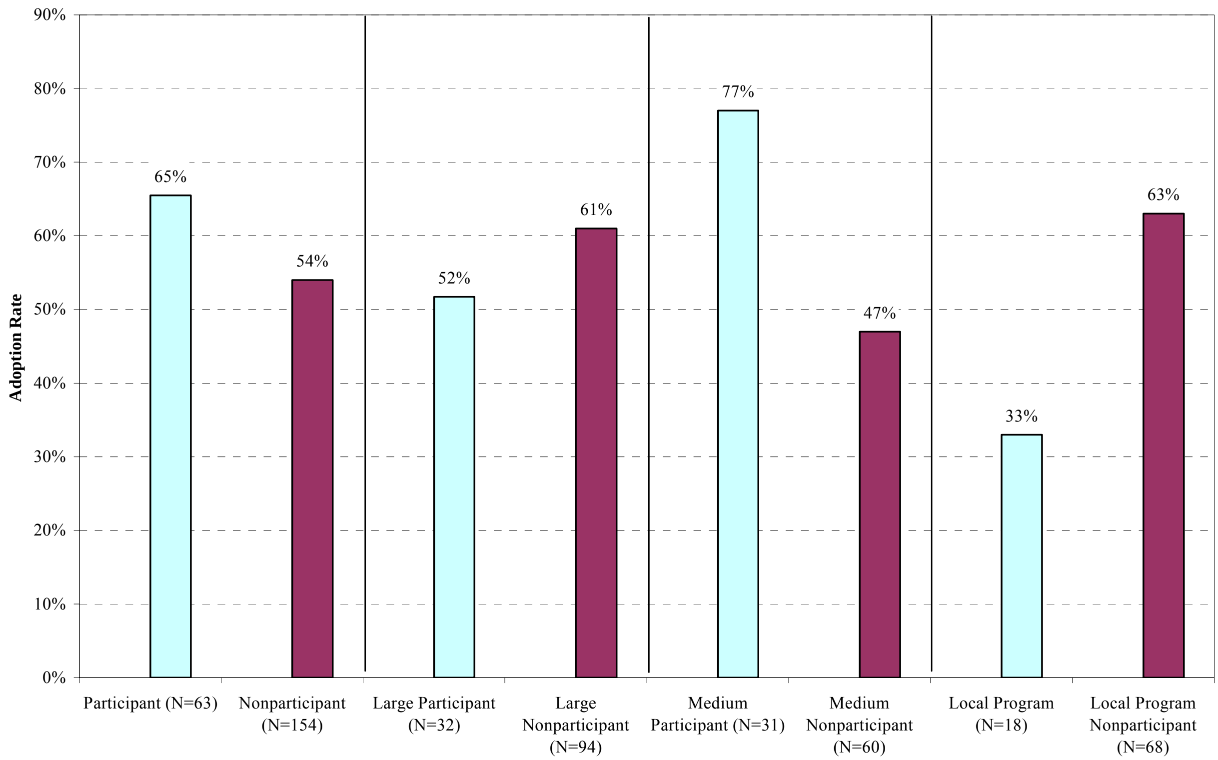


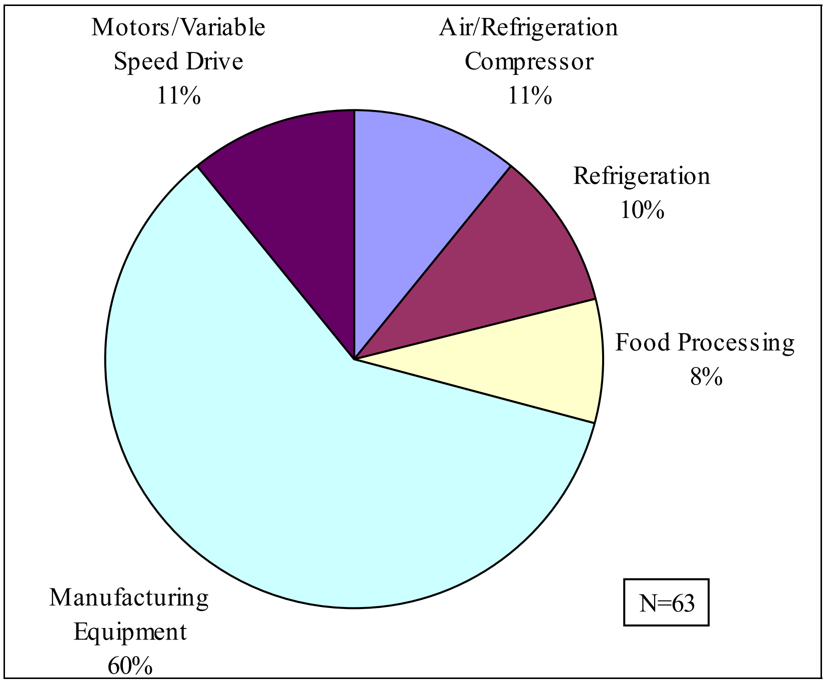
Table 5-33 below presents the self-reported descriptions of each processing equipment adoption reported by participant respondents, including quantities and self-reported efficiency levels. There are 63 participant adoptions of industrial process equipment reported. High efficiency adoptions include a significant number of compressors, refrigeration units, and motors or variable frequency drives.

Table 5-33: Self-Reported Processing Equipment Measures, Medium and Large Participants

Technology Category	Self-Reported Measure Description	Self-Reported Efficiency	Quantity*
Air/Refrigeration Compressor	Air Compressor System	High	1
	Air Compressor System	High	2
	Air Compressor	Don't Know	1
	Compressor - 400 volt	High	1
	Air Compressor	High	1
	Air Compressor	Don't Know	1
	Compressor	Don't Know	1
	Variable Speed Air Compressor - 150hp	Don't Know	1
Refrigeration	Process Cooling Controls	High	1
	Walk-in Refrigerator	High	1
	Freezer	High	1
	Milk Cooling Tanks	High	1
	New Freezer	High	1
	Amonia critical charged system w/variable speed drives	High	4
	Free-standing Freezer	Don't Know	1
Food Processing	Dehumidification System	Don't Know	1
	Temperature Controlled Rooms	Don't Know	11
	Gas Oven	Don't Know	2
	Convection Reflow Oven	Don't Know	1
	Variable Speed Milk Pumps	High	2
Manufacturing Equipment	Replaced electric-heated plattens w/ oil-heated plattens	High	30
	Furnaces	Don't Know	1
	Gas Burner	High	1
	Spray Booth	Don't Know	1
	Injection Moulding Machine	High	1
	Envelope-making Machines	Don't Know	2
	Profile Sander - 9 head	High	1
	Printing Press	Don't Know	1
	Pail Tester	Don't Know	1
	Lint Cleaner	Don't Know	1
	Injection Moulding Machine	High	7
	Spray Booth	Don't Know	1
	Laser Marker Machines	Don't Know	1
	Packaging Machines	Don't Know	1
	Printing Equipment	Standard	1
	High-torque cold forging machines	Don't Know	1
	Circuit Board Manufacturing	High	1
	Injection Moulding Machine	High	4
	Hydraulic Machines	High	7
	Wood Remanufacturing Machines	Don't Know	10
	Printing Press	Don't Know	1
	6-color Press	High	1
	Aluminum Press	Don't Know	1
	Laser Cutter	Don't Know	1
	Door Prefit machines	Don't Know	1
	Prefinish Line	Don't Know	1
	Hot Press	Don't Know	1
	Band Saw	Standard	1
	Back Converting Machines	Don't Know	2
	Sand blast unit	Don't Know	1
	5-head molder for wood	High	2
	Paper Cutter	High	1
	Thermal sprayer - BP400 arc spray system	Don't Know	1
	Conveyors - 10 hp	Don't Know	2
	Assembly Machinery	Don't Know	1
	Installed new Processing equipment	Don't Know	1
Motors/Variable Speed Drive	Motors upgrade for Process system	High	1
	50 hp Motor	Don't Know	10
	Motors	High	40
	Energy Efficient Motor	High	1
	Energy Efficient Motor - 3 phase and single phase	High	50
	Variable Speed Drive - 60 HP Motor	Don't Know	6
	Variable Speed Drive on Air Compressor	High	1

Figure 5-40 below shows the technology distribution of Medium/Large participant industrial process adoptions. Motors, compressors, and refrigeration were mainly reported as high efficiency, and make up about a quarter of all process equipment adoptions. Of the manufacturing equipment, 11 responses claimed high efficiency while only two claimed standard efficiency. As might be expected for this category, 23 respondents stated that they did not know whether their equipment was high or standard efficiency.

Figure 5-40: Technology Distribution of Process Adoptions, Medium and Large Participants



<u>Other Equipment Adoptions</u>

The final category of equipment adoptions is a 'catch-all' that includes any other installations that respondents believe significantly effect their overall energy consumption. These can include refrigeration, motors, outdoor lighting, food service and some building envelope measures, among other items.

Figure 5-41 shows the rate of "Other" equipment adoptions for Very Small/Small participants and nonparticipants. There is little difference between participants and nonparticipants in either the small or the very small size class. There is considerable variation in adoption rates across delivery mechanisms, with CD-ROM and on-line at the top, each with about 15 percent of respondents adopting measures. Despite these variations, the overall picture indicates little effect on the rate of adoption in the "other" measure category.

Figure 5-41: “Other” Equipment Adoption Rates, Participant versus Nonparticipant, Very Small and Small Customers

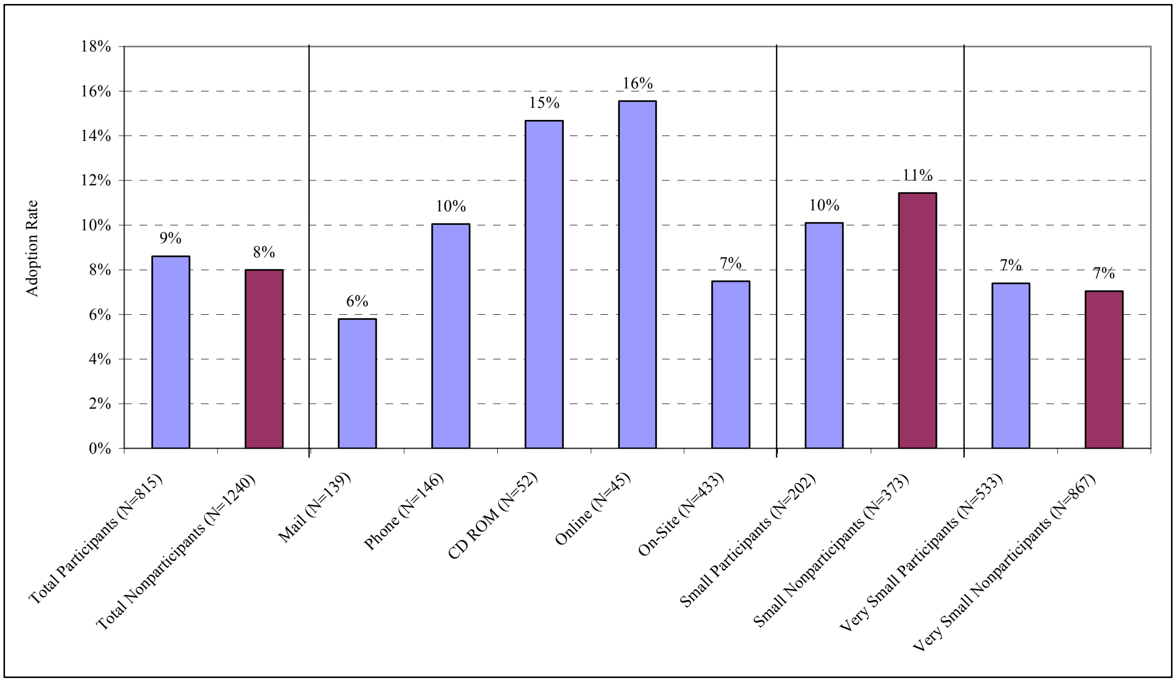


Figure 5-42 presents ‘other’ equipment adoption rates for Medium/Large customers. Among these customers, a program effect is evident. Participant adoption rates are higher in both medium and large customer size groups, as well as overall. This program effect is visible, too, in PG&E’s Local audits. Overall, both the local and statewide participants adopted ‘other’ equipment at about double the rate of nonparticipants.

Figure 5-42: 'Other' Equipment Adoption Rates, Participant versus Nonparticipant, Medium and Large Customers

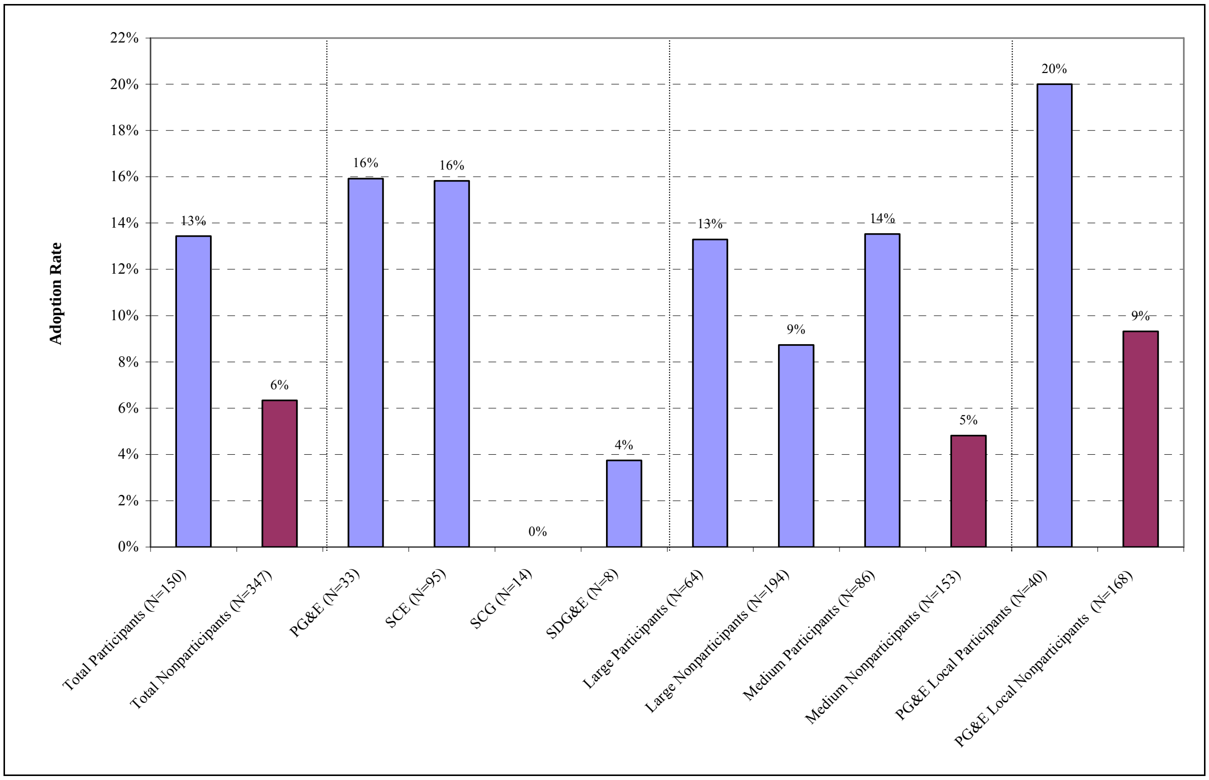


Table 5-34 below shows the technology distribution of the "Other" equipment adopted by participants and nonparticipants. The technology distributions among smaller customers are similar across the participant and nonparticipant segments, as are the overall adoption rates. However, among medium and large customers, where we do see a difference in adoption rates, there is also a difference in technology distributions. Specifically, the participants are installing more motors, controls, window measures and water heating measures than nonparticipants.

Table 5-34: 'Other' Equipment Adoptions by Technology, Participants and Nonparticipants

End Use	Very Small and Small Customers		Medium and Large Customers	
	Participant	Nonparticipant	Participant	Nonparticipant
Controls	4%	2%	10%	4%
Food Service Equipment	14%	19%	9%	3%
Motors	6%	6%	32%	20%
Office Equipment	11%	7%	0%	0%
Outdoor Lighting Equipment	5%	2%	2%	11%
Refrigeration Equipment	25%	27%	0%	26%
Washer / Dryer	6%	15%	6%	9%
Water Heating Equipment	8%	16%	11%	0%
Window Measures	3%	0%	8%	0%
Other	27%	27%	34%	35%
N	73	100	28	33

Survey respondents were asked to describe the efficiency of their 'other' equipment purchases. This data was used to categorize purchases as high or standard efficiency[57]. As shown above, no program effect is apparent among Very Small/Small customers for "Other" adoptions, and this remains true when adjusted for self-reported efficiency levels. Figure 5-43 shows that the adoption rates for participants are somewhat in excess of nonparticipants. Given the substantial samples in these customer segments, these results provide compelling evidence of program effects for the "Other" end-use in the Very Small/Small customer segment.

[57] If efficiency data is missing or inconclusive, standard efficiency is assumed.

Figure 5-43: “Other” High Efficiency Equipment Adoptions, Participants and Nonparticipants, Very Small and Small Customers

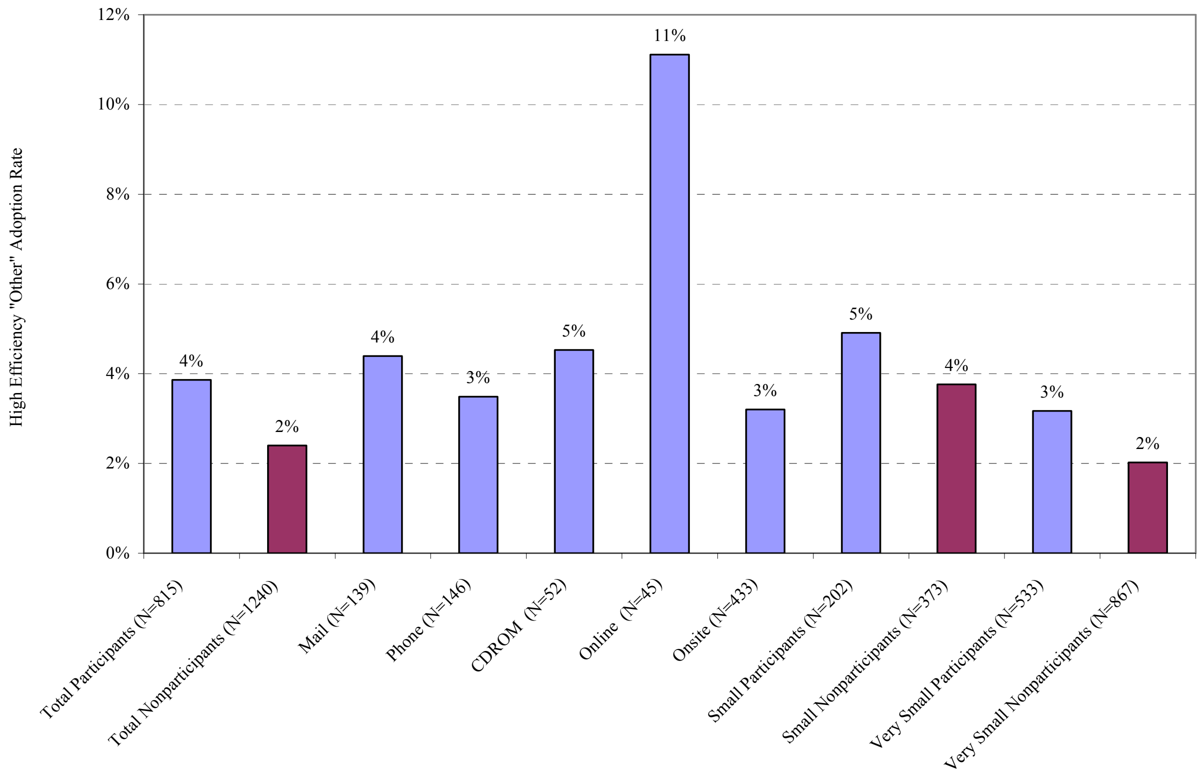
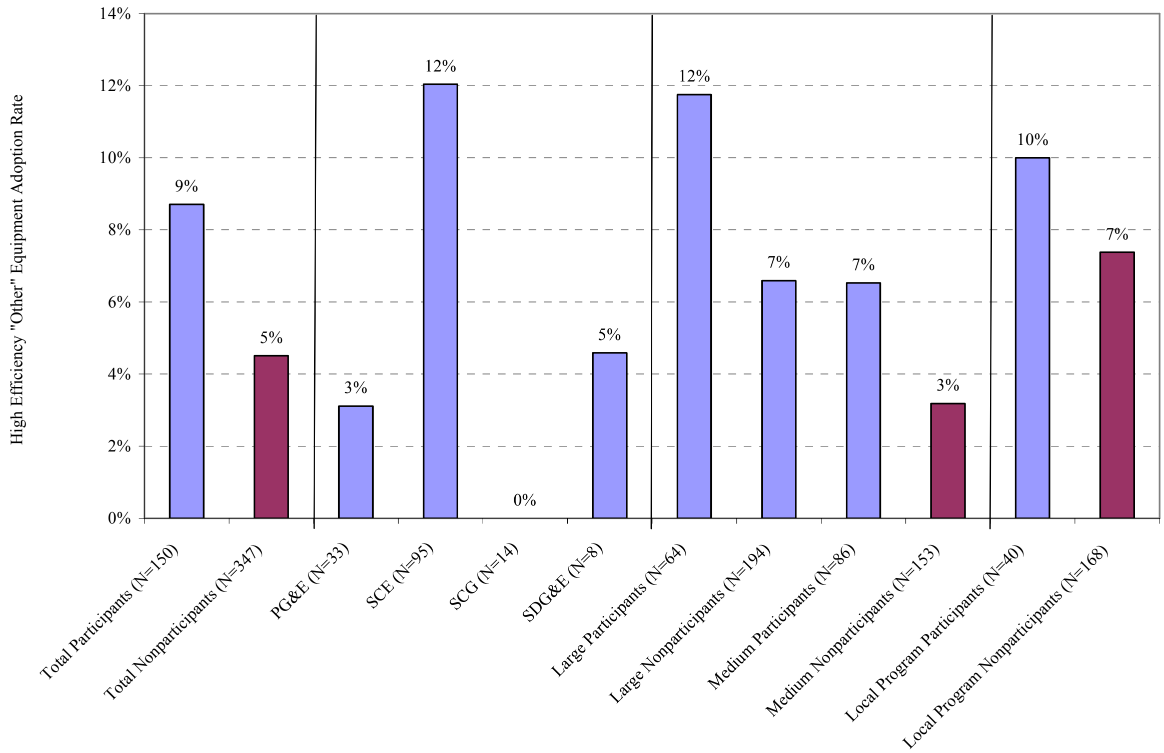


Figure 5-44 shows that larger Audit participants adopt “Other” energy efficient measures at a rate more than one-third higher than similar nonparticipants. Not all participant segments outperformed nonparticipants, large customers and SCE customers have higher adoption rates, but other IOU’s and the medium segment fall short of nonparticipant rates. The Local Program result remains, though not as strong as the overall “Other” result, with participant adoptions outpacing nonparticipants 10 versus 7 percent.

Figure 5-44: 'Other' High Efficiency Equipment Adoptions, Participants and Nonparticipants, Medium and Large Customers



Overall, the data support the conclusion of a program effect for the 'other' end use. Particularly strong effects are found among larger customers and in the Local Program. Small and very small customers also exhibit a program effect, though it is smaller in magnitude and only evident when examining the subset of adoptions categorized as energy efficient.

Conservation Practice Adoption Rates

This section explores the rates of conservation measure adoption, i.e., no-cost actions that save energy, occurring in the participant and nonparticipant populations. This section also explores the types of conservation activities undertaken and the role of the audit in the decision to adopt conservation practices.

Figure 5-45 explores the pattern of conservation practice adoption rates in the small and very small customer segment, comparing participant adoption rates to the nonparticipant baseline group. The Figure shows a marked difference between participants and nonparticipants in their self reported rates of conservation practice adoptions, with participants far outpacing the nonparticipant group. Within the participant group, rates are similar across all of the delivery mechanisms and size categories, averaging just over 60 percent. Nonparticipant segments are also similar, with an average of about 26 percent.

Figure 5-45: Conservation Practice Adoption Rates, Very Small and Small Customers

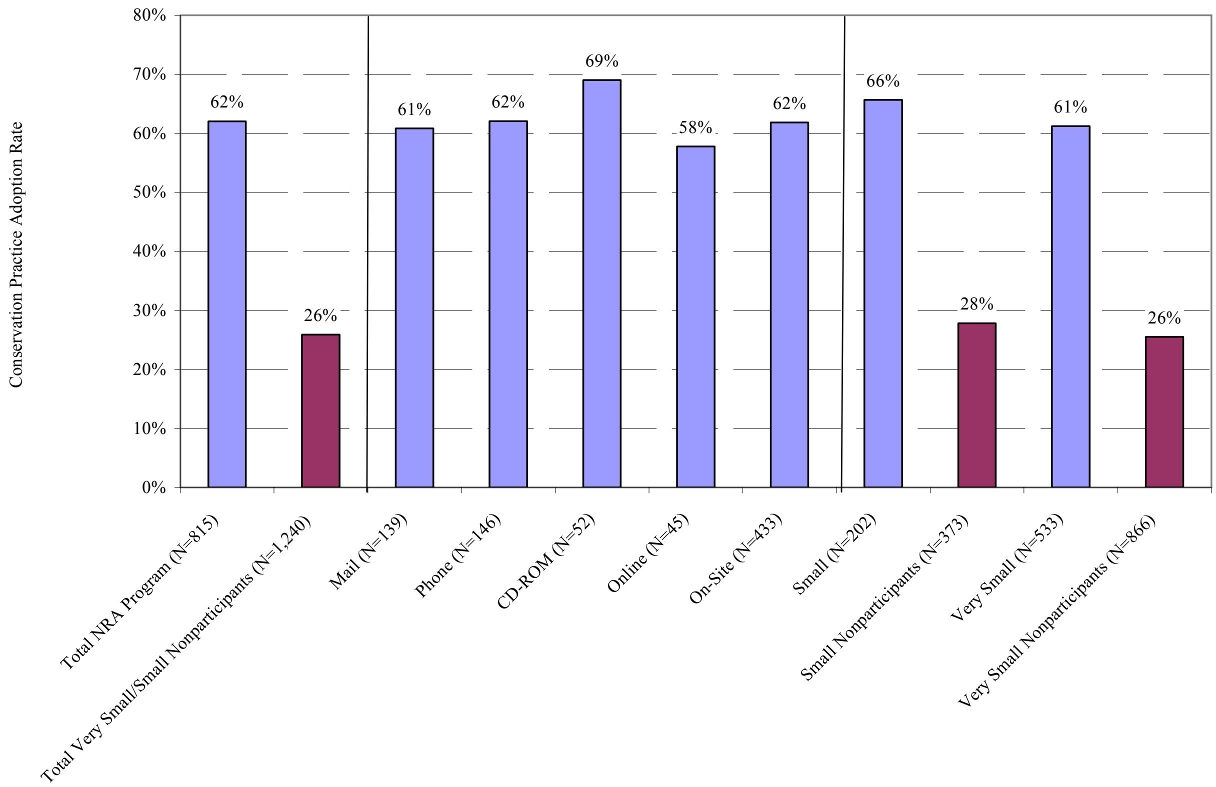


Figure 5-46 shows self-reported rates of energy conservation practice adoption rates within the Medium/Large customer segment. In contrast to the small and very small segment, participants in the medium and large segment show little program effect for conservation practices. Overall, participants and nonparticipants behave similarly, with overall adoption rates of about 45 percent. Participants 44 (nonparticipants) and 47 percent(participants).by a very slim, by The segment's overall practice adoption rate among nonparticipants is higher than among participants (The small and very small audit participants have more than double the rates of conservation than the respective nonparticipants. Medium audit participants show only a slight increase in conservation practice adoption– from 37 to 41 percent – over nonparticipants. Large customers show no program effect in conservation practice adoptions.

Figure 5-46: Conservation Practice Adoption Rates, Medium and Large Customers

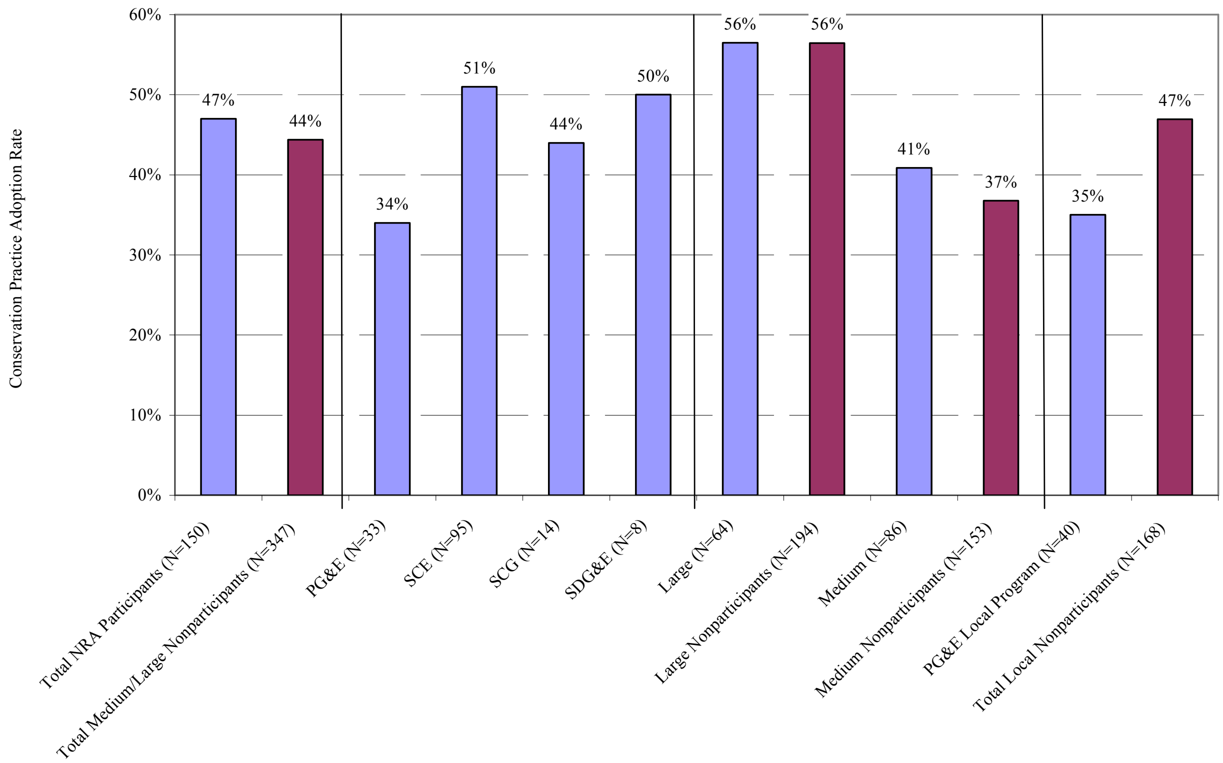
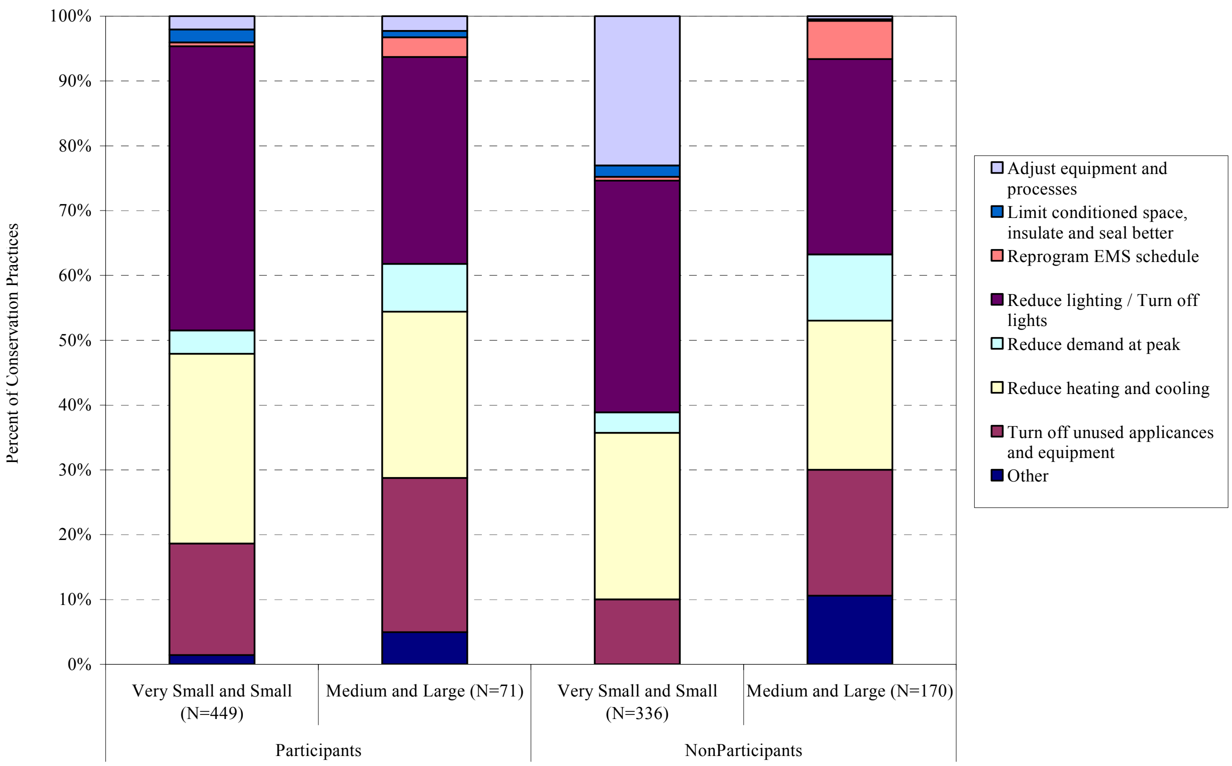


Figure 5-47 displays the specific types of conservation practices participants and nonparticipants are doing in both general size categories. Lighting reductions topped the list for all groups, with between 30 and 40 percent of all segments shown reporting such conservation practices. Around a quarter of all groups reported similar attention to reducing heating and cooling. Medium and large companies reported the highest rates of conservation by shutting off unused equipment, perhaps because of a higher incidence of energy-using process equipment. Similarly, medium and large customers are more likely to take steps to limit peak demand than smaller customers. The wider range of options open to larger companies perhaps contributed to their “other” category’s conservation adoptions being more frequent than those of smaller companies.

Smaller companies in general were more likely to conserve by limiting conditioned space. Given the higher incidence of energy management systems in larger companies, it is hardly surprising that the medium and large nonparticipants report the highest rate of conservation by reprogramming these systems.

As in the PY 2003 evaluation, the evidence provided by Figure 5-45 through Figure 5-47 suggests that the audit program *is* galvanizing small and very small participants to conserve more than the general sample. Medium and large participants showed little if any such effect. This effect in the very small/small segment was not born out in the SAE billing analysis results, so it remains unclear whether or not a conservation practice impact exists from the Audit program.

Figure 5-47: Types of Conservation Practices, Participants versus Nonparticipants



Adoption Rate Section Conclusions

In summary, this examination of participant and nonparticipant measure adoption rates yields some general indications regarding program impacts. First, adoption rates indicate the greatest program effects occur in the lighting end-use, where positive program impacts are indicated across all customer segments.

Impacts within the cooling end-use are also positive, though less consistent across segments and smaller in magnitude than for lighting. Program effects for the gas equipment end-use are not measurable at the statewide level. However, consistent with previous evaluation results, the SCG audit shows a positive program effect in the gas equipment end-use.

The fourth end-use, process equipment, was explored in the medium and large customer segment. Program effects appear to be positive within the process end-use, though differences between participants and nonparticipants are not consistent across customer segments. Surprisingly, greater impacts are indicated in the medium segment relative to the large customer segment. Local Program results do not indicate a program effect for the process end-use.

The fifth and last end-use is the catch-all category "Other" which includes refrigeration, motors, food service technologies, office equipment and outdoor lighting, among other technologies. Overall, the data support the conclusion of a program effect for the 'other' end use. Particularly strong effects are found among larger customers and in the Local Program. Small and very small customers also exhibit a program effect, though it is smaller in magnitude and only evident when examining the subset of adoptions categorized as energy efficient.

5.5 Gap Analysis

The "Gap Analysis" presented here examines the portfolio of program year 2004 and 2005 NRA program recommendations by IOU service territory, customer size, business type and delivery mechanism. The objective is to provide a better understanding of recommendation content and identify areas (such as measure end-uses, or integration of behavioral practices) that warrant greater or lesser emphasis. It also compares participant adoptions with audit recommendations to estimate a rate of follow through for specific recommendation types. The former analysis is based on tracking data and the latter on tracking data combined with survey responses.

The recommendation data available statewide is somewhat limited. PG&E was able to provide recommendations for on-site, phone and mail surveys, but not for their large company consultant audits[58]. SCE was able to provide recommendations associated with on-site surveys, but not for the most detailed, large customer audits[58].

[58] Recommendations were provided in hard copy and/or PDF files, but not in electronic database format, which is required for this type of analysis.

Table 5-35 below displays the distribution of the PG&E and SCE recommendations, by customer size category and end-use. Both IOUs, across both size categories emphasize lighting recommendations. Two-thirds of the PG&E recommendations and close to half the SCE recommendations are in the lighting end-use. Within the lighting end-use, both IOUs emphasis T-8/T-5 retrofits, and compact fluorescent lights.

SCE also shows a significant focus in HVAC recommendations, at over 40 percent of the total. These are concentrated in three measures, Air conditioners, HVAC economizers and programmable thermostats. Nearly 25 percent of PG&E's recommendations fall into the HVAC end-use, where the focus is on HVAC maintenance, reflective window film, and programmable thermostats.

About 10 percent of PG&E's recommendations are in the refrigeration end-use, and they are well diversified across all of the refrigeration measures shown. Refrigeration recommendations make up about 5 percent of SCE recommendations.

For both IOU's motors recommendations are more commonly offered to medium and large companies, where they make up about 2 percent of recommendations. Food Technologies and Water Heating measures make up less than 3 percent of PG&E's recommendations, and zero percent of the SCE recommendations.

Table 5-35: Summary of Measure Recommendations by Utility and Customer Size

Recommendation Description	Medium/Large		Very Small/Small	
	PG&E	SCE	PG&E	SCE
Agriculture	0.1%		0.0%	
Food Tech				
Reduce Hours (Equipment Specific)	0.1%		0.2%	
Other Food Recommendation	0.1%		0.0%	
Food Tech Total	0.2%		0.3%	
HVAC				
HVAC Maintenance	7.8%		13.0%	
Programmable Thermostat	5.6%	11.8%	5.7%	13.4%
Reflective Window Film	3.0%		6.3%	
Packaged/Split System A/C	2.1%	16.2%	1.2%	17.9%
Adjustable Speed Drives	0.9%		0.0%	
Remove Conditioning Unit	0.2%		0.0%	
Time Clock	0.1%		0.0%	
HVAC Economizer	0.1%	13.4%	0.0%	12.7%
Other	0.5%		0.0%	
HVAC Total	20.3%	41.3%	26.4%	43.9%
Lighting				
T-8 or T-5 Lamp and Electronic	24.3%	30.1%	39.3%	31.3%
Screw-in Compact Fluorescent Lamp	10.3%	12.3%	13.1%	13.1%
Wall or Ceiling Lighting Sensor	10.1%	2.3%	11.0%	1.3%
Exit Sign	4.7%	6.8%	2.9%	4.1%
Exterior HID Fixtures	0.8%		0.5%	
Add or Clean Reflectors	0.6%		0.2%	
Interior HID Fixtures	0.5%		0.2%	
Photocell or Timeclock	0.5%		0.2%	
Electronic Ballasts	0.1%		0.0%	
Other (Unspecified Lighting)	14.5%	0.1%	2.7%	0.0%
Lighting Total	66.4%	51.6%	67.3%	49.8%
Motors				
Motors	2.4%		0.2%	0.0%
Repair Compressed Air System(s)	0.0%	2.0%		1.1%
Motors Total	2.4%	2.0%	0.2%	1.1%
Refrigeration				
Strip Curtains	2.0%	0.8%	1.4%	1.5%
Cooler or Freezer Door Gasket	1.4%	1.5%	1.2%	2.0%
Auto Closer for Cooler/Freezer	1.1%		0.6%	
Vending Machine Controller	1.0%	2.3%	0.2%	0.7%
Non-Elect cond Evaporator	0.6%		0.4%	
Night Cover for Display Cases	0.5%		0.1%	
Case Lighting Elect Ballasts	0.2%		0.1%	
Evaporative Fan Motor/Controller	0.1%	0.5%	0.1%	0.9%
Insulate Bare Suction Line	0.1%		0.0%	
Multiplex Compressor System	0.1%		0.0%	
New Doors: Glass or Acrylic	0.1%		0.0%	
New Refrigerator Case with Doors	0.2%		0.0%	
Other (unspecified Refrigeration)	1.6%		0.3%	0.0%
Refrigeration Total	8.9%	5.1%	4.4%	5.2%
Water Heat				
Insulate Water Heat Tank/Pipes	1.3%		1.3%	
Reduce Pump Hours	0.2%		0.0%	
Replace Boiler/Water Heater	0.1%		0.0%	
Other	0.2%		0.1%	
Water Heat Total	1.8%		1.4%	0.0%
Total Recommendations (N)	**7,895**	**1,674**	**23,060**	**21,256**

Table 5-36 below compares the distribution of PG&E Audit recommendations to the distribution of PG&E customers' self-reported adoptions gathered in the impact survey conducted for this Evaluation. Adoptions by PY 2004/2005 NRA participants through the Express Efficiency and SPC programs identified through tracking system merges is also shown in the table. A breakdown of recommendations and self-reported adoptions is also shown by customer-size segment.

PG&E's Audit recommendations are more concentrated in the lighting end-use than customer adoptions, 72 versus 49 percent, respectively. Motors, refrigeration, agriculture and water heating measures are also more commonly recommended than adopted, but only by small margins. These patterns hold true for both very small/small customers and medium/large customers.

There are three end-uses where adoptions are more frequent than recommendations. The biggest of these "gaps" is for cooling measures, which account for 47 percent of adoptions but just 17 percent of recommendations. Gas appliance and industrial process adoptions are also more frequent than recommendations, but by relatively small margins[59].

The distribution of PG&E's Audit participant adoptions through the Express Efficiency program across the lighting and cooling end-use areas is remarkably close to the recommendation distribution, indicating a strong relationship between these two programs.

The distribution of PG&E's Audit participant adoptions through the SPC program are concentrated in industrial process, lighting, cooling and refrigeration end-uses. In comparison, the recommendations made to the medium/large customer segment are highly concentrated in lighting, exceeding the frequency of adoptions by a considerable margin (69 versus 39 percent respectively). Refrigeration recommendations also outpace adoptions, but by a reasonable margin, 11 versus 5 percent. Industrial process adoption recommendations are nearly non-existant[59].

There is little difference across customer size segments in the distribution of recommendations, which we find to be appropriate given the distributions of adoptions in these two categories. The population of recommendations made to the medium/large customer segment is quite similar in end-use distribution to recommendations offered to the very small/small customer segment. An examination of adoptions made across these two

[59] Recommendations made in PG&E's large company consultant audits were not available for this analysis, and likely include industrial process recommendations.

groups leads to the conclusion that this is appropriate for lighting, cooling, water heat and gas appliance recommendations, as these end-uses have similar adoption distributions by customer size. However, motors adoptions are three times more likely to occur in the medium/large segment than the very small/small segment. Reflectively, the recommendations are also more concentrated in the larger company segment.

These observations lead to the recommendation that the cooling end-use should be given more emphasis in audit recommendation reports. Similarly gas appliance and water heat recommendations should be increased some to reflect customer activity and to more fully exhaust potential energy savings opportunities.

Another important finding from Table 5-36 below is that industrial process adoptions are under-emphasized in the audit recommendation reports to medium and large companies, as indicated by participant adoptions, and SPC program adoptions.

Table 5-36: PG&E Recommendations Compared with Survey-Reported Adoptions

	Total		PG&E Cross Program Adoptions		Medium/Large		Very Small/Small	
End Use	Audit Rec's	PG&E Adoptions	Express Efficiency Program	SPC Program	Audit Rec's	PG&E Adoptions	Audit Rec's	PG&E Adoptions
Agriculture	0.1%	0.0%			0.1%	0.0%	0.0%	0.0%
Food Technology	0.2%	0.2%	0.2%	0.0%	0.2%	0.0%	0.2%	0.2%
Cooling	16.6%	46.7%	19.8%	18.9%	15.1%	45.3%	16.0%	46.8%
Lighting	72.1%	49.0%	72.4%	38.7%	69.4%	46.3%	73.9%	49.1%
Motors	0.8%	0.1%	4.3%	0.0%	2.2%	0.3%	0.1%	0.1%
Refrigeration	8.9%	0.2%	3.2%	5.0%	11.4%	0.0%	8.6%	0.3%
Water Heat	1.3%	0.9%	0.1%	0.0%	1.7%	0.8%	1.1%	1.0%
Industrial Process	0.0%	0.3%	0.0%	37.4%	0.0%	5.9%	0.0%	0.0%
Gas	0.0%	1.7%	0.0%	0.0%	0.0%	1.5%	0.0%	1.7%
N	92,881	3,059	6,912	222	8,674	613	28,884	2,446

Table 5-37 below compares the distribution of SCE Audit program recommendations to the distribution of SCE customer self-reported adoptions from the survey data. Adoptions by PY 2004/2005 Audit participants through the Express Efficiency and SPC programs identified through tracking system merges is also shown in the table. A breakdown of recommendations and self-reported adoptions is shown by customer-size segment in order to highlight differences in patterns of adoption and recommendation by customer size.

For the most common adoption end-use categories, lighting and cooling, SCE recommendations do a very good job of mirroring adoptions. SCE also makes measurable numbers of recommendations in refrigeration and motors, where recommendations outpace adoptions, but by a reasonable rate that can be interpreted as appropriately encouraging. However, recommendations are virtually missing in the industrial process, water heating, gas appliance and food technology end-use categories, where there is some measurable participant activity.

SCE Audit participant adoptions through the Express Efficiency program display a different end-use distribution than Audit participant adoptions as a whole. There is a greater focus on lighting, with nearly three-fourths of all SCE cross program express adoptions, as well as a healthy portion of motors adoptions (8.5 percent) relative to the population (0.1%).

An examination of recommendation distributions by customer size segment reveals little in the way of size specific distinctions. There are slightly more motors recommendations made to medium and large customers than to very small and small customers. Participant self-reported adoptions are also fairly similar, though medium and large are much more likely to adopt industrial process equipment than very small and small (6.4 versus 0 percent).

Table 5-37: SCE Recommendations Compared with Survey-Reported Adoptions

	Total		SCE Cross Program Adoptions		Medium/Large		Very Small/Small	
End Use	Audit Rec's	SCE Adoptions	Express Efficiency Program	SPC Program	Audit Rec's	SCE Adoptions	Audit Rec's	SCE Adoptions
Food Technology	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.3%
Cooling	44.0%	47.3%	15.3%	11.8%	41.3%	44.4%	43.9%	48.1%
Lighting	49.7%	48.0%	74.2%	60.0%	51.6%	44.9%	49.8%	48.8%
Motors	1.2%	0.1%	8.5%	0.0%	2.0%	0.0%	1.1%	0.2%
Refrigeration	5.1%	0.1%	1.9%	4.3%	5.1%	0.0%	5.2%	0.1%
Water Heat	0.0%	1.1%	0.0%	0.0%	0.0%	1.8%	0.0%	0.9%
Industrial Process	0.0%	1.4%	0.0%	23.9%	0.0%	6.4%	0.0%	0.0%
Gas	0.0%	1.4%	0.0%	0.0%	0.0%	2.3%	0.0%	1.1%
N	26,465	2,125	4,093	1,059	1,674	826	21,256	1,299

Table 5-38 below explores the pattern of adoptions among surveyed customers for whom recommendation data was also provided. Self-reported adoptions are compared with the set of recommendations given each customer. The table shows the number of surveyed customers receiving each listed recommendation, followed by the percent of those customers that self-reported the same adoption. For example, among PG&E customers, 26 surveyed customers were given a recommendation to install a programmable thermostat, of those 26 participants, 19 percent reporting installing a programmable thermostat. Of the 46 surveyed PG&E customers that received at least one cooling recommendation, 17 percent adopted at least one of those recommended measures.

For both IOU's the highest cooling recommendation follow-through rate occurs for the split or packaged air conditioner replacement recommendations. Programmable thermostats also have a high follow-through rate. PG&E and SCE have similar results for the lighting end-use, where good follow through rates are found for compact fluorescent lighting and exit signs. The recommendation to retrofit linear florescent fixtures with T-8 or T-5 technologies also has a very respectable follow-through rate. Overall, about one-third of customer that received lighting measure recommendations installed at least one of those recommendations.

Table 5-38: A Comparison of Recommendations and Self-Reported Adoptions, Among Customers with both Survey Data and Recommendation Data

	PG&E		SCE	
Recommendations	**Number of Surveyed Customer Receiving Rec.**	**Percent Adopted**	**Number of Surveyed Customer Receiving Rec.**	**Percent Adopted**
Cooling				
Adjustable Speed Drives	1	0%		
HVAC Economizer	2	0%	10	0%
Packaged/Split System A/C	11	27%	13	8%
Programmable Thermostat	26	19%	8	0%
Reflective Wind Film	12	0%		
Time Clock	1	0%		
Remove only	1	0%		
Total Cooling	46	17%	14	7%
Lighting				
Add Reflectors	2	0%		
Exit Sign	18	39%	6	33%
HID Fixtures	2	0%		
Photocell	1	0%		
Screw-in Compact Fluorescent Lamp	49	45%	14	21%
T-8 or T-5 Lamp and Electronic	75	16%	20	10%
Wall or Ceiling Mounted Lighting Sensor	40	10%	3	0%
Other	17	18%		
Total Lighting	107	35%	21	33%

Overall, these findings lead to several recommendations. First, the IOUs should consider increasing industrial process recommendations to the medium and large customer segment. In addition, more emphasis should be placed on motors, gas, water heat and food technology recommendations to add more balance to the recommendation and better reflect the distribution of participant adoptions. Similarly, there is some indication that the IOUs should increase the emphasis on cooling measures as well, to better reflect participant interest. The reader should bear in mind that the audits and database of recommendations analyzed here are not exhaustive and thus not completely representative of the statewide NRA program.

6

Process Assessment

6.1 Introduction

This section presents the results of the 2004-2005 Statewide Nonresidential Audit Process Assessment to review and evaluate the implementation of the program. Research undertaken for the process assessment component of this project includes telephone surveys with 401 program participants and 1,597 nonparticipants, in-depth interviews with four audit training course instructors and ten students, and ten program managers and program implementation staff.

As defined in the research plan, this process assessment seeks to address the following objectives:

- Examine program awareness and sources of information
- Determine participant energy efficiency intentions and knowledge
- Assess program marketing, delivery and training
- Determine key drivers for customer participation and follow-through
- Assess usefulness of the audit and participant satisfaction
- Estimate the effectiveness of audit follow-up initiatives
- Conduct a review of recent program changes and experiences
- Examine the cross-program influence of audits
- Build upon the 2003 Best Practices Assessment

These research objectives are addressed in the following five sections that make up the process assessment chapter. These sections focus on specific research topics or groups interviewed as a part of the process assessment and are organized as follows:

- ***Logic Model*** – An overview of the logic model is presented to give a clear perspective on how the program is designed to operate and achieve its intended goals.

- ***Program Manager and Staff Interviews*** – This section uses information from program manager and staff interviews to address the following issues:
  - Program implementation process
  - Recent program changes
  - Differences in implementation between the four IOUs
  - Benefits and challenges of the five audit delivery channels
  - Success of audit recommendation implementation
  - Marketing efforts

- ***Audit Training Efforts*** – This section addresses training conducted by the four IOUs for the audit program. Interviews with instructors and students of utility "How to do an Audit" courses were used to evaluate these efforts and determine their effectiveness.

- ***Participant and Nonparticipant Surveys*** – This section uses data gathered through participant and nonparticipant surveys to examine customer experiences with the audit program. Specifically, this section addresses the following issues:
  - Audit program awareness and sources of awareness
  - Knowledge of energy efficiency and intentions to install energy efficient measures
  - Attitudes and barriers toward energy efficiency
  - Participation drivers
  - Audit program satisfaction and usefulness
  - Effectiveness of follow-up
  - Cross program influence of audits

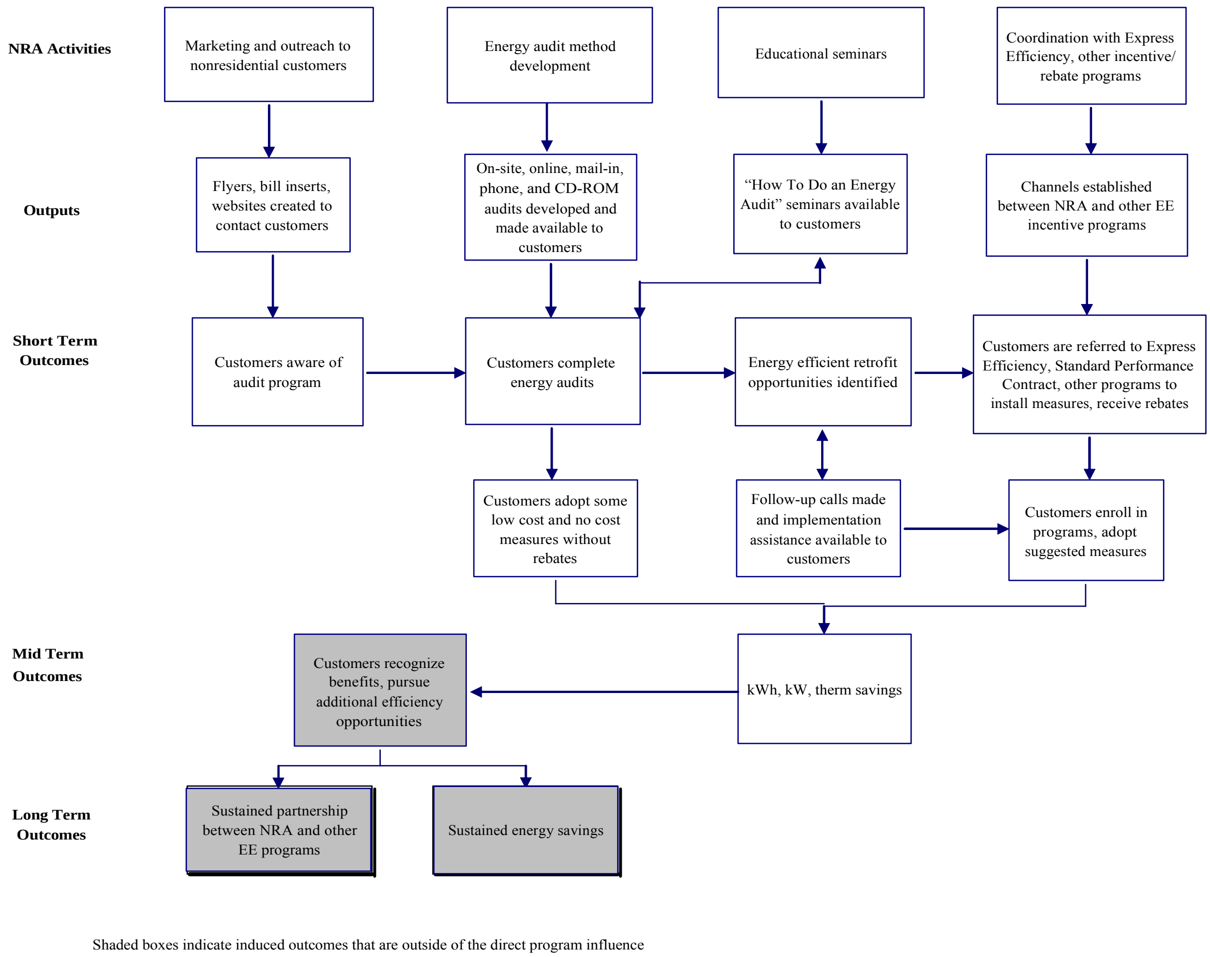
- ***Best Practices Assessment*** – A review of proven audit program best practices and emerging auditing technologies are presented to highlight effective strategies, techniques and tools applicable to the Statewide Nonresidential Audit Program.

Methodologies and background information are discussed at the beginning of each section within this chapter. These provide important details on how research was conducted for this process assessment and what information is included in each section.

6.2 Logic Model

The logic model for the 2004-2005 Statewide Nonresidential Energy Audit Program (NRA) in Figure 6-1 presents a process map of program activities, outputs, and resulting outcomes over short- and long-term horizons. This section examines the program logic model and resulting short-, mid- and long-term outcomes to give a more detailed overview of how the NRA Program operates and accomplishes its goals. The section is broken down into four subsections: activities and outputs, short-term outcomes, mid-term outcomes, and long-term outcomes. Components of each of the four subsections are examined to give a more detailed description of the logic model and program theory.

Figure 6-1: Logic Model for the 2004-2005 Nonresidential Audit Program (NRA)



6.2.1 Activities and Outputs

Marketing and outreach to nonresidential customers

The IOUs are responsible for conducting marketing and outreach efforts to solicit participation in the Nonresidential Audit Program. Examples of such efforts include flyers, bill inserts, websites and outreach through utility staff providing information about the program and encouraging participation.

Energy audit delivery methods

Five different energy audit delivery methods have been developed for nonresidential customers. These five different methods allow the utilities to address the different needs of customers of different sizes, locations, and with varying levels of complexity in a cost--effective manner. The five audit delivery methods currently in use include on-site, online, mail-in, phone, and CD-ROM audits.

Educational seminars

The four IOUs conduct educational training seminars to provide staff and other interested parties with the tools and information necessary to conduct an audit through the NRA program. These training seminars are made available to the public for all IOUs, except for SoCal Gas, who only offers them internally to staff.

Coordination with Express Efficiency, other incentive/rebate programs

The Nonresidential Audit Program is set to link up with other utility programs that provide incentives or rebates for measures recommended through the audit. Establishing these connections helps set up the transition from measure recommendation to implementation.

6.2.2 Short-Term Outcomes

Customers aware of audit program

Marketing and outreach efforts alert the customers of the Nonresidential Audit Program and its services and raise customer awareness of its availability.

Customers complete energy audits

After becoming aware of the program, some customers will choose to participate and complete the energy audits. Customers participate through one of the five delivery channels that best suits their individual needs.

Energy efficient retrofit opportunities identified

After completing the audit, customers become aware of opportunities for energy efficient retrofits. This puts them in the position to pursue these opportunities through a variety of channels in the future.

Customers are referred to Express Efficiency, Standard Performance Contract, other programs to install measures, receive rebates

Customers are referred to utility programs that offer incentives and rebates for measures recommended through the audits. These programs provide NRA participants with financial incentives to pursue recommended energy efficient measures. The two most common programs customers are referred to through the NRA Program are Express Efficiency and Standard Performance Contract.

Customers adopt some low-cost and no-cost measures without rebates.

After completing the audit, customers receive a list of recommended energy efficiency measures to implement. Some of these measures can be implemented at little or no cost and are more likely to be pursued by the customer because of their minimal financial impact.

Follow-up calls made and implementation assistance available to customers

The utilities attempt to boost the adoption of recommended measures by conducting follow-up calls with customers and offering implementation assistance. These encourage customers to follow through with recommendations after the audit has been completed.

Customers enroll in programs, adopt suggested measures

Customers who complete the audit will receive facility recommendations, references to utility rebate programs, and follow-up calls to encourage implementation. As a result, some of these customers choose to enroll in the utility rebate and incentive programs to help finance the implementation of measures recommended through the NRA Program. Customers my also adopt energy efficiency measures outside of utility-sponsored programs.

6.2.3 Mid-Term Outcomes

kWh, kW, therm savings

As a result of the audit, customers will choose to implement measures recommended through the program. These energy efficient measures reduce individual energy use and allow the utilities to realize kWh, kW and therm savings.

Customers recognize benefits, pursue additional efficiency opportunities

As an indirect benefit of the program, customers who install recommended measures begin to see the benefits through lower energy bills, better equipment performance, reduced maintenance, and reduced environmental impact. These customers realize the benefits of installing energy efficient measures and engaging in energy efficient practices, and they choose to pursue additional options on their own accord in the future.

6.2.4 Long-Term Outcomes

Sustained partnership between NRA and other EE programs

The NRA Program feeds a significant number of participants into utility programs providing rebates and incentives for energy efficient measures. These two types of programs are in an excellent position to develop a sustained partnership over time, as they compliment each other well and help the utilities achieve greater energy savings.

Sustained energy savings

The NRA program identifies opportunities for customers to save energy and directs them to actions, measures and resources that help them achieve these savings. Actions taken by customers result in sustained energy savings for the utilities and helps them achieve long-term savings targets.

6.3 Program Manager and Implementation Staff Interviews

This research task was designed to solicit perspectives on the relative strengths and weaknesses of the NRA delivery channels from Program Managers and implementation staff. To gather this information, ten in-person and telephone interviews were conducted with program managers and implementation staff from the four California IOUs as well as representatives from Nexus, a third-party implementer of CD-ROM, mail, and online audits. An interview guide was used to direct the interviews and focused on addressing the following topics:

- ***Exploration of Program Implementation Processes*** – understanding the key objectives of audit programs and how audit channels interact with incentive programs.
- ***Recent Program Enhancements and Prospective Changes*** – identifying specific changes in program implementation, the rationale for those changes and relative success of them.

- ***Differences in IOU Implementation*** – understanding how and why individual utility efforts differed from one to another.

- ***Relative Success of Program Delivery*** – Understanding which delivery channels targeted the various customer segments, and which channels were most successful.

- ***Implementation of Audit Recommendations*** – Identifying those recommendations that are more likely to be adopted and barriers to implementation.

- ***Marketing Efforts*** – Understanding marketing strategies undertaken and the relative cost of those efforts.

These topics are explored in further detail in this section to give a better account of NRA program processes. Quotes from interviews with program managers and implementation staff are also frequently referenced in this section, as they provide even greater insight into some of the major issues related to the program processes.

6.3.1 Introduction and Exploration of Program Implementation Processes

Each utility's commitment to NRA programs is well documented. They all have a long history of providing audits to large Commercial and Industrial customers. Each utility also recognizes the value of lower cost alternatives to on-site audits that can provide significant benefit to the broadest possible nonresidential customer base, including hard-to-reach customers. The suite of audits provided through the NRA program is uniformly viewed as beneficial for both the utilities and their customers.

The 2004-2005 NRA goals focused on simple completion of audits. By the time these interviews were conducted with program managers and implementers, the programs had evolved and each utility had pursued more independent paths than those set forth in the 2004-2005 statewide strategy.

Interviews with program managers and implementation staff revealed the different levels of sophistication and varying resources applied to the different audit channels. The interviews reflected utility views that nonresidential audits are a key service offering that provide significant benefits to a broad array of nonresidential customers. The utilities understand that certain audits types are not for certain customers/classes, with each devoting considerable strategic attention to understanding how to best leverage specific audits to certain market segments.

The utilities viewed the challenge of finding the most effective and efficient means of creating demand for the audits as a key to long-term success. Each of the utilities also viewed the audits as fulfilling three primary needs:

- To provide general information and education to those who are uninformed,
- To provide specific resources and direction for the more informed/sophisticated customer, and
- To stimulate participation in other utility programs.

Tracking the number of audits provided or conducted has not been a challenge. However, because NRAs are viewed as a key driver for participation in other programs, the value of tracking the interactions between NRAs and other programs is high. As the NRA program has evolved, each utility has been challenged to track the effectiveness of audits beyond the number of audits provided. Databases were not integrated nor frequently or easily updated. The challenge that confronted all the utilities in varying degrees is reflected by the following quote from one of the program managers: "Once the audit is complete, we have no way of knowing how it ties back to a particular program."

Program managers also cited the following issues they face that prevent optimal performance of the NRA Program:

- Resource constraints (e.g., $, insufficient or overextended staff).
- Lack of expertise (e.g., technical, IT, marketing).
- Changes in organizational strategy.
- Staff turnover.
- Challenges in coordinating with key stakeholders (e.g., marketing, key account representatives, IT).

6.3.2 Recent Program Enhancements and Prospective Changes

Interviews with utility staff reflected an evolutionary (as opposed to revolutionary) approach to optimizing existing NRA channels or exploring new methods. When asked what changes were made during 2005, no significant program changes were volunteered. One program manager volunteered, "We always 'tweak' and make minor changes." Some of these changes mentioned were:

- Improving customer access to available contractor pool.
- Recruiting more contractors to expand participating pool.
- Bringing laptop computers to events. This was described as a means of "showing not telling" customers the benefits of NRAs and how they work. "Our marketing group

is putting more emphasis on public visibility and this is a great way to interact with customers in a very substantial way."

Program managers cited other more significant initiatives and program enhancements that were identified (and in some cases initiated) in 2005 but more formally implemented in 2006. Some examples include:

- ***Development of on-bill financing options*** – There is an industry-wide understanding that first-costs represent a key obstacle to the broader adoption of energy efficiency measures. On-bill financing, in which the costs of a measure are incorporated into the utility bill, is viewed as an important strategic tool to address this market barrier and is of particular value to small commercial customers. It is expected that integration of on-bill financing into some of the audit channels will improve participation in utility programs. On-bill financing is not a NRA Program specific development for the utilities and was not viewed as a practical tool for SoCal Gas.
- ***Use of wireless auditing tools*** – Utility pilots of PDA tools for NRAs focusing on small businesses have shown (in some places) substantial impact in the market. PDAs are more powerful and show great promise for many applications. Some utilities were expanding the use of these tools while others were averse to broad adoption as a program focus. The benefits of wireless auditing tools cited during interviews include:
  - Allows easier targeting of underserved market segments
  - Easy to train staff
  - Improves staff productivity and impacts of audit recommendations
  - Eliminates paper
  - Allows for strategic partnerships with third-party implementers

  The interviews also revealed risks and problems associated with wireless auditing tools. Some of the issues cited include:
  - The technical capability of the tools in the field needs improvement (e.g., diagnostics, real-time reprinting/printing)
  - Utility staff are resistant to change. "Some of our staff felt the PDA was limiting."
  - Utilities have had difficulties getting PDAs to interact with their customer information database. "This is a big issue with our licensees. We have a firewall and need to protect our customer information. We are working with it but it is a drawback that may influence decisions of others not to pursue this option."

Additional smaller enhancements or changes were also discussed during the interviews. These changes were either in the process of being developed or considered by some of the utilities and include:

- Changing the business model to focus on mass market and target market strategies.

- Developing a universal auditing tool able to serve all sectors and delivery channels.
- Exploring demand response and photovoltaic components.
- Securing partnerships with third-party implementers to conduct field audits.

6.3.3 Differences in IOU Implementation

Not surprisingly, the interviews revealed different utilities with different perspectives and different challenges in implementing NRA components. By 2006, each utility was operating independently of the statewide requirements of 2004-2005. Some program managers acknowledged the value of the statewide mandate in getting them to focus on standard implementation channels and tools but were relieved to be operating more autonomously.

A few key points summarize why utilities function differently. These include:

- "We each have different business models and customer interests. Our focus is on maintaining consistency within our organization rather than with other utilities."
- "We recognize the value of state-wide consistency but collaboration with other utilities is difficult. It is time consuming and offers little tangible return. I don't have time for a lot of those meetings. I am responsible for four programs. I know my peers and if I need information I know whom to call. Our interests converge primarily with policy and less so with actual implementation."
- "I have a lot to do and a lot of responsibility to my organization. I can see how improved coordination with other utilities would be really valuable. But my experience is that it is often more of a ritual than a committed effort and, therefore not so productive. We do have a spirit of communication and collaboration. In 2004/05 we had quarterly meetings, (but) in 2006 I don't think we have had one. I don't think our programs have suffered for it."

Tracking data that illustrates the number of audits completed by delivery channel for each of the four IOUs reveals how the utilities differed in their approach to implementing the NRA program. However, the interviews offered little specific information about how program managers view their programs as functioning differently from those offered by the other IOUs. The following comments from program managers offer some additional insight into how program delivery differs between the utilities:

- "We are focusing on things that others might not value. (But) we will continue with all audit types because they each work for us in some capacity." This quote contrasts another offered by a program manager at a different utility: "(By 2006) We have discontinued mail, phone and CD-ROM channels and changed our third party implementation contractor."

- "We are moving away from shared third party implementers. Our innovations are focusing on integrating demand response, improving customer service and streamlining program delivery. We are moving away from labeling our programs and establishing ourselves as offering solutions. This creates a problem with other's interests in creating statewide programs."
- "We know that some utilities are de-emphasizing certain audits and understand why. We don't want to take any (audit) types off the table. They all work for us in some capacity."

Individual program managers can also have a significant impact on the implementation of the audit program and contribute to differences between utilities. One third-party implementer that had considerable experience working with a number of utilities for many years offered the following insight: "Variations in program implementation from utility to utility inevitably depend on the program manager and their experience and understanding of markets. Program managers that understand their programs, have specific goals and deadlines, and are curious about market dynamics are usually successful. Having decision-making authority usually helps too. These types have more ownership of their programs and are generally more adaptive."

6.3.4 Relative Success of Implementation

The data showing the number of audits by delivery channel is one means of determining success. This section provides an assessment of specific delivery channels by examining the benefits and challenges of the five audit mechanisms used during the NRA Program.

Online Audits

Benefits:

- Easy to update content.
- Best customer resource as it is available 24/7. This is of particular value to the busy small business owner.
- Most cost effective audit channel for some utilities.

Challenges:

- Limited ability to track effectiveness, "It is difficult for us to really understand how effective this is, how user friendly, how valuable the content is to what types of users."
- Online transactions do not track with customer records (for some utilities).

- Difficult for some utilities to draw traffic to the site.
- Does not benefit the customer that is looking for specific information and is not inclined to browse for it.
- Limited engineering algorithms cannot serve sophisticated measures.

One program manager was careful to differentiate between information updates which can be quick and inexpensive and reprogramming costs which can be extremely time consuming and expensive.

CD-ROM

Benefits:

- Great value to utility as a giveaway at events.
- Customers value it.
- Interactive and engaging for the user.
- Best for small and very small customers.

Challenges:

- Short shelf life. No way to update them.
- "Once we give them away, I have no way of knowing if anyone uses them or what they do with them. It is difficult for us to get data back from customers."

From the program manager perspective, the online audit is clearly viewed as the more logical solution than the CD-ROM. "Physical media has its limitations these days. I am hard pressed to see how many people, if given a choice between going online or using a disc, would choose the disc."

Phone

Benefits:

- Quick.
- Doesn't demand much of the customer. "Our customers get a lot of value for the amount of time it takes them. A quick interaction provides customers with spiral bound report that is full of good, usable information."

- Easily allows for referrals to other utility programs and resources. "Aside from on-sites, this is our chance to really interact with customers."
- Customers appreciate the interaction and ease.
- Provides the easiest means of hitting targets for the utilities.

Challenges:

- Success depends on the ability to ask the 'right' questions, quickly. "We can't keep customers on the phone for a long time."
- Phone lists can be inaccurate and outdated (e.g., closed accounts, wrong numbers).
- Success depends on customer input, which is not the most reliable and accurate source of auditing information.

There are advocates for both the inbound and outbound phone telephone strategy. Proponents of outbound suggest that the phone was easiest means of hitting audit targets. As one program manager stated, "When we reach people, we have 25% response rates!" This is contrasted to another that said, "We don't do cold calls because they are too intrusive. (But) when they call us, we take the time to ask if they would value an audit. It works great as a follow-up for (inbound) high bill phone calls because we have something to offer them at that moment."

In addition, one program manager volunteered that some evaluation work has suggested that customers act on the phone audits more than any other channel. However, they were not able to cite the source for this information.

On-site

All utilities offer on-site audits for their small, medium and large customers. Different models are used depending on market segment and customer size. A utility's approach to on-site audits of a large commercial or industrial customer is significantly different from the approach to a small commercial customer.

Benefits:

- Provides the most comprehensive audit
- Provides the best way to engage customers. Face time with customers provides the best means of understanding individual needs, opportunities and influencing outcomes. "A person can do this in a way that an on-line or CD or mail interaction cannot."

- Interns can be trained to complete audits for smaller customers so account executives can focus on larger customers

Challenges:

- Most resource intensive of the five delivery channels.
- Very labor intensive.
- Limited resources to conduct these on-site audits mean other delivery channels are necessary to meet program targets.
- Targeting different market segments can be difficult, since multiple marketing strategies must be used.
- Follow-through efforts can be difficult.

Mail

Benefits:

- Simple interactions. Questions are easy to answer.
- Customized, quality report for customers with lots of usable information.
- Mass mailing is one/best way to target hard-to-reach customers.
- Good seasonal tool.

Challenges:

- Low response rates.
- Slowest response times.
- Not an engineering tool.
- Expensive relative to on-line audit.

"Our response rates to mailings are usually very low (one to two percent), but we have had good luck with the audit using seasonal mailings. Specifically in the fall. We have had up to four percent response rates relative to cold weather…and rate increases."

6.3.5 Implementation and Adoption of Audit Recommendations

Program managers were only able to provide anecdotal information regarding implementation of NRA recommendations. They were not able to provide any comparative analysis of implementation of recommendations by audit channel. Program managers were able to inventory the relative obstacles of each channel, however. As for measure installation, interviewees provided unanimous agreement of the following:

- Low-cost and no-cost options are always most likely measures to be adopted.
- Lighting is an obvious opportunity that most decision-makers are aware of. Program managers perceive broad awareness of the benefits of lighting retrofits.
- Payback periods, ease of access to a program, and ease to complete transactions are key. Success depends most on mitigating first costs and confusion.
- For small businesses, direct install options are the easiest means of overcoming obstacles. These apply most simply to controls, thermostats, and lighting.
- Across all sectors and market segments, bigger ticket efficiency opportunities have the highest transaction costs that require the most time, the most detailed information and the most follow-up. On-site audits are the best vehicle for these larger measures.

Individual program managers also offered the following important insights regarding the effective implementation of audit recommendations:

- "We are also trying to address the first cost barrier and promote both payback and lifecycle cost benefits. This is best done one-on-one."
- "If we want to start to change the mind-set of our smaller commercial customers, then we need quick turnaround times. Interest drops off with more lag time. We are viewing speed as a best practice."
- "The time to reach customers is when they get or pay their bill. Either paper or online. For any customer, you can't create a needle in a haystack. One good idea was to bring the on-line tool to where customers are. We put it right at the on-line bill pay so there was no hunting at all. This is a challenge for commercial customers. How do you get more small commercial customers to pay on-line?"

6.3.6 Marketing

Utility resources, strategies and tactics vary significantly. The interviews with program managers and implementation staff sought general understanding of marketing strategies and activities in 2004-2005. This was not conducted in a quantitative fashion. The following paragraphs provide a summary of highlights from this section of the interviews.

Emphasis on Coordination*:* Each utility program manager commented on the challenge of coordination with the various departments that play a role in NRA fulfillment. These various agents can include Account Executives, Marketing staff, Corporate communications groups, Commercial/Industrial engineering staff, IT departments, and Third-party implementers. One program manager summed it up concisely as follows: "For us, coordination is key. A targeted marketing approach has worked best for us. We segment by small, medium, large and hard-to-reach and then by market segment. Some of the market segments include hotel/motel, restaurants, office, retail, hospitals, schools and universities, and warehouses. All our program marketing materials include audit information. We have worked hard to be able to direct certain audits to certain customers but it is no easy task. We work closely with (our marketing group) but our data is not synchronized with theirs. We have synchronized our marketing dollars to support other programs. We share costs and think it is effective and efficient. But frankly, there is no easy answer. We just keep trying."

Emphasis on Education*:* Each utility views NRAs as educational tools of enormous value. CD-ROM, mail, telephone, and online audits represent significant opportunities to use media to engage and educate certain customers. The on-site audits represent an equally important opportunity to educate customers in a more direct way. "We have wanted to provide simple messages for trouble-shooting and for educating the uninformed. We want to let all our customers know we are there to help them identify and solve problems."

Marketing Collateral: There are challenges for all utilities to develop marketing messages and tools for disparate audiences. NRA target markets are extremely diverse and present challenges of language and content. For small businesses that are not particularly sophisticated regarding energy efficiency, there has been emphasis on making materials that are easy to read, easy to use and not too wordy. The following is a noteworthy references to the statewide marketing tri-fold, "We have used it (but) it took a long time to get done. Things are bureaucratic enough with one utility. If you add four to the mix, you can imagine the challenge. Lot of effort, little value."

Focused Targets & Outreach Strategies*:* Each utility recognizes the value of segmenting and targeting specific NRA audiences. They are all, to some degree or another, challenged to do so effectively. Utilities have had success working with local governments and community organizations to saturate areas with program information. Specific references were made to using Mobile Energy Clinics and Feet on the Street efforts to promote NRAs and to use NRAs as a program channel. "I look at how other utilities try to market. We all know the value of doing this (targeted) work but it is a challenge for all of us. We send stuff out in waves (but) when we push information out, it is very difficult to get usable customer information in return."

The Online Challenge: The Internet is now a ubiquitous tool for almost all NRA customers. The potential of the web as a delivery channel for all types of information and auditing tools is enormous yet it presents significant challenges for each utility and their implementation teams. One challenge is how to create useful tools for such diverse users. This is particularly difficult given the frequent disconnects between planning and implementation groups, IT staff, and innovative web design and marketing resources. Developing effective marketing for online tools presents another significant challenge, since utility staff generally have little experience in this area. Further research is needed to provide effective solutions to this challenge.

The Strategic Value of NRAs: One utility program manager said the following: "Our marketing group has determined that audits are *the* major marketing mechanism for Energy Efficiency." This presents a significant strategic decision. If audits can be marketed effectively to ensure the broadest possible participation, then the utility can most effectively promote all its programs, measures and services.

6.4 Audit Training

This section focuses on the training efforts undertaken by the four IOUs as a part of the Statewide Nonresidential Audit Program. Fourteen in-depth interviews were conducted with instructors (4) and students (10) of various "How to do an Audit" courses offered as a part of the process evaluation. The purpose of these interviews was to determine the effectiveness of various audit training programs offered by the four California IOUs and how these programs could be improved. Information gathered through these training-focused interviews also generates a better understanding of how the utilities implemented the Statewide Nonresidential Audit Program as a whole. This section outlines the methodology used to gather data, examines main topics of inquiry for instructors and students, highlights key findings from the interviews, and discusses suggestions for improvement for the training methods used in 2004 and 2005.

Lists of participating instructors and students of 2004-2005 "How to do an Audit" courses were provided by the four utilities. Telephone interviews were scheduled with four instructors (one from PG&E, SCE, SoCal Gas and SDG&E) and ten students (three from PG&E, five from SCE, two from SoCal Gas and zero from SDG&E) and were conducted over a two-week period in May of 2007. Student contact information was not available for SDG&E. Interviews lasted roughly 30 minutes for instructors and 15 minutes for students. Responses from instructors and students were used to provide the following descriptions of the various elements of program training efforts.

6.4.1 Instructor Interviews

Course Information and Target Audience

Courses offered by PG&E, SCE and SDG&E were typically conducted at utility training centers and provided a comprehensive overview of how to conduct an audit within the nonresidential sector. Instructors were typically in charge of leading two to five classes per year that consisted of 25-50 students. Courses were intended to serve the commercial and industrial sectors and focused on individuals involved in facility management or building performance. Individuals from ESCOs, energy consulting firms and small municipal utilities also attended the audit training courses.

SoCal Gas courses were offered as training to new staff at the utility and were not available to the public. These courses were taught on an as needed basis to an average of one to five students at a time.

Goals and Learning Outcomes

Learning outcomes were similar for all four utilities. Courses focused on familiarizing students with the audit process, reviewing current technology related to auditing, identifying opportunities for energy efficiency measures, and collecting data for subsequent analysis. Instructors wanted students to leave the course with the ability to uncover energy saving opportunities using techniques and information presented in the class. In addition to these outcomes and goals, SoCal Gas employees receiving audit training were expected to be able to successfully complete the California Statewide Standard Audit.

Course Curriculum Development

Course curriculum at SoCal Gas and SDG&E was designed as a collaborative effort between multiple utility staff members. Materials from other related courses, such as outlines from PG&E's audit course, were used to help shape the curriculum for SDG&E. SCE took a more structured approach in developing their curriculum by enlisting two professional firms, ASW Engineering and McClain & Davenport Instructional Design Consultants, to assist their staff with this process. Utility instructors from the four IOUs indicated that the curriculum has proven to be effective, citing evaluations, feedback, and completed rebate requests as evidence that students appreciated the class and were applying the material covered. Curriculum was updated periodically to reflect changes in technology and policy. Instructors also tweaked some courses to remove subjects that were more advanced and emphasize more straightforward opportunities, though many suggested that more hands-on training and real-world examples would greatly improve the effectiveness of the curriculum.

Course Content and Feedback

All instructors reported that students were happy with the course and had appreciated the material. Formal evaluation forms were completed for SCE and SDG&E courses, though all instructors had received some sort of verbal feedback from students. Feedback was used occasionally to modify course curriculum to concentrate more on topics students found useful, such as site walk-throughs.

Instructors for PG&E, SCE and SDG&E did not follow up with students to determine what actions they had taken as a result of the course, though SDG&E instructors did monitor incoming rebate applications to see if previous students were turning any in. SoCal Gas instructors followed up with employees who had received the training at least three times to make sure they were doing well and meeting their goals.

Instructors believed that hands-on training and using actual examples were the most important pieces of content for the audit courses. This content was cited as being the best at preparing students to independently identify opportunities in the field after leaving the course. Instructors indicated that students were most interested in specific energy and money saving applications in their respective facilities and wanted to know what methods to use to use to identify them.

Marketing

Instructors were not directly involved in marketing and had some difficulty assessing its effectiveness. They all believed courses were marketed using traditional methods (flyers, emails, website, word of mouth, etc.) and cited high attendance as evidence of its effectiveness. Their only suggestion was to include testimonials of what individuals had been able to accomplish after completing the course to give prospective students a better idea of what they could expect to get out of the training. All instructors promoted other utility offerings and programs through the training class since they linked very well with the audit program.

6.4.2 Student Interviews

Background

Ten students were interviewed who had participated in one of the four utilities' audit training courses (three PG&E, five SCE, two SoCal Gas and zero SDG&E). These individuals came from the following professional backgrounds: three staff from other utilities, three facilities managers, two SoCal Gas employees, one photovoltaic contractor, and one architectural consultant.

Pre-Participation

All PG&E and SCE students had heard about the courses through email or direct mail. Many had taken classes from the utility in the past and were on a mailing list to receive information about course offerings periodically. All students who had taken classes in the past from the utilities believed them to be very valuable for their respective professions. Students cited the following as being the most important reasons for why they initially attended the "how to do an audit" training course:

- Learning how to reduce energy costs.
- Improving general knowledge of energy efficiency and conservation for career development purposes.
- Learning specific energy auditing techniques.
- Developing efficiency and auditing programs at small municipal utilities.

SoCal Gas students were employees of the utility and were required to take the course as part of their job. The two individuals interviewed from SoCal Gas had hoped to gain a better understanding of the auditing tools and process used by their company through the training in order to use it effectively in their work.

Audit Training Course

All students surveyed indicated that the course had met their expectations. Students cited the following aspects of the course as the most important or beneficial:

- Specific examples of what to look for.
- Auditing techniques.
- Tools available through the utilities.
- Learning how to calculate savings.
- Services and rebates offered by the utilities.
- Measures specific to lighting and HVAC.

Students also reported learning about other utility program and measure offerings through the training, with many signing up for additional courses in other subjects as a result of this class.

Course Impacts

Most of the students attending the audit training reported taking some sort of action as a result of completing the course. Three of the students used the training to perform energy audits at outside facilities to recommend various efficiency and conservation measures. Many of the students reported implementing strategies learned from the course at their own facilities, while several also used information from the course to develop audit plans for their respective organizations and facilities. Only two out of the ten students indicated that they did not undertake much action as a result of the training.

Recommendations

Most students thought the courses were very well run and had few major recommendations as to how they could be improved. Some suggested holding the course at satellite locations (i.e., Orange County for SCE) to make it more accessible, spending more time on the hands-on elements and rebates offered by the utility, or including auditing techniques for small facilities in addition to topics covered. Students generally thought marketing was fine, though some suggested enlisting local chambers of commerce to increase visibility and emphasizing that the course was offered free of charge. This suggestion is discussed in further detail in the best practices section located at the end of this chapter.

Students were interested in additional education, training and support from the utilities that was focused on emerging renewable and energy efficiency technologies. Specifically, there was a high level of interest in solar technology and learning how the utilities could help individuals install solar projects at their facilities. Students indicated that they were interested in solar technology but were unaware of the costs, process of installation, calculating savings, and funding offered by the utility, and would like to learn more about these topics.

6.5 Participant and Nonparticipant Survey Results

This section summarizes findings from telephone surveys with 401 Program Year 2005 Audit program participants and 1,597 nonparticipants. The section is organized by various topics of inquiry and includes the following:

- Audit program awareness and sources of awareness.
- Knowledge of and intentions to install energy efficiency measures.
- Attitudes and barriers toward energy efficiency.
- Participation drivers.
- Audit program satisfaction and usefulness.
- Audit follow-up initiatives.
- Cross-program influences.

Graphs, figures and frequencies are used frequently throughout this section to illustrate the experiences and perceptions of participants and nonparticipants with the audit program.

6.5.1 Audit Program Awareness and Sources of Awareness

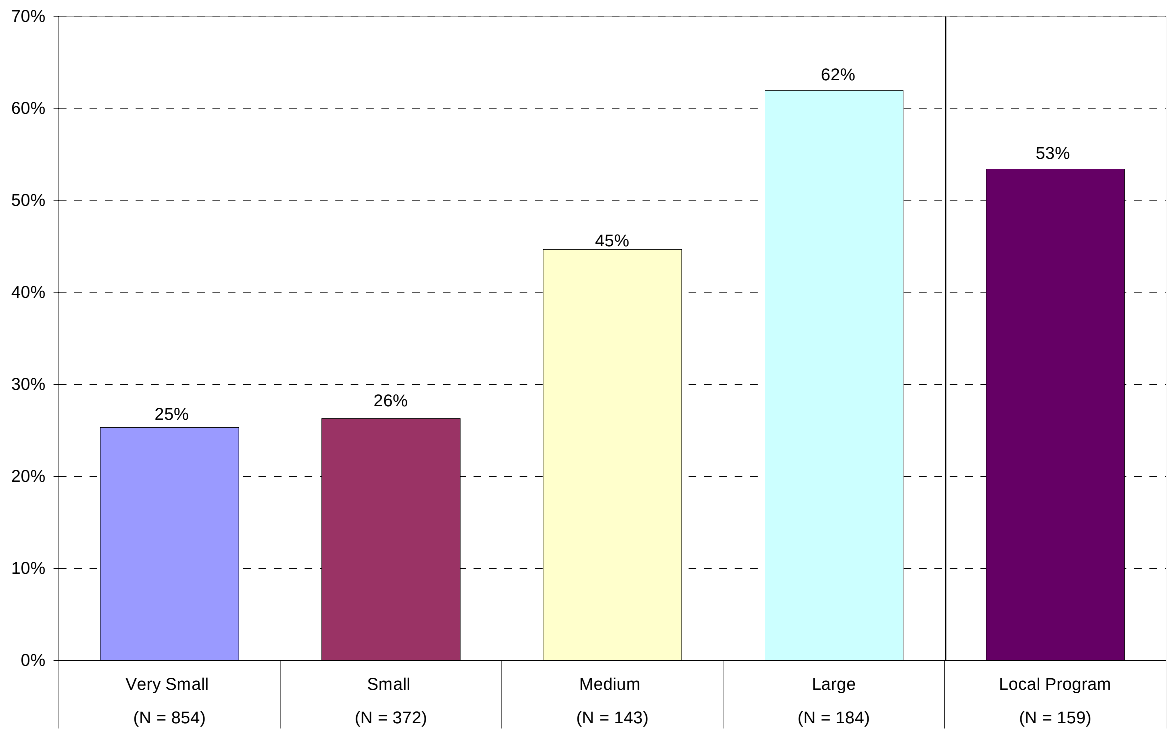
This section examines awareness of the 2004 statewide Nonresidential Audit program among nonparticipants. Additionally, participants' and nonparticipants' sources of awareness are compared, as this may suggest which marketing efforts are most successful at encouraging participation.

Among nonparticipants, rates of program awareness are higher for medium and large businesses than for smaller businesses. About one-quarter of small and very small nonparticipants are aware of the energy audit program. Forty-five percent of medium nonparticipants and sixty-two percent of large nonparticipants are aware of the program. Relative to the results of the PY 2003 Evaluation, nonparticipant awareness has declined somewhat for smaller customers[60] while remaining consistent among larger customers.

[60] Nonparticipants aware of the audit program made up 32 percent of very small customers and 36 percent of small customers, 50 percent of medium customers, and 65 percent of large customers in 2004.

The rate of Audit program awareness among nonparticipants of the Local Program is also shown in Figure 6-2. The Local Program nonparticipant group is a group of PG&E medium and large nonparticipants weighted to represent the Local Program participant population by size and NAICS code distribution. Among this group, the rate of awareness was relatively high at 53%.

Figure 6-2: Rate of Audit Program Awareness Among Nonparticipants



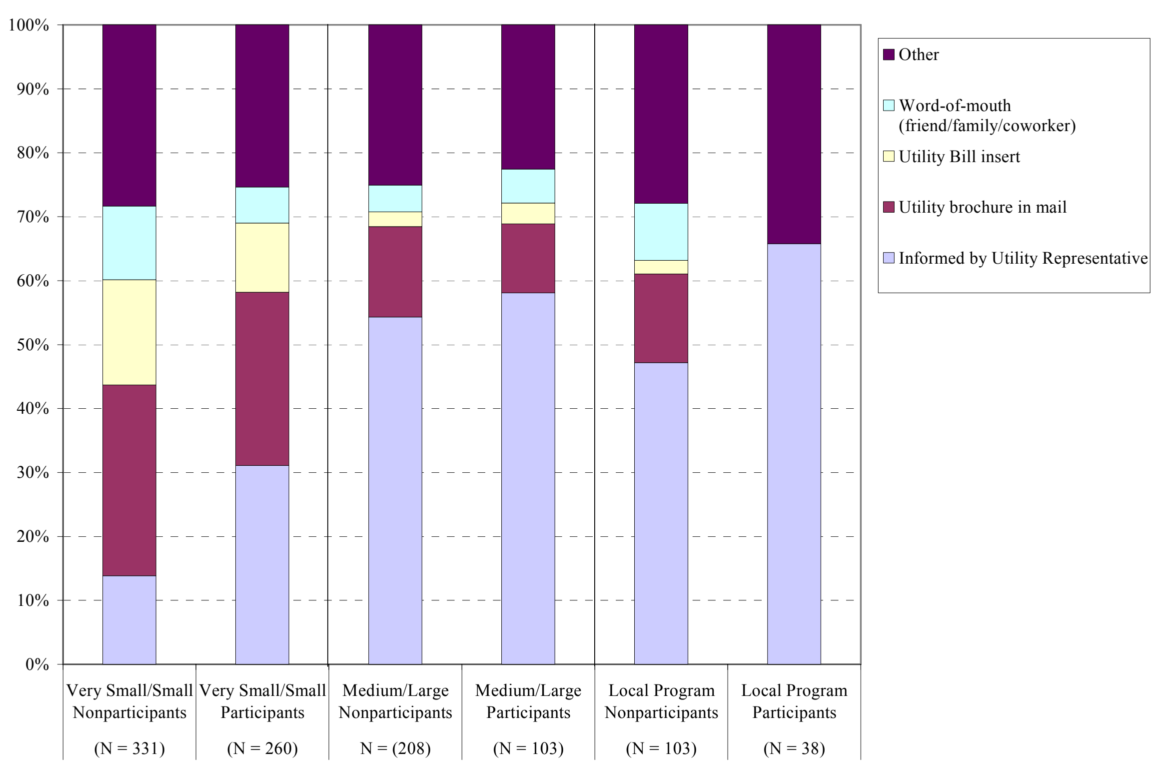
Sources of awareness of the Audit program varied by customer size and by participant status. By far, the single most often reported source of awareness was utility representatives. Over 60% of medium and large customers reported being told about the Audit program by their utility representative, regardless of participant status. Among small and very small customers, 33% of participants and 15% of nonparticipants were informed via a utility representative.

The largest source of awareness for small and very small nonparticipants was utility brochures in the mail, reported by 33% of these customers. Additionally, 29% of small/very small participants reported learning of the program via utility brochures. In general, utility brochures and utility bill inserts accounted for a larger proportion of awareness for small/very small customers compared to medium and large customers; combined, mail media accounted for 51% of small/very small nonparticipants' awareness, and 40% of small/very small participants' awareness.   Of medium and large customers, 19% of nonparticipants and 15% of participants learned about the program via mail media.

Utility representatives are clearly an effective source of program information for medium and large customers. On the other hand, small and very small customers appear to be most influenced by mail media, including utility bill inserts and mailed brochures. If nonparticipants are considered a proxy for the general population, then comparing participants to nonparticipants suggests that these marketing efforts are effective; for each source of awareness, of those who learn about the program, a sizeable portion appear to participate in the program.

Figure 6-3 shows the sources of Audit Program awareness for participants and nonparticipants by customer size. Among PG&E Local customers, participants were more likely to report that they were informed of the program by their utility representative, with 63% of participants and 53% of nonparticipants reporting this source of awareness. PG&E Local participants did not report hearing of the program via utility brochures in the mail, utility bill inserts, or word-of-mouth, whereas nonparticipants did report these sources of awareness. For PG&E Local customers, utility representatives appear to be the primary source for successfully encouraging participation in the Audit program.

Figure 6-3: Sources of Audit Program Awareness



Sources of participant awareness by delivery mechanism. Those who participated in on-site audits or audits over the phone were most likely to have become aware of the Audit program via a utility representative. On the other hand, those who participated in mail or CD-ROM audits were most likely to have been informed about the program via utility brochures in the mail. Additionally, a sizeable minority of mail and CD-ROM participants, as well as on-site and phone participants, were informed via utility bill inserts.

It should be noted that these results may be driven by the size distribution of the different delivery channels. For example, about half of the on-site sample are medium/large participants, which may explain why they were more likely to have contact with their utility representative. Mail and CD-ROM participants consist of small and very small customers, who, as shown in Figure 6-4, tend to become aware of the program via brochures and bill inserts. Phone participants consist of small/very small customers, but these participants may have been informed of the Audit when they called the IOU about their bill – leading to a higher rate of awareness via utility representatives for this group.

Figure 6-4: Sources of Participant Awareness by Delivery Mechanism

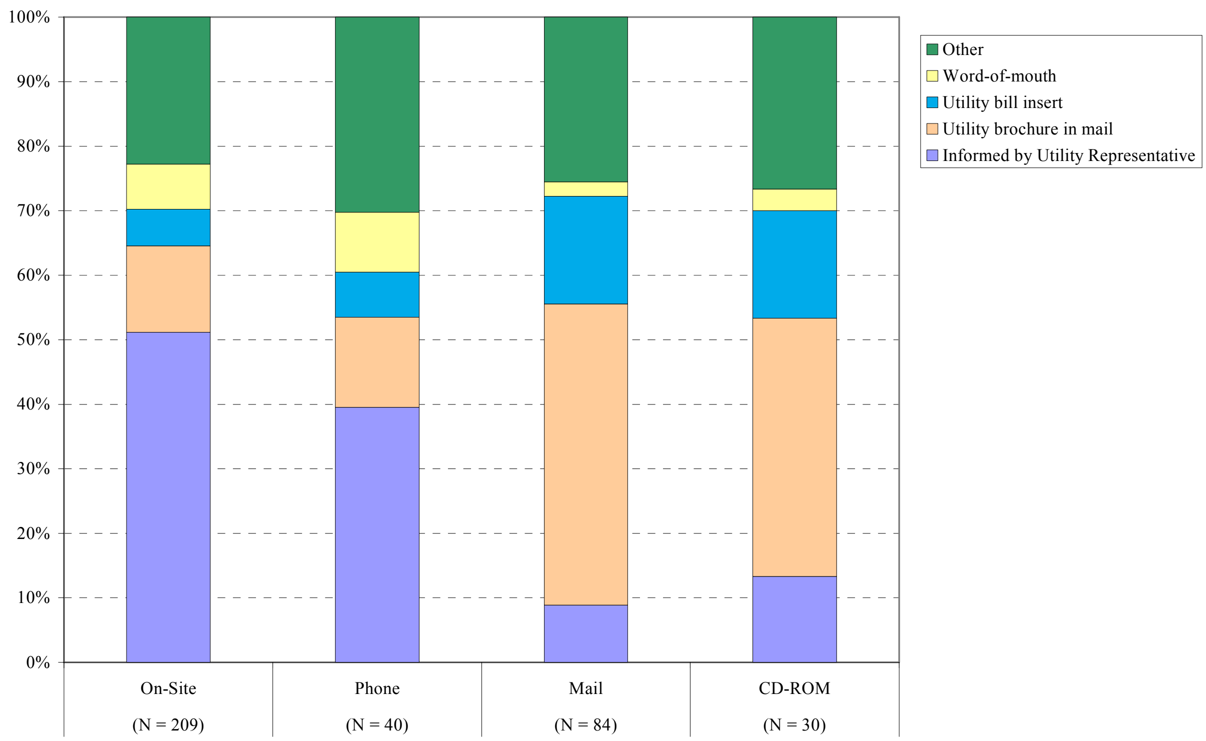
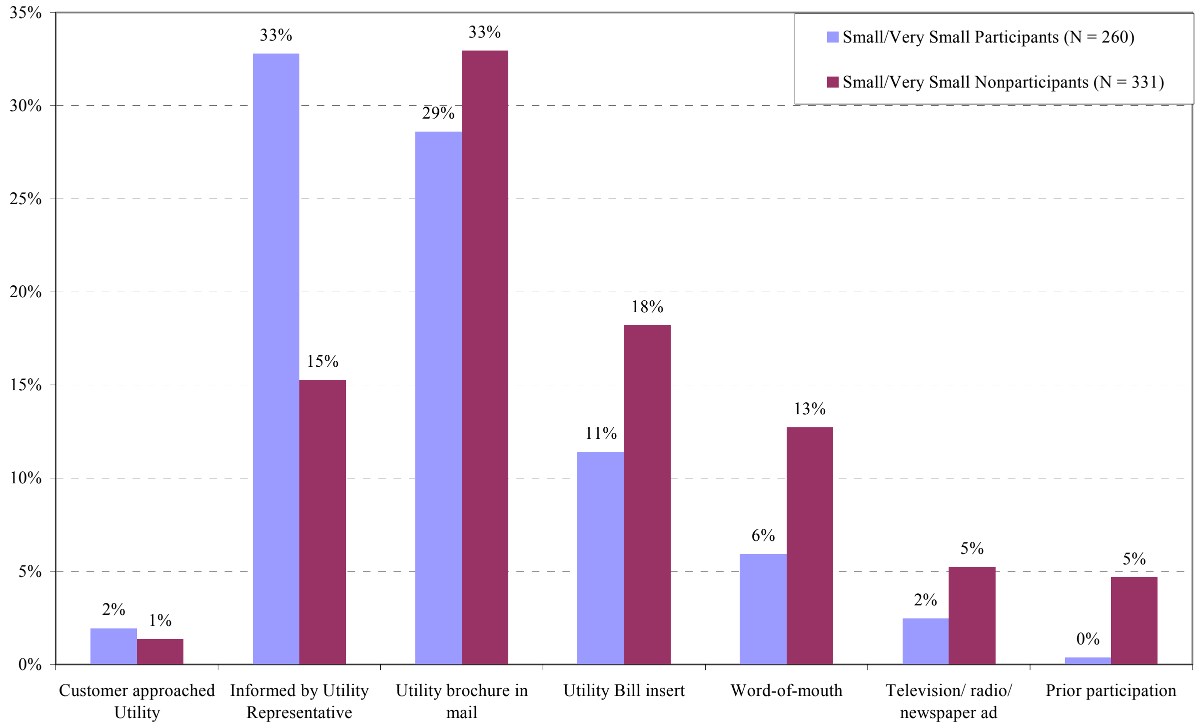


Figure 6-5 details the variety of sources of awareness reported by small/very small participants and nonparticipants. The greatest proportion of small/very small participants reported learning of the Audit via their utility representative, while the greatest proportion of nonparticipants learned about the Audit via mailed brochures.

Consistent with the 2003 Audit, mailings continue to be a reliable source of information. Of small and very small customers, 29% of participants and 33% of nonparticipants reported utility brochures as a source of information, while 11% of participants and 18% of nonparticipants reported utility bill inserts as a source of information. On the other hand, only 2% of participants and 5% of nonparticipants reported receiving information about the Audit via television/radio/newspaper ads. Mail media appear to be an effective marketing strategy among small and very small participants. If nonparticipants are considered a proxy for the general population, then for example, it can be concluded that 29% of the 33% of customers who become aware of the Audit program via brochures in the mail go on to participate in the Audit.

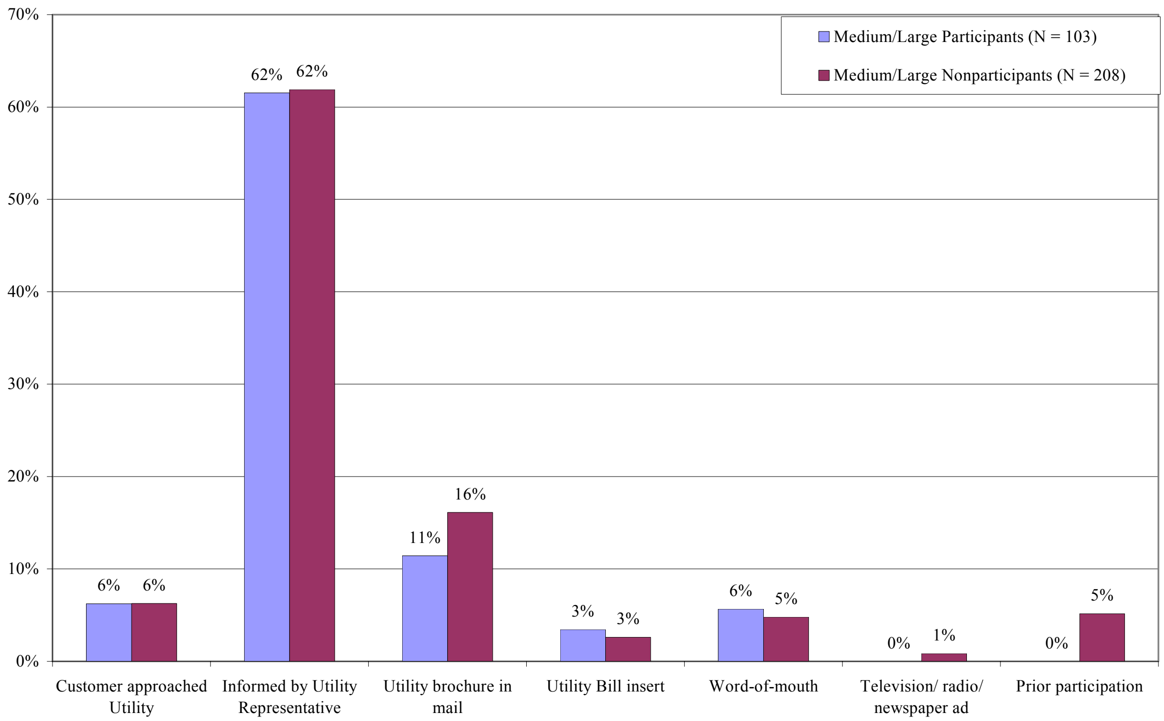
If nonparticipants are considered an approximation of the general population, then it can be assumed that among the general population, approximately 15% became aware of the program through their utility representative. Among Audit participants, 33% became aware of the program through their utility representative, suggesting that while utility representatives contact a fairly small percentage of the total population, this type of outreach has a high success rate among very small and small customers.

Figure 6-5: Very Small/Small Customer Sources of Awareness, Participant vs. Nonparticipant



As shown in Figure 6-6, Medium and large customers were very likely to have received information about the Audit program via their utility representative; sixty-two percent of both participants and nonparticipants learned about the program in this way. Although not as effective as utility representatives, utility brochures in the mail were also an effective source of awareness; while 16% of nonparticipants learned about the Audit in this way, 11% of participants did so. Nonparticipants were also more likely to cite prior participation as a source of awareness, suggesting one reason for their nonparticipant status. Utility bill inserts do not appear very effective, as only 3% of participants reported bill inserts as a source of awareness. Likewise, television and radio ads were not reported as sources of awareness for any medium/large participants.

Figure 6-6: Medium/Large Sources of Customer Awareness, Participant vs. Nonparticipant



Of Local Program participants, 3% reported hearing about the program when they approached the utility. None reported that they learned of the program via television/newspaper/radio ads or from participation in previous years. Of PG&E Local nonparticipants, 4% reported that they heard about the program when they approached the utility. Television/newspaper/radio ads were a source of awareness for 4% of Local Program nonparticipants, and 5% cited prior participation as a source of awareness.

6.6 Conclusions – Program Awareness and Sources of Awareness

Small and very small nonparticipants are generally unaware of the Audit program – only 25% of these customers reported awareness. On the other hand, medium and large nonparticipants have a sizeable proportion of awareness: 45% and 62%, respectively – an increase from 2003. This is good news, because it means that more medium and large customers are becoming aware of the Audit program. The challenge is to motivate these nonparticipants to take part in the Audits.

Sources of program awareness vary by delivery mechanism; those who receive on-site and phone Audits tend to learn about the program through their utility representative, whereas those who participate via mail and CD-ROM tend to learn about the program through utility brochures in the mail and utility bill inserts. However, these results may simply be a function of the size distribution of the various delivery channels.

The most common source of awareness for medium and large customers is utility representatives. Among small and very small customers, participants are most likely to gain awareness through utility representatives, while utility brochures in the mail are the most common source of awareness for nonparticipants. These findings suggest that among the general population of small/very small customers, it is more common to be made aware of the Audit program via utility brochures in the mail; however, utility representatives appear to be a more effective means of inducing participation. Television and newspaper ads, potentially expensive forms of advertising, account for a very small proportion of program awareness. Perhaps this form of advertising is not currently being utilized. If recent marketing activities include outreach via these media, perhaps visibility of television/radio/newspaper ads could be improved, or maybe this is simply not a worthwhile method for encouraging participation in the Audits.

As with medium and large customers, Local Program customers have high levels of awareness of the Audit program, and the majority of participants were informed via their utility representative.

6.6.1 Knowledge of Energy Efficiency & Intentions to Install Energy-Efficient Measures

This section explores self-reported levels of energy efficiency knowledge as well as intentions to purchase high efficiency equipment. Comparisons of these important population characteristics among participants and nonparticipants provide an indication of the success of the program in educating customers about energy efficiency opportunities as well as motivating them to install energy efficient equipment.

Figure 6-7 shows small and very small customers' self reported knowledge of energy-efficient products. Participants and nonparticipants were asked to rate their knowledge on a 1 ("not at all knowledgeable") to 10 ("extremely knowledgeable") scale. Participants report greater knowledge of energy-efficient products than nonparticipants, with this difference more apparent among very small customers; very small participants had an average response of 5.8, while very small nonparticipants had an average response of 4.8. It appears as though the Audit program may be effective in increasing smaller customers' self-reported knowledge of energy-efficient products that are available.

Figure 6-7: Knowledge of Energy-Efficient Products, Mean Responses of Small/Very Small Customers

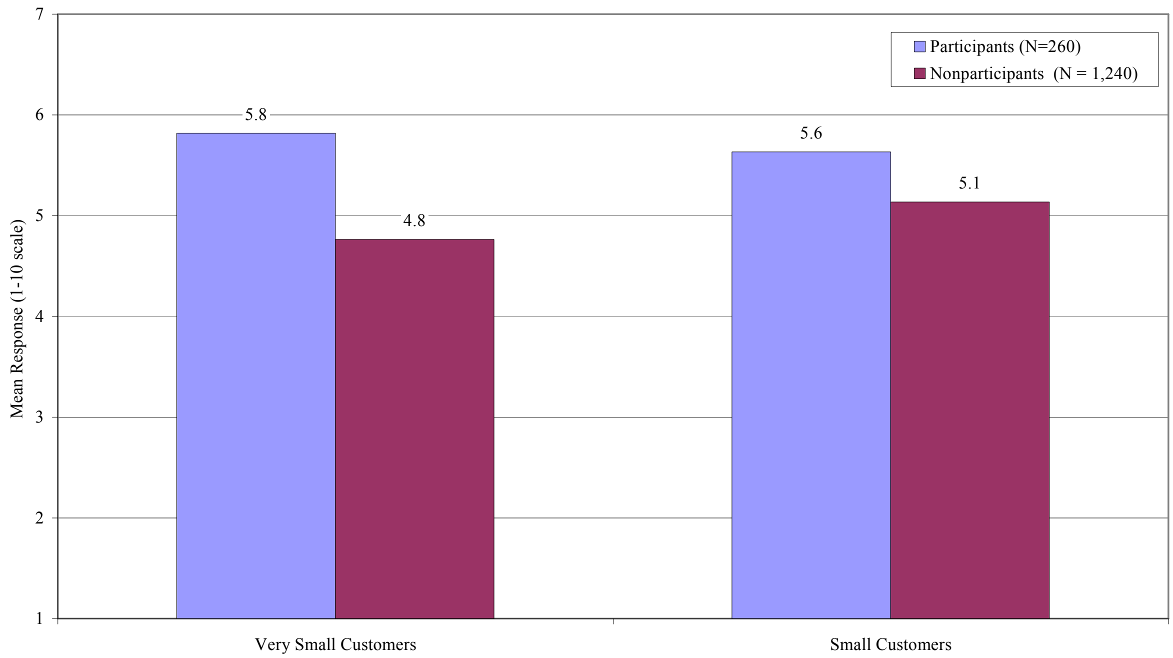


Figure 6-8 shows medium and large customers' mean responses when asked about their knowledge of energy-efficient lighting and HVAC systems. Customers were asked to respond on a 1 – 10 scale, with 1 being "not at all knowledgeable" and 10 being "extremely knowledgeable." These data allow conclusions about the success of the Audit program in increasing participants' knowledge of energy-efficient lighting and HVAC systems.

Medium and large Nonresidential Audit customers reported being slightly more knowledgeable about energy saving opportunities for lighting than for HVAC systems. Audit participants tend to be somewhat more knowledgeable about energy-efficient lighting than nonparticipants (mean ratings of 7.0 and 6.6, respectively). However, participants and nonparticipants are equally knowledgeable regarding HVAC systems.

Local Program customers show a similar pattern. Local Program participants report being more knowledgeable about energy saving opportunities for lighting than for HVAC systems. For lighting, PG&E Local participants have a mean knowledge rating of 6.8, while the mean rating for Local nonparticipants was 6.3. Differences were less apparent for HVAC, although participants do report marginally greater knowledge than nonparticipants.

In general, and although differences were small, Audit participants report somewhat greater knowledge than nonparticipants of energy saving opportunities for lighting. Among Local

Program customers, participants tended to report somewhat greater knowledge than nonparticipants for energy saving opportunities for both lighting and HVAC systems, although the difference was more pronounced for lighting. These results suggest that although the Audit program may be somewhat effective at increasing knowledge of energy-efficient lighting, there is room for improvement. The Audit does not appear to be effective in increasing knowledge of energy-savings opportunities for HVAC systems.

Figure 6-8: Knowledge of Energy Savings Opportunities for Lighting and HVAC Systems Among Medium and Large Customers

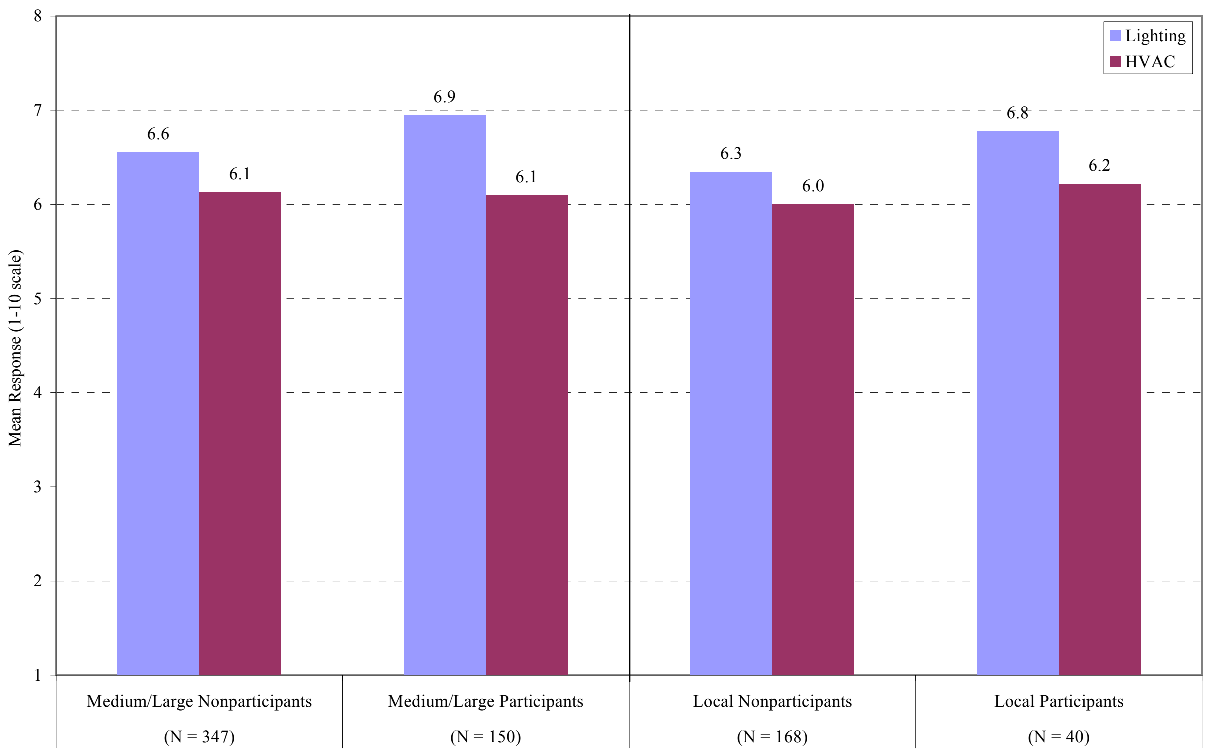


Figure 6-9 shows that across delivery mechanisms, knowledge of energy-efficient products is generally consistent, with the exception of those who participated in the Audit via CD-ROM, who report greater knowledge of energy-efficient products. These participants had an average response of 6.6, with 1 being "not at all knowledgeable" and 10 being "extremely knowledgeable." Among the remaining delivery mechanisms, there are only negligible differences in self-reported awareness of energy-efficient products, with mean responses ranging from 5.6 to 5.8. Although those who participated via CD-ROM report greater knowledge of energy-efficient products, compared to the remaining Audit delivery mechanisms, data were only available for the 30 CD-ROM participants who responded to the survey. It is also possible that those who participated via CD-ROM already had greater energy efficiency knowledge *prior to participation*.

Figure 6-9: Knowledge of Energy Efficiency by Delivery Mechanism

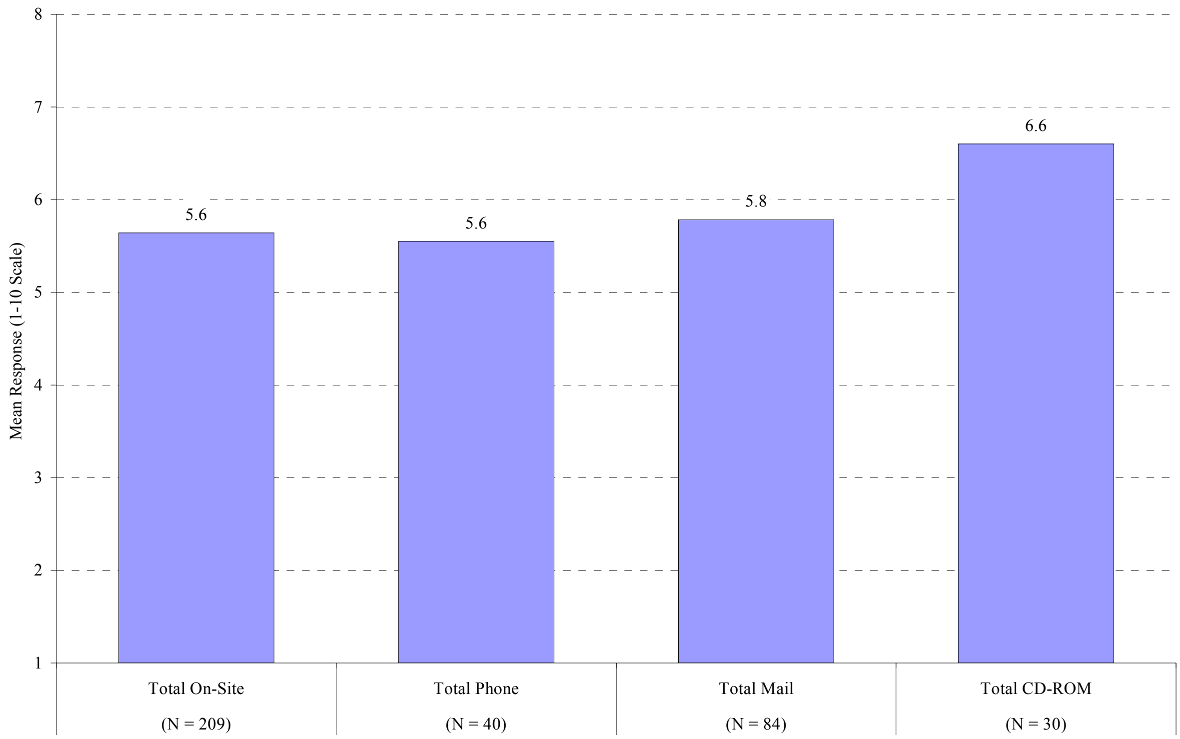
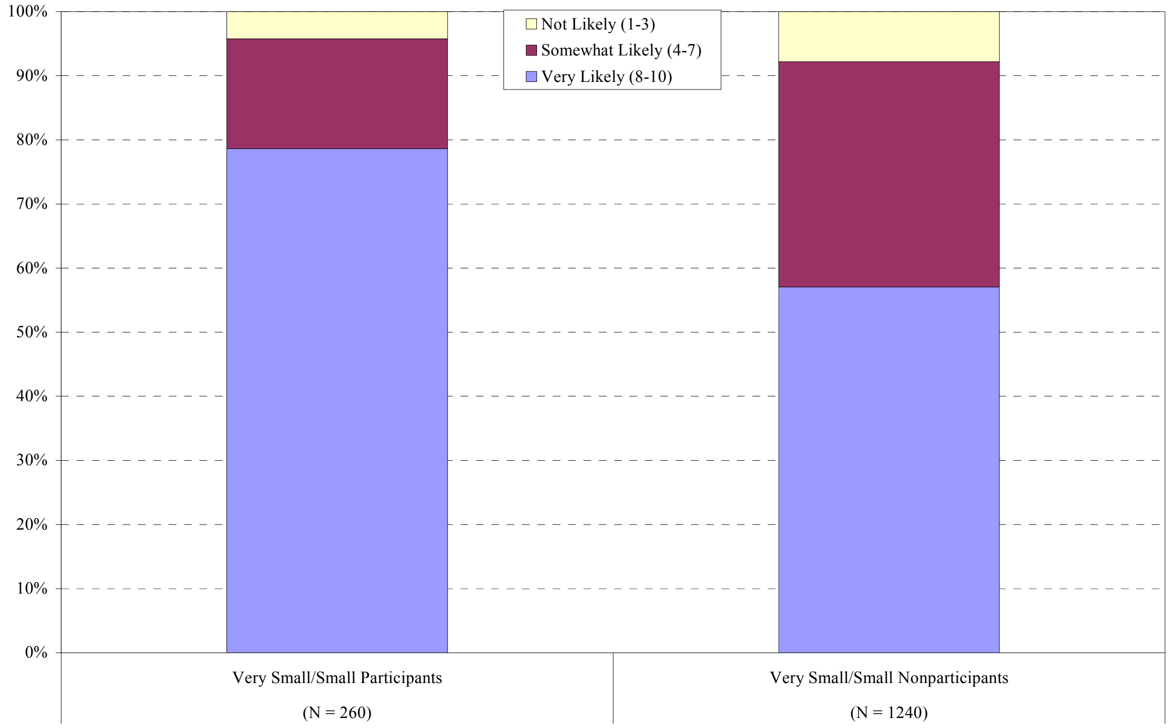


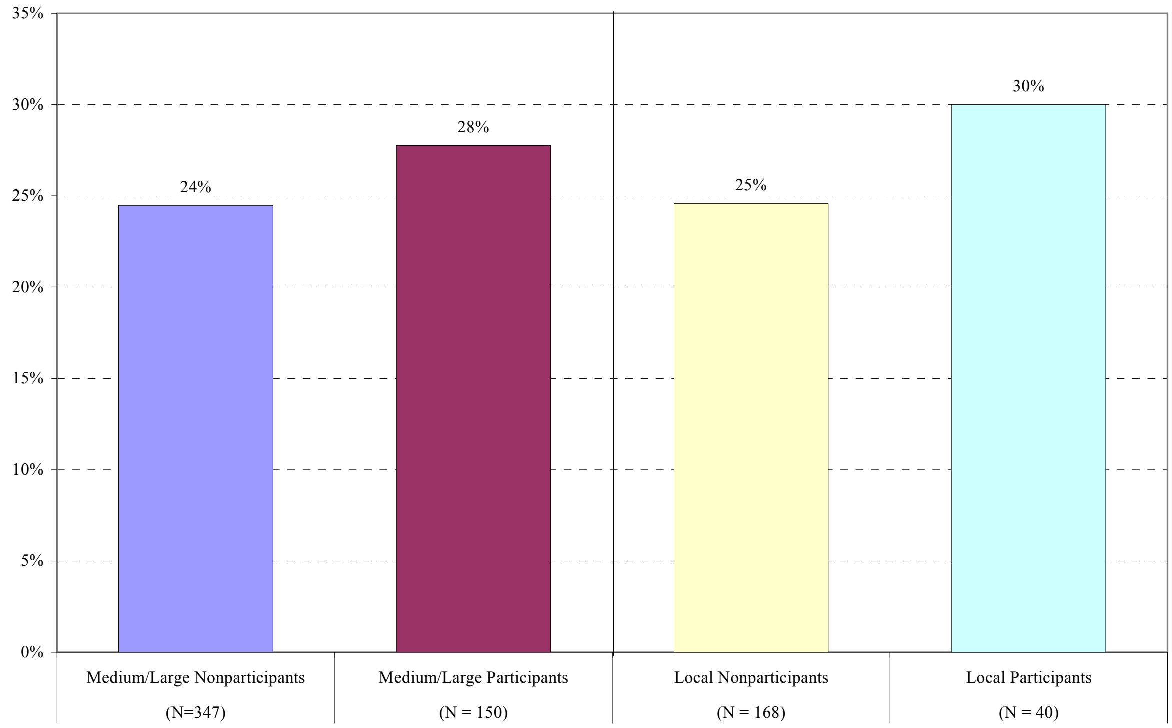
Figure 6-10 shows small/very small customers' self-reported likelihood of installing energy-efficient measures in the future. Among small and very small customers, participants were more likely than nonparticipants to state they were very likely to install energy-efficient measures in the future. Seventy-eight percent of participants' responses range from 8 to 10, with 1 being "not at all likely" and 10 being "extremely likely." On the other hand, only 57% of nonparticipants responded in this range. A small minority of customers, 4% of participants and 8% of nonparticipants, reported that they were not likely to install energy-efficient measures in the future.

Figure 6-10: Likelihood of Installing Energy Efficient Measures in the Future Among Small/Very Small Customers, Participants vs. Nonparticipants



One way to assess the impact of the Audit on intentions to install energy-efficient measures is to compare the proportion of customers who have developed policies for selecting energy-efficient equipment among participants and nonparticipants. Figure 6-11 shows the percentage of customers who report having a policy in place for selecting energy-efficient equipment. Among Nonresidential Audit customers, 24% of nonparticipants have developed a policy for selecting energy efficient equipment, while 28% of participants report having such a policy in place. Twenty-five percent of the sample representing Local Program nonparticipants and thirty percent of Local Program participants have developed a policy for selecting energy efficient equipment. These data suggest that the Audit program may be effective in encouraging intentions to install energy efficient measures, as participants had a somewhat greater proportion of businesses that had developed policies for selecting energy efficient equipment.

Figure 6-11: Percentage of Participants and Nonparticipants Who Have Developed a Policy for the Selection of Energy-Efficient Equipment



6.7 Conclusions – Knowledge & Intentions

Small and very small customers' self-reported knowledge of energy-efficient products is greater among participants than nonparticipants. Looking at knowledge of energy savings opportunities for lighting and HVAC systems, customers, including those sampled to represent businesses in the Local Program, report greater knowledge of savings opportunities for lighting than for HVAC systems. In general, Audit participants reported greater knowledge than nonparticipants for lighting, but not for HVAC systems. These results suggest that although the Audit program may be somewhat effective at increasing knowledge of energy-efficient lighting, there is room for improvement. The Audit does not appear to be effective in increasing knowledge of energy-savings opportunities for HVAC systems.

Across delivery mechanisms, those who participate in the Audit via CD-ROM report greater knowledge than those who participated via on-site, phone, or mail. However, CD-ROM customers comprised a small number of respondents. In general, likelihood of installing energy efficient measures looks promising; 78% of vary small/small participants and 57% of small/very small nonparticipants said they were very likely to install energy efficient measures in the future. Of medium/large Audit customers, participants were somewhat more likely to have developed a policy for the selection of energy efficient equipment at their business. Similarly, PG&E Local participants were more likely than nonparticipants to have developed such a policy. The fact that participants are more likely than nonparticipants to install energy-efficient measures and to have developed a policy for the selection of energy efficient equipment suggests that the Audit program is effective in increasing these measures.

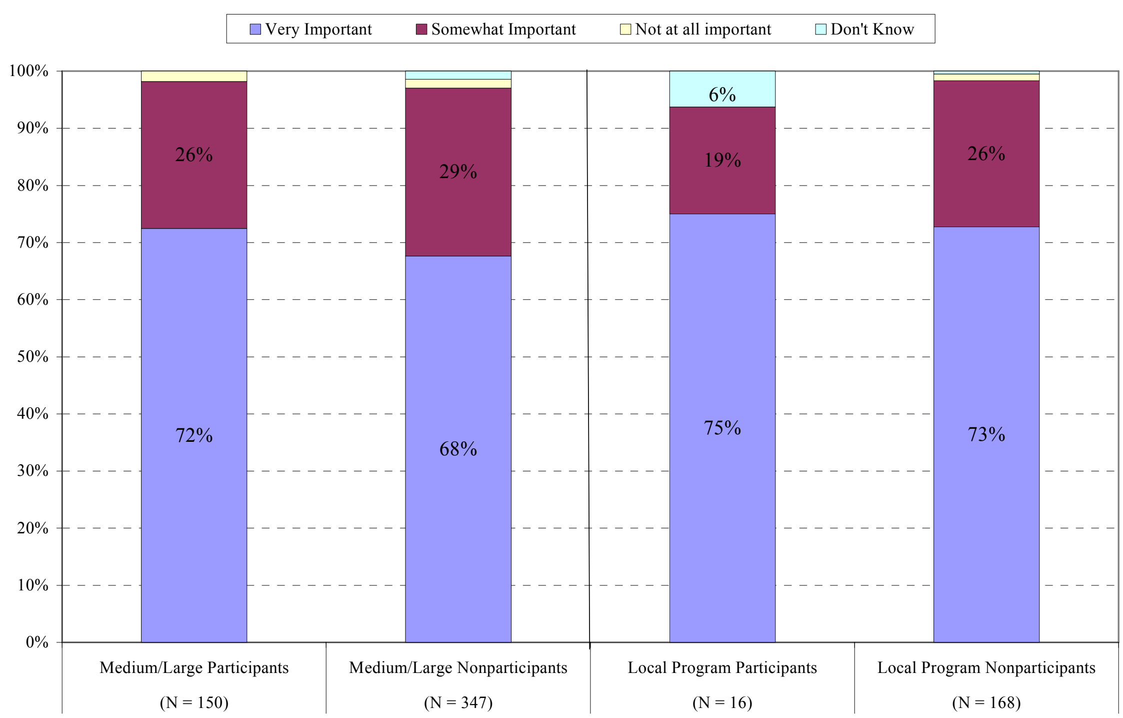
6.7.1 Attitudes & Barriers Toward Energy Efficiency

This section compares participants' and nonparticipants' attitudes toward energy efficiency among medium and large customers. Barriers to implementing energy efficient projects among nonparticipants are also explored, suggesting the types of barriers that are encountered in the general population. This knowledge can suggest the types of barriers the Audit might seek to address in the future.

Shown in Figure 6-12, attitudes toward energy efficiency were similar across participant status. Of medium/large participants, 72% felt that energy efficiency was very important, and of medium/large nonparticipants, 68% felt that energy efficiency was very important to the decision makers at their business.

Of PG&E Local customers, 75% of participants felt that energy efficiency was a very important concern, and 73% of nonparticipants felt that energy efficiency was a very important concern for their business.

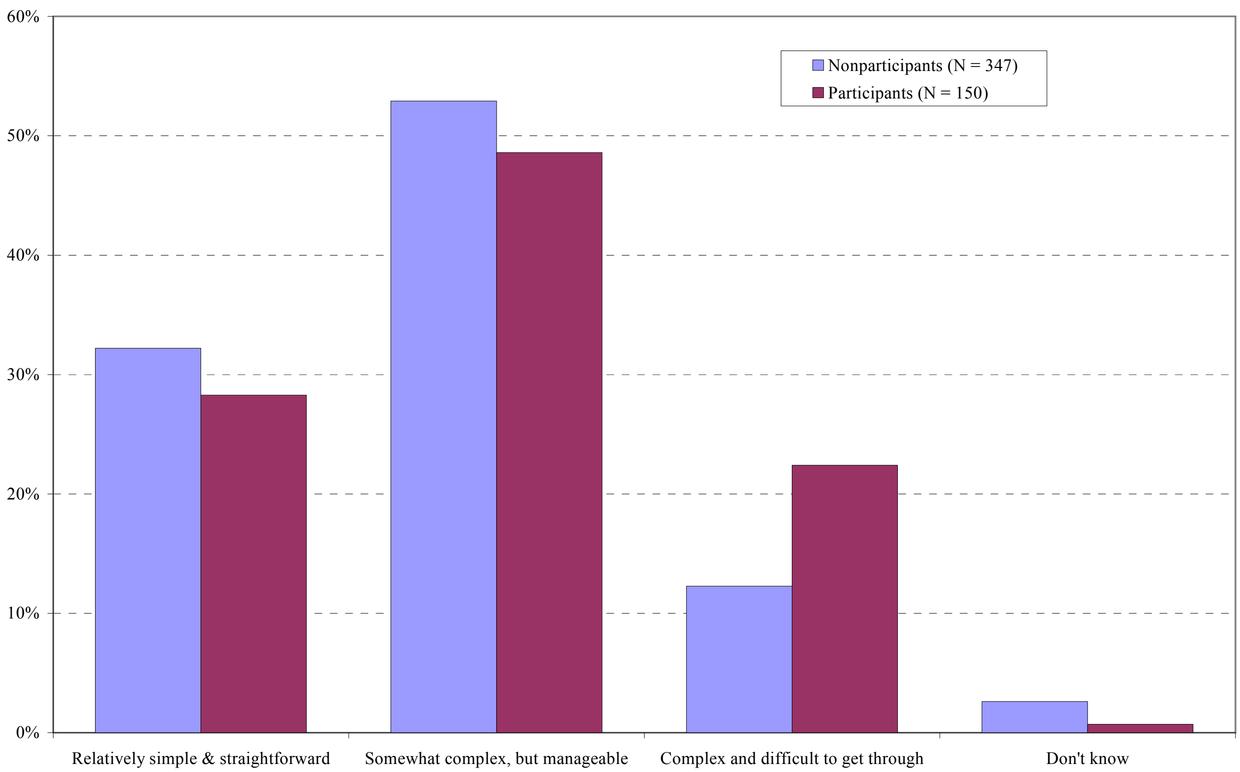
Figure 6-12: Importance of Energy Efficiency, Participants vs. Nonparticipants



In order to assess perceived barriers to energy efficiency, medium and large customers were asked to report how difficult the process of approving energy-efficiency projects at their business was. Comparing the difficulty reported by participants to that of nonparticipants gives a sense of whether the Audit program might reduce perceived barriers to energy efficiency.

Surprisingly, in Figure 6-13, a greater percentage of Audit participants (22%) than nonparticipants (12%) reported that approving energy-efficiency projects was complex and difficult to get through. This same pattern was observed for PG&E Local program customers. It may be that Audit participants are more likely to have gone through the process of getting energy-efficiency projects approved, and thus are aware that it can sometimes be difficult.

Figure 6-13: Self-Reported Difficulty of Approving Energy-Efficiency Projects, Participants vs. Nonparticipants

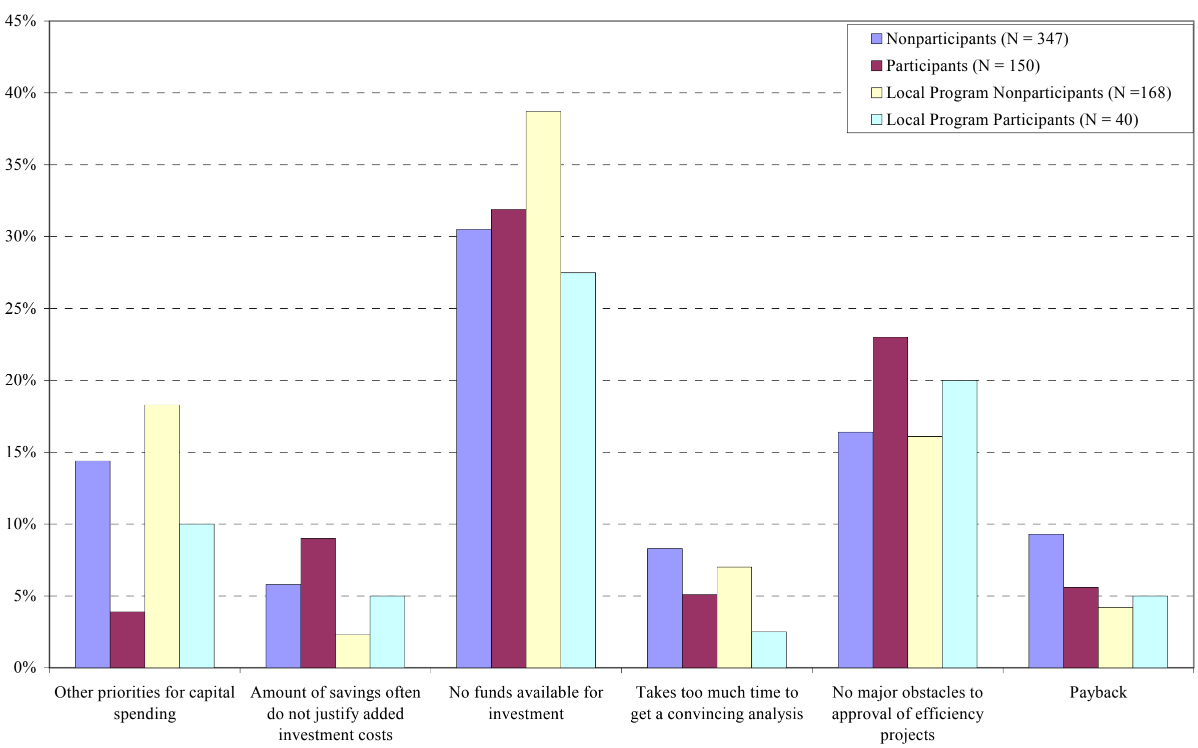


Medium and large customers were also asked to report the main obstacles to approval of major energy investments at their business. These results may highlight areas where the Audit program might consider addressing obstacles to energy efficiency. At the very least, these data may suggest strategies for marketing the Audit program and energy efficiency in general to nonresidential customers.

Twenty-three percent of medium/large participants and sixteen percent of nonparticipants reported that there were no major obstacles to approving energy-efficiency investments. A lower proportion of participants than nonparticipants reported that there were other priorities for capital spending. On the other hand, a somewhat greater proportion of participants (9%) than nonparticipants (6%) reported that the amount of savings do not justify the added investment cost. It appears that the Audit program may be successful in attenuating some beliefs regarding obstacles to energy efficiency, and in increasing energy efficiency as a priority for capital spending. It seems that an area where improvements might be made in marketing or program materials is to include or make more prominent the payback potential of energy-efficiency investments.

The pattern of data was fairly similar for PG&E Local customers. Figure 6-14 shows twenty percent of Local participants and sixteen percent of Local nonparticipants reported that there were no major obstacles. The most commonly reported obstacle was availability of funds, reported by 39% of nonparticipants and only 28% of participants.

Figure 6-14: Main Obstacles to Energy-Efficiency Investments Among Medium and Large Customers



6.8 Conclusions – Attitudes & Barriers

In general, around 70% of respondents, including PG&E Local customers, found energy efficiency to be quite important, and this proportion was somewhat greater among participants. Looking at barriers to installing energy-efficient measures may suggest why this sense of importance may not translate into action. Twenty-two percent of participants reported that the process to approve major investments at their organization was complex and difficult to get through, compared with only twelve percent of nonparticipants. Among PG&E Local customers, 15% of participants and 8% of nonparticipants reported that the process was complex and difficult to get through.

When medium/large customers were asked what the main obstacles were to approval of major energy efficiency investments, nearly one-third of both participants and nonparticipants stated that there were no funds available for investment. On the other hand, participants were less likely than nonparticipants to report that there were other priorities for capital spending. The pattern of data was fairly similar for PG&E Local customers, however Local participants were less likely than nonparticipants to state that there were no funds available for investment. For those who do have funding available, the challenge is to make the approval process more streamlined and make energy efficiency projects more of a priority.

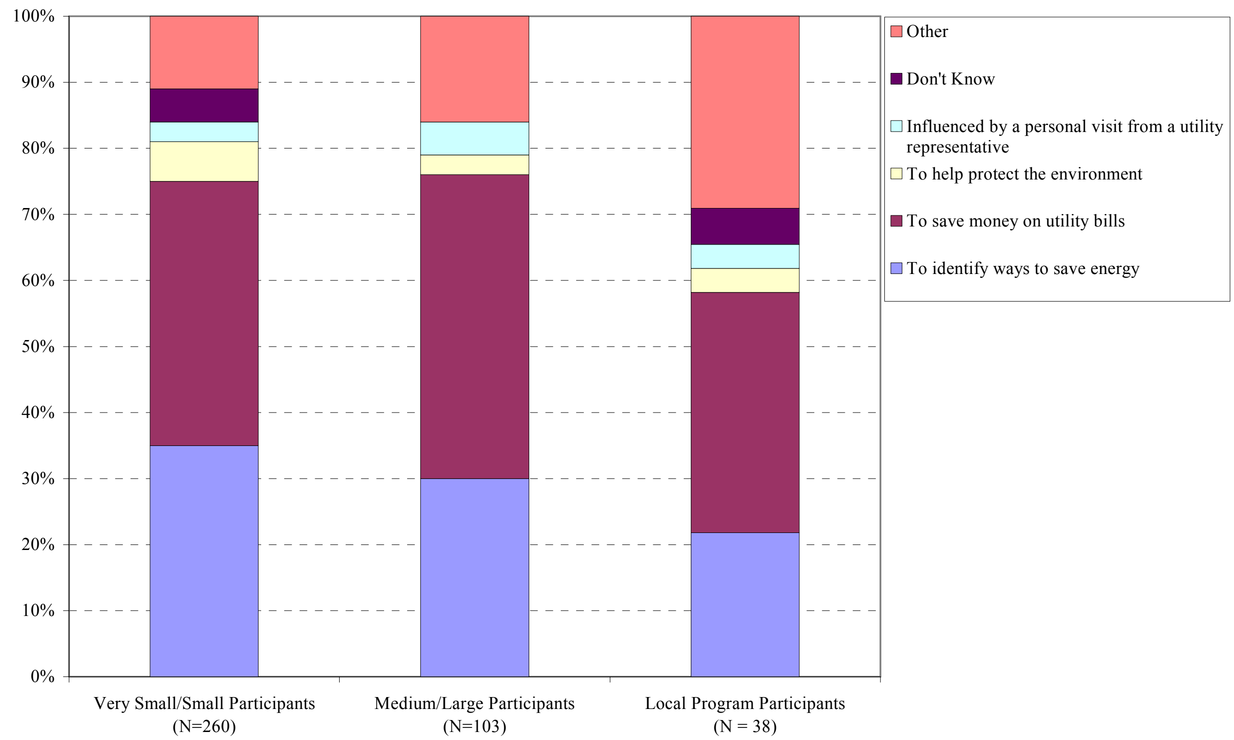
6.8.1 Participation Drivers

This section reports the reasons that customers participated in the program, as well as reasons why aware customers did not participate in the program. Reasons for participation and nonparticipation can be used to further refine how the Audit program is marketed to customers.

The most-often reported reason for participating in the Audit program cited by both small/very small and medium/large participants was to save money on utility bills. This response was mentioned by 58% of medium/large participants and by 40% of smaller participants. The second most often reported reason for participating in the Audit was to identify ways to save energy, cited by 35% of small/very small participants and 38% of medium/large participants. It is interesting to note that only 6% of small/very small participants and 4% of medium/large participants participated in order to help protect the environment. It is possible that this benefit could be made more salient to customers who are participating, and could be used as an incentive to motivate nonparticipants to participate in the Audit. For example, in addition to highlighting monetary savings, environmental benefits such as reduced carbon emissions could be highlighted in marketing materials.

Among PG&E Local participants, Figure 6-15 shows that 53% reported that they participated in order to save money on utility bills. Thirty-two percent reported that they wished to identify ways to save energy.

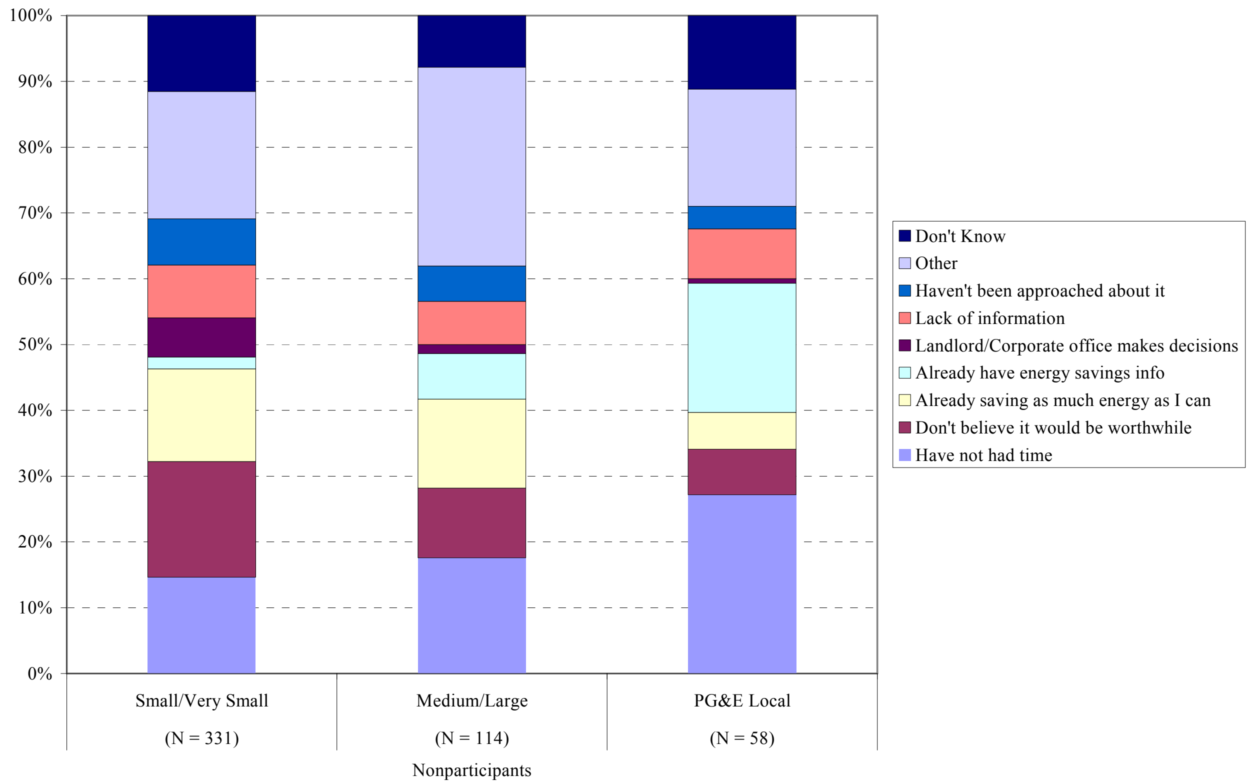
Figure 6-15: Reasons for Participating in the Audit Program



Nonparticipants who had heard of the Audit program were asked why they did not participate in the program. The greatest percentage of responses from medium/large nonparticipants was that they had not had the time to participate. Among small/very small participants, the greatest percentage of responses was that they didn't believe it would be worthwhile. A sizeable minority of respondents, 15% of both small/very small and medium/large nonparticipants, reported that they were already saving as much energy as they could. Among PG&E Local nonparticipants, 28% reported that they had not had the time to participate, and 20% reported that they already had energy savings information.

In general, these nonparticipants felt that the benefits of the program did not outweigh the time associated with participating. It is possible that these customers were already maximizing their conservation potential, or that the Audit would not be able to identify enough ways for them to save money in order to be worthwhile. However, it is also possible that these nonparticipants were simply unaware of additional ways in which they could be conserving energy. Thus, there is a great opportunity to educate nonparticipants about the Audit's potential to identify additional ways to save energy, as well as market the Audit as a worthwhile program. Perhaps marketing materials could explicitly state that the Audit can identify new ways of conserving energy that the customer may not be aware of.

Figure 6-16: Reasons That Aware Customers Have Not Participated in the Audit Program



6.9 Conclusion – Participation Drivers

The majority of both Nonresidential Audit participants and PG&E Local program participants took part in the program in order to save money on utility bills or to save energy. Very few participants cited environmental protection as a reason for participating in the Audit: only 6% of small/very small participants and 3% of medium/large participants. Beyond monetary motivations, some customers may be persuaded by environmental appeals. Thus, one way to persuade customers to participate in the Audit might be to highlight the environmental benefits of energy efficiency.

Many customers who were aware of the Audit but had not participated explained that they didn't believe the Audit would be worthwhile or they simply didn't have time to participate.

Fifteen percent of these nonparticipants said that they were already saving as much energy as they could. Twenty percent of PG&E Local nonparticipants reported that they already had energy-savings information. It is possible that marketing the Audit program as providing ideas for energy savings beyond those that are widely known may encourage more skeptical customers to participate and make time for the Audit program.

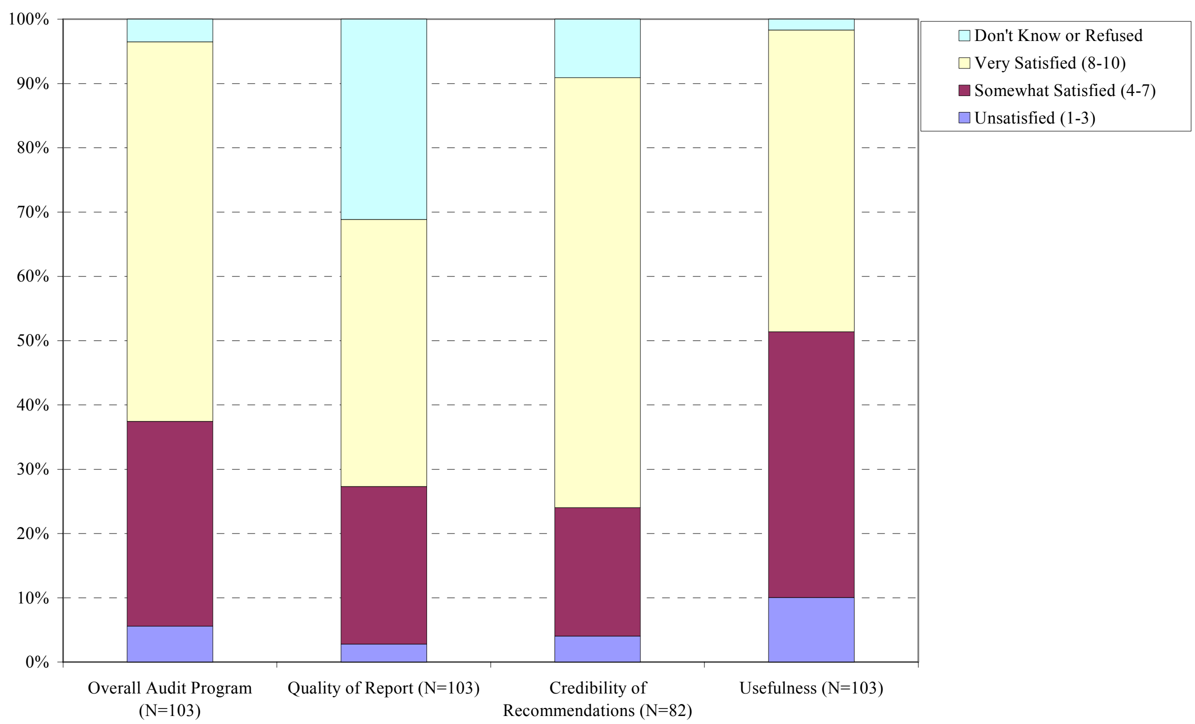
6.9.1 Audit Program Satisfaction and Usefulness

Audit Program Satisfaction

This section reports satisfaction with the Audit program overall, as well as satisfaction with quality, credibility, and usefulness of the Audit recommendations. Satisfaction levels are given by customer size and delivery mechanism, and reasons for satisfaction/dissatisfaction are detailed.

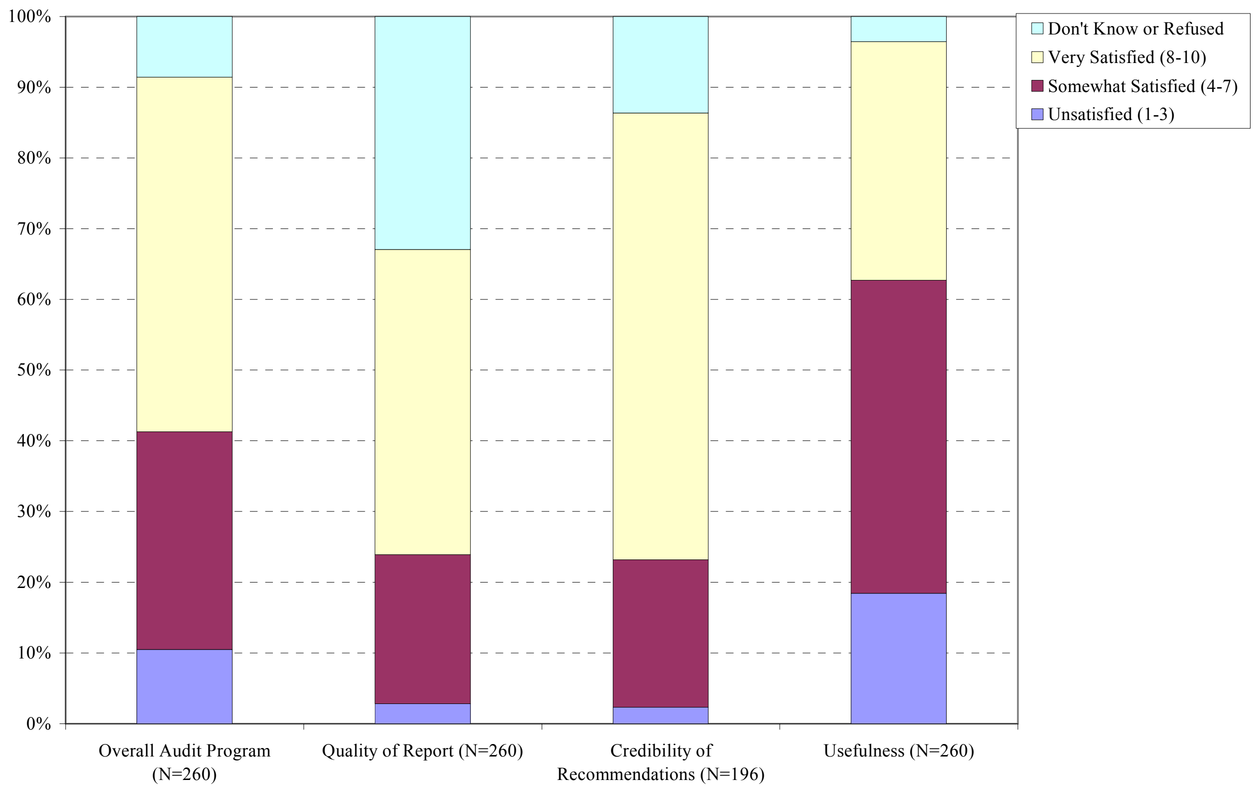
Among medium and large participants, satisfaction for the Audit program overall was quite good, with 59% of these participants rating their satisfaction from 8 to 10 on a 1 - 10 scale. The quality of the report and usefulness of the Audit were rated somewhat lower, with 42% and 47% of medium/large participants reporting that they were very satisfied with these aspects of the program. Credibility of recommendations was quite high, with 67% of medium/large participants rating their satisfaction with credibility between 8 and 10.

Figure 6-17: Medium and Large Audit Participant Satisfaction



Small/very small participants reported satisfaction levels similar to medium/large participants for quality of the report and credibility of recommendations; 43% were very satisfied with the quality of the report, and 63% were very satisfied with the credibility of the recommendations. Small/very small participants were somewhat less satisfied with the program overall, with 50% indicating their satisfaction between 8 and 10. Furthermore, only 34% of small/very small participants were very satisfied with the usefulness of the Audit.

Figure 6-18: Small and Very Small Audit Participant Satisfaction



Satisfaction levels among PG&E participants were high across all 4 indicators. Seventy-one percent of Local participants were very satisfied with the overall Audit program, rating their satisfaction between 8 and 10 on the 1-10 scale, while 68% were very satisfied with the quality of the Audit report. Credibility of recommendations was rated highest, with 85% reporting a satisfaction rating between 8 and 10. Usefulness was the area that was rated lowest, yet 58% of participants were very satisfied with this aspect of the program.

Figure 6-19: PG&E Local Program Participant Satisfaction

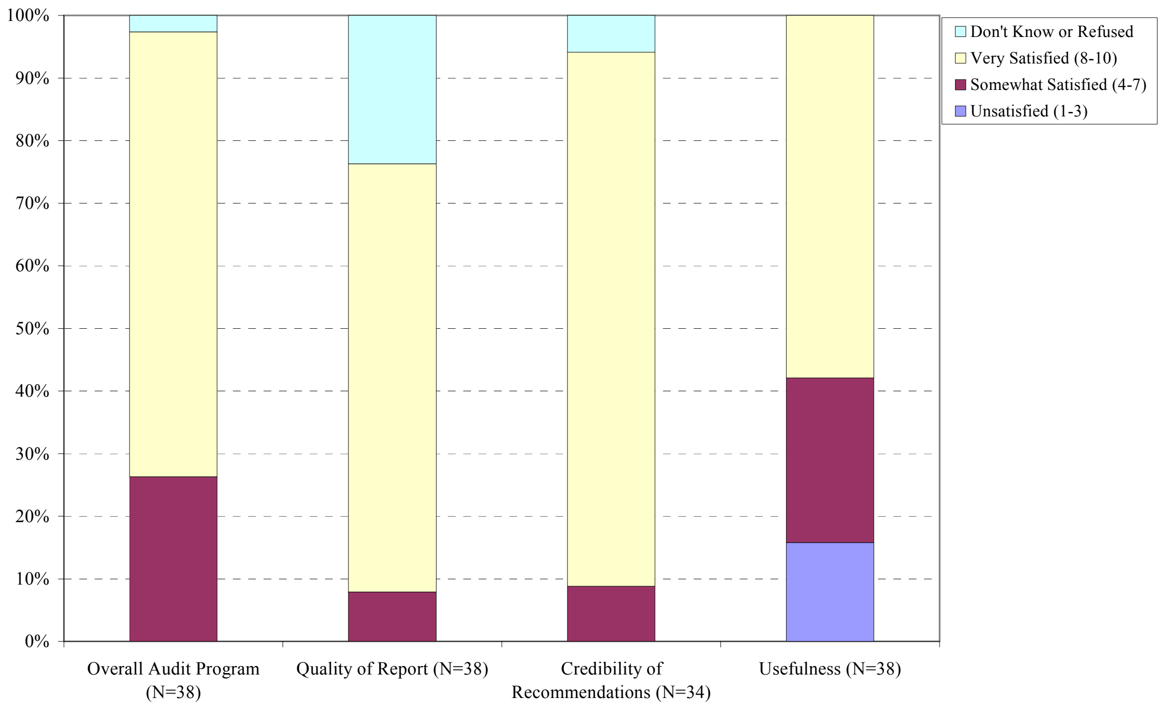
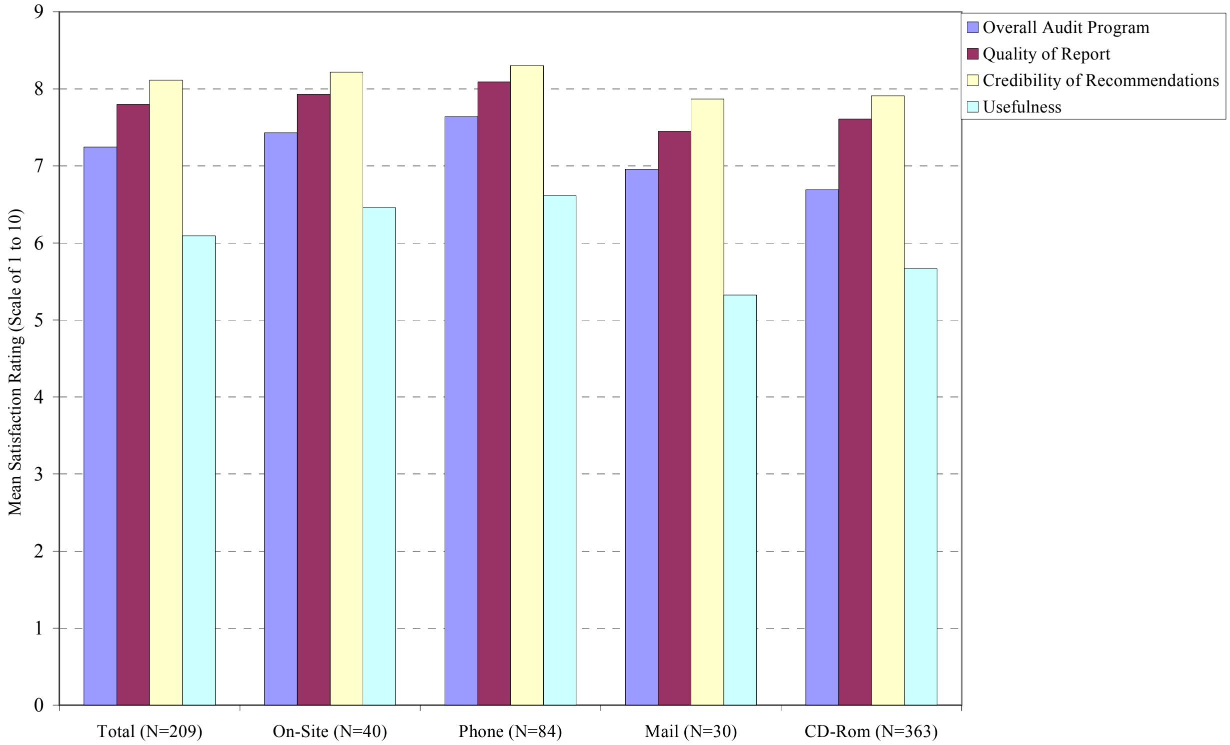


Figure 6-20 shows mean satisfaction across modes of participation. Those who received on-site and phone audits had the highest satisfaction ratings across all 4 categories of satisfaction: overall satisfaction, quality of the report, credibility of recommendations, and usefulness. Although mail and CD-ROM participants had the lowest levels of satisfaction, their ratings were still quite high. Usefulness ratings were lowest for participants who received Audits via mail, perhaps due to the impersonal nature of this delivery mechanism.

Figure 6-20: Mean Satisfaction by Delivery Mechanism



Overall satisfaction levels were good, with 80% of participants reporting that they were at least somewhat satisfied with the Audit program. These participants were asked to report reasons for their satisfaction level. Figure 6-21 shows the reasons given by those who were very satisfied, with a satisfaction rating of 8 to 10 on a 1-10 scale, and those who were somewhat satisfied, with a rating of 5 to 7. Of those who were very satisfied, 27% reported that the Audit provided good, thorough, and useful information, 25% reported that there was good customer service and follow up, and 22% reported that the Audit was helpful for saving money and energy. Of those who were somewhat satisfied, 27% reported that the Audit suggestions were too obvious, general, vague, or inapplicable, while 12% reported that the Audit provided good, thorough, and useful information.

Figure 6-21: Reason for Level of Satisfaction among Nonresidential Audit Participants[61]

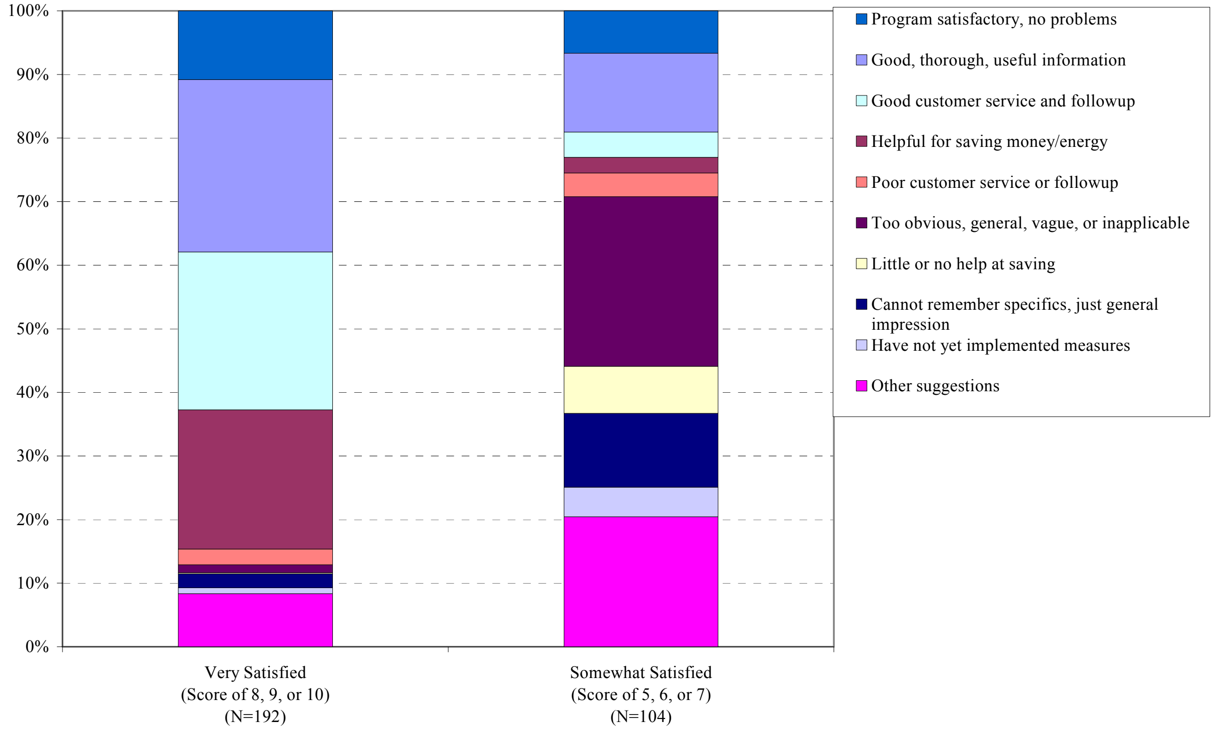
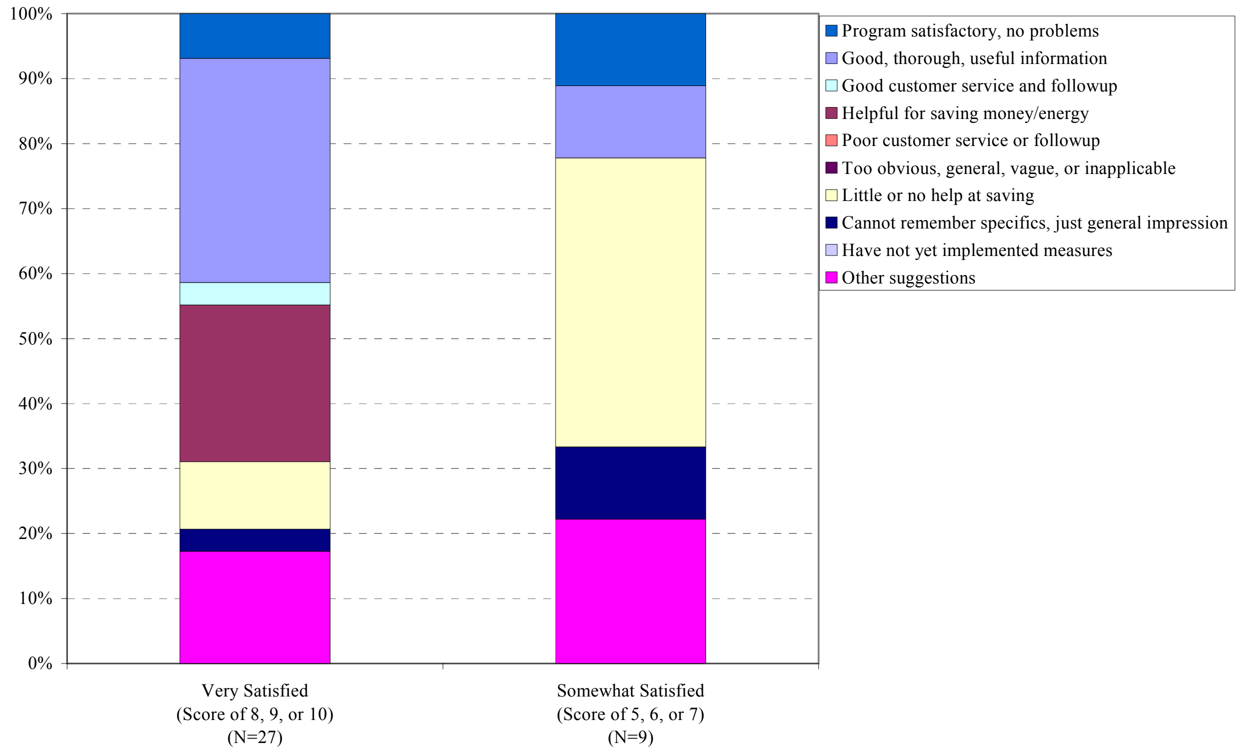


Figure 6-22 shows an overwhelming 95% of the PG&E Local customers were at least somewhat satisfied with the Audit program, rating their satisfaction 5 or higher on the 1-10 scale. Of those who were very satisfied (rating of 8 to 10), 34% reported that the Audit provided good, thorough, and useful information, while 24% reported that the Audit was helpful for saving money/energy. Ten percent reported that the program provided little or no help at saving. Of those who were somewhat satisfied, (rating of 5-7), 44% reported that the program provided little or no help at saving.

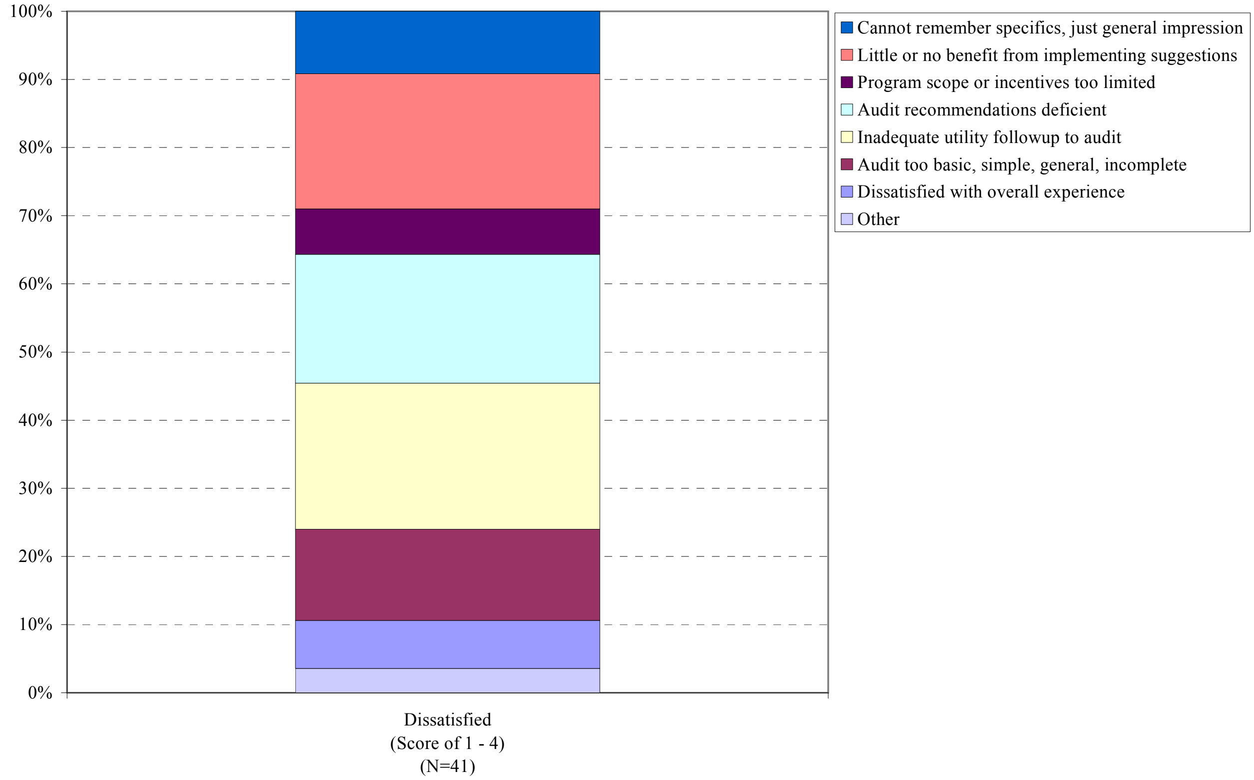
[61] Reasons for satisfaction is collected only for those survey respondents reporting a satisfaction rating of 5 through 10. Those reporting scores of 1 through 4 are asked why they were *dissatisfied*. These responses are summarized in Figure 6-23.

Figure 6-22: Reason for Level of Satisfaction Among PG&E Local Participants



Twelve percent of participants were dissatisfied with the Audit program, answering between 1 and 4 on a 1 – 10 scale for overall satisfaction. These participants were asked if there was anything about the Audit program that they were dissatisfied with. Of those who were dissatisfied, 21% reported that there was inadequate follow up from the utility. Twenty percent reported that there was little or no benefit to implementing the Audit suggestions, and 19% reported that the Audit recommendations were deficient.

Figure 6-23: Reason for Dissatisfaction Among Nonresidential Audit Participants



Only 1 PG&E Local participant was dissatisfied with the Audit program. This customer reported that there was inadequate follow up from the utility.

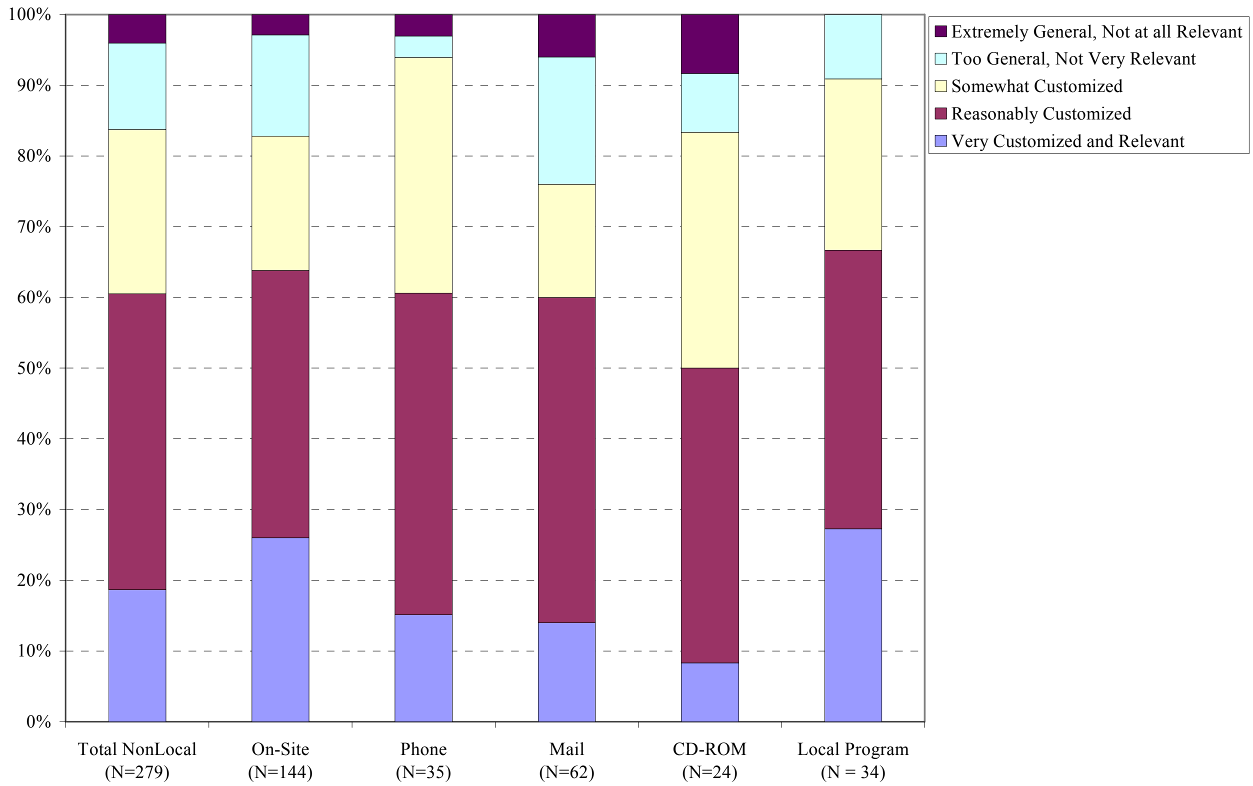
Usefulness of Audit Program

This section reports participants' ratings of how relevant and customized the Audits were. In order to further explore perceptions of Audit usefulness, participants were also asked to report what actions they might have taken if they had not taken part in the Audit program.

Participants were asked about the relevance and customization of Audit recommendations. Figure 6-24 shows how these responses varied by delivery mechanism. The greatest proportion of participants who found the Audit to be very customized and relevant were the on-site participants, at 26%. CD-ROM Audits may be the least customized and relevant, with only 8% of participants in this category reporting that they were very satisfied with this aspect of the Audit.

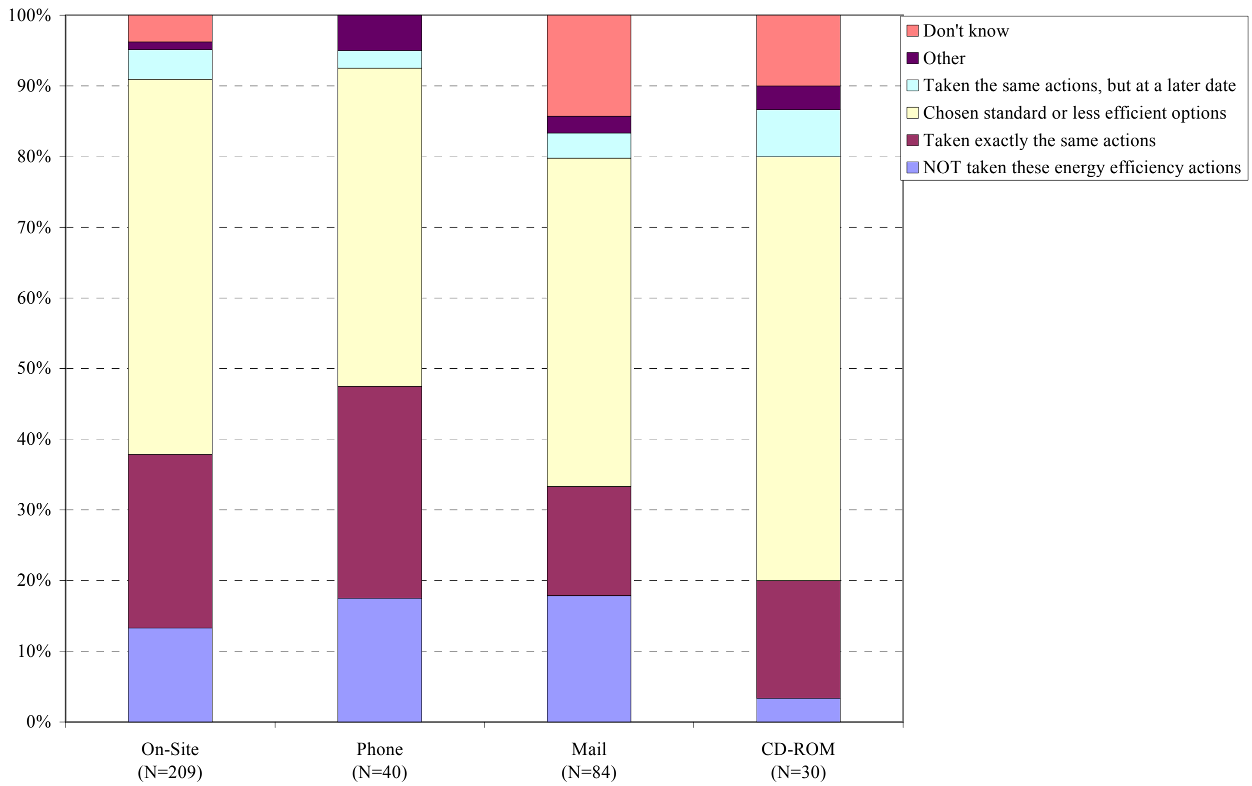
Also shown are responses for the PG&E Local program participants. Twenty-seven percent of these participants found the Audit to be very customized and relevant, while none reported that the Audit was extremely general or not at all relevant.

Figure 6-24: Relevance and Customization of Recommendations, All Participants



In Figure 6-25, all Audit participants were asked to report what actions they might have taken if they had not received energy efficiency recommendations and information as a result of the Audit. Responses varied by delivery mechanism. The greatest proportion of participants who would have taken exactly the same actions were those who participated via phone, at 30%. However, phone participants, along with those participated via mail, were most likely to report that they would have not taken energy efficient actions without the Audit, at 18%. Those who participated via CD-ROM were most likely to report that they would have chosen standard or less efficient options without the Audit, at 60%.

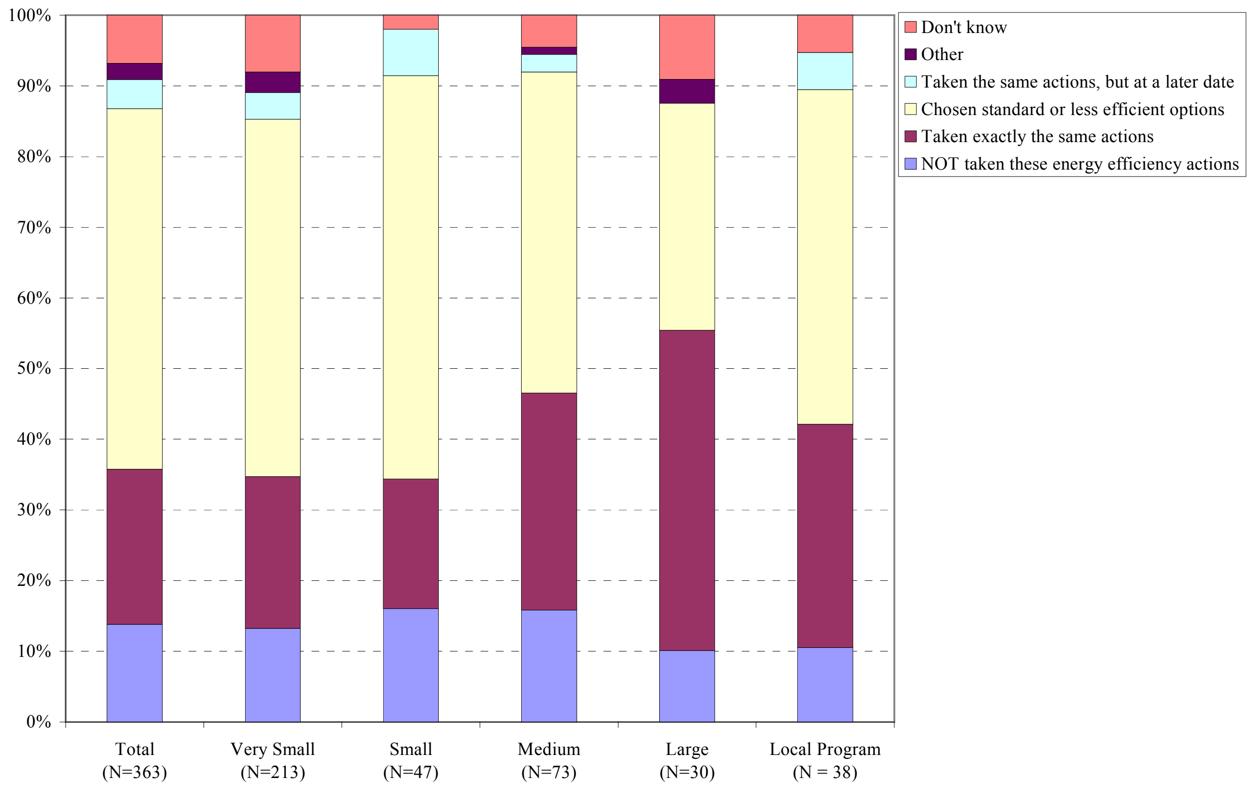
Figure 6-25: Actions if Had Not Received Audit, by Delivery Mechanism



The actions participants reported they would have taken without participating in the Audit also varied somewhat by customer size. Large participants were most likely to report that they would have taken exactly the same actions without the Audit, at 45%. Small customers were most likely to report that they would have chosen standard or less efficient options, at 57%. Along with medium customers, small customers were also most likely to report that they would have not taken energy efficient actions without the Audit, at 16%. Thus, it appears that the Audit may have been most useful for small customers.

Figure 6-26 also shows the actions that PG&E Local participants would have taken if they had not taken part in the Audit. Forty-seven percent of PG&E Local participants would have chosen standard or less efficient options, and 11% would not have taken any energy efficient actions if they had not participated in the Audit.

Figure 6-26: Actions if Had Not Received Audit, by Customer Size



6.10 Conclusion – Audit Program Satisfaction and Usefulness

Medium/Large participants were somewhat more satisfied with the Audit program overall, compared to small/very small participants. Consistent with the 2002 and 2003 evaluation data, usefulness remains an area for improvement, especially for small/very small participants and those who participated via mail. In addition to improving the usefulness of Audits, quality of the report is another area in need of improvement. PG&E Local participants were very satisfied with the Audit program.

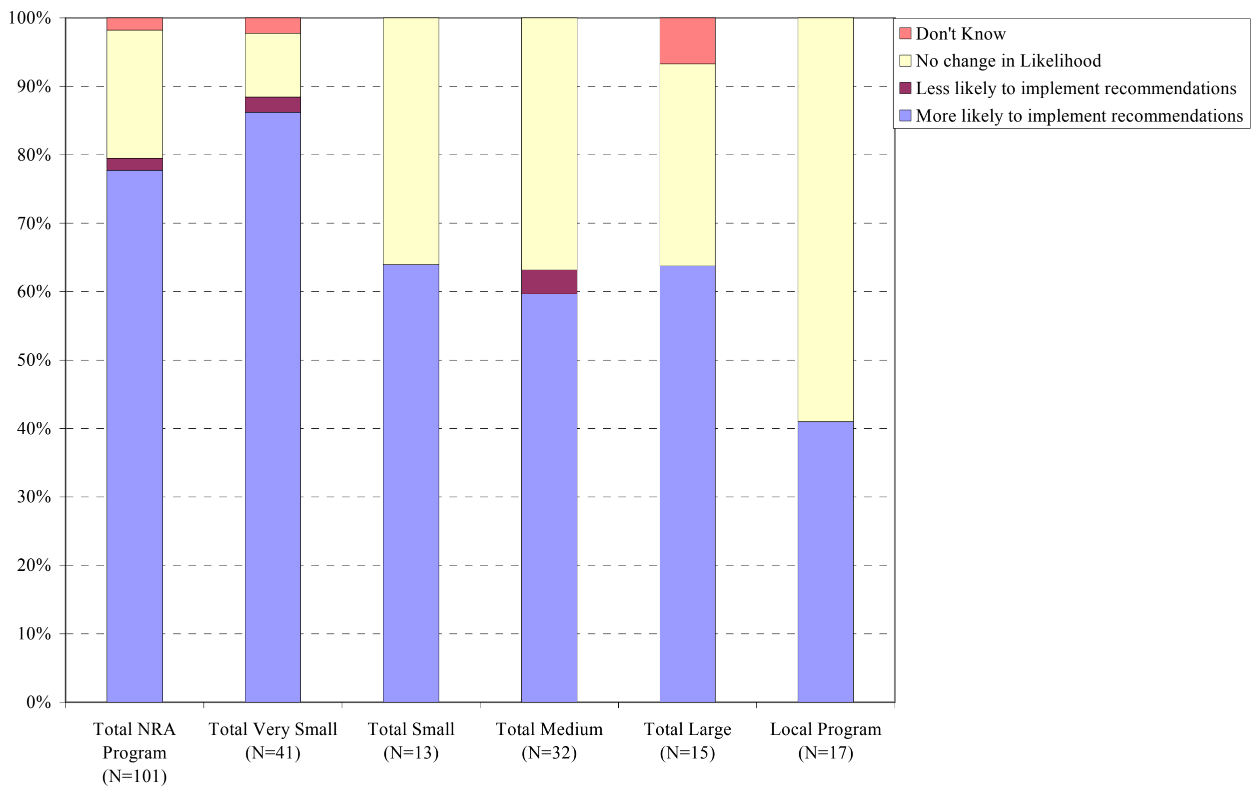
Areas for improvement include making Audit suggestions less general and more applicable, while highlighting the benefits of implementing Audit suggestions. Again, PG&E Local participants were overwhelmingly satisfied with the program. Of those with somewhat lower satisfaction levels, PG&E local participants desired more help with saving energy.

On-site participants were most likely to report that the Audit was very customized and relevant, while CD-ROM participants were least likely to report that the Audit was very customized and relevant. When asked what actions they might have taken without the Audit program, phone and mail participants were most likely to report that they would not have taken energy efficient actions without the Audit. When analyzed by size, small and medium customers were most likely to report that they would not have taken energy efficient actions without the Audit. Thus, usefulness of the program is perceived to be highest among those who participated via phone or mail, and among small and medium customers. Usefulness of the Audit was also perceived to be quite high among PG&E Local participants.

6.10.1 Audit Follow Up Initiatives

This section explores the effects of follow-up calls made to customers after the audit had been completed. These calls asked customers about their progress towards implementing energy efficiency measures recommended through the audit in an attempt to increase the impacts of the program. Twenty-three percent of participants recalled receiving a follow up call, with 97% saying they appreciated receiving the call. Figure 6-27 shows the influence of the follow-up call on the implementation of recommendations. Seventy-five percent of surveyed participants reported that the follow-up call made them more likely to implement recommendations from the audit, while only two percent reported that it made them less likely. PG&E local program participants were the least likely to say that follow-up calls made them more likely to implement recommendations out of all groups, with only 41 percent reporting that follow-up had this effect.

Figure 6-27: Influence of Follow Up on Implementation of Recommendations



Follow Up vs. No Follow-Up Comparisons

The effect of follow up contact on the likelihood of participating in the Express Efficiency or Standard Performance Contracting program is investigated in Table 6-1 below. The table compares incentive program penetration rates among the Audit program population in general, and among the sub-population of customers who received follow-up contact. The table reveals that the follow-up effort had a strong positive impact on Audit participants' likelihood of participating in Express Efficiency, with the overall probability of participating in Express following the audit increasing more than two-fold (from 11 to 24 percent) among those that received a follow-up call. SPC program penetration does not appear to be influenced by follow-up contact.

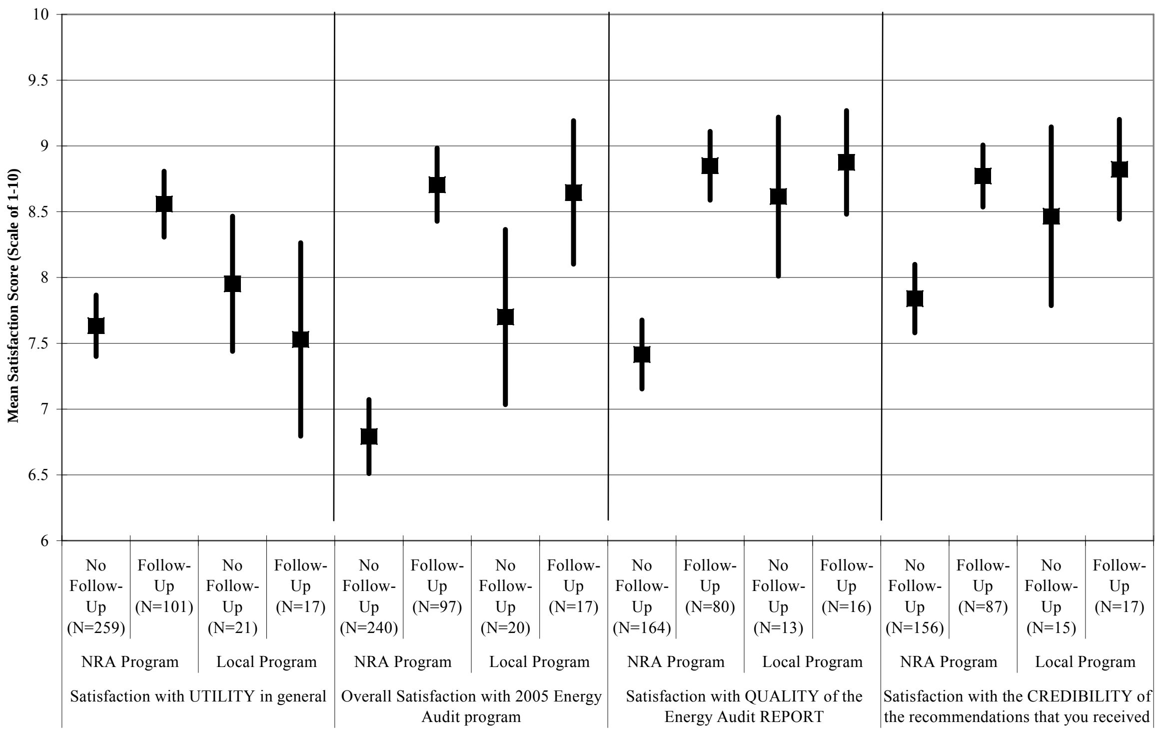
Table 6-1: Follow Up and Cross Program Participation

		Express Penetration		SPC Penetration		N	
Utility	Size	Follow-Up Database	Audit Database	Follow-Up Database	Audit Database	Follow Up Database	Audit Database
PG&E	Large	39%	36%	7%	7%	409	697
	Medium	36%	33%	2%	2%	590	1,024
	Small	23%	20%	1%	0%	1,069	2,338
	Very Small	18%	13%	0%	0%	1,993	9,924
	Total	25%	17%	1%	1%	4,845	13,985
SCE	Large	0%	18%	0%	31%	0	937
	Medium	25%	22%	0%	4%	32	1,158
	Small	30%	20%	0%	0%	208	3,482
	Very Small	21%	11%	0%	0%	312	6,006
	Total	25%	16%	0%	3%	559	11,584
SDG&E	Large	8%	15%	15%	19%	26	59
	Medium	20%	19%	3%	3%	61	232
	Small	17%	14%	0%	0%	127	551
	Very Small	6%	3%	0%	0%	227	3,000
	Total	12%	6%	1%	0%	474	3,842
SCG	Large		14%		0%		170
	Medium		18%		0%		375
	Small		10%		0%		2,009
	Very Small		1%		0%		10,262
	Total		3%		0%		12,890
Total	Large	37%	24%	7%	19%	435	1,863
	Medium	34%	25%	2%	3%	683	2,789
	Small	24%	17%	0%	0%	1,404	8,380
	Very Small	17%	7%	0%	0%	2,532	29,192
	Total	24%	11%	1%	1%	5,878	42,301

Table 6-2 shows the mean satisfaction scores, with 90% confidence intervals, across 4 ratings: satisfaction with the utility in general, satisfaction with the Audit program, satisfaction with the quality of Audit reports, and satisfaction with the credibility of Audit recommendations. Of those who participated in the statewide Audit program, customers who received a follow-up call were significantly more satisfied than those who did not receive a follow-up call, across *all 4 satisfaction ratings*.

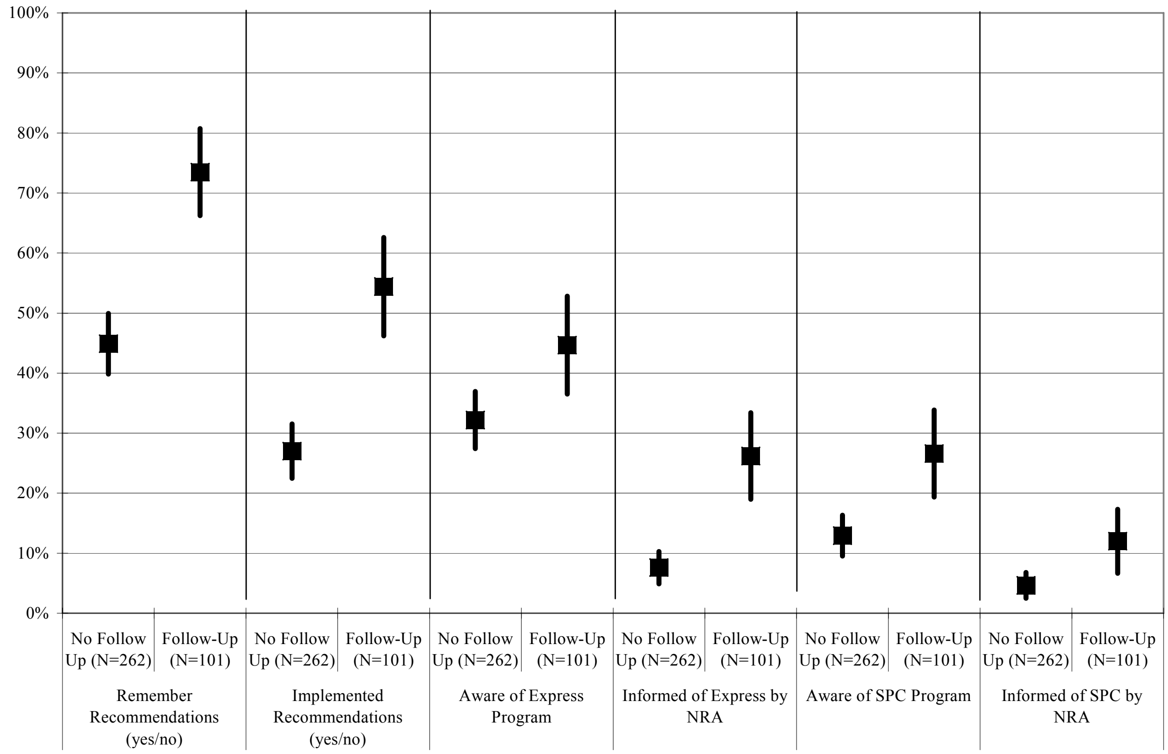
With the exception of satisfaction with the utility, those in the PG&E Local program reported satisfaction levels that were *generally* higher than those who did not receive a follow-up call; however, differences were not statistically significant.

Table 6-2: The Follow-Up Program and Satisfaction with Audit Program Elements



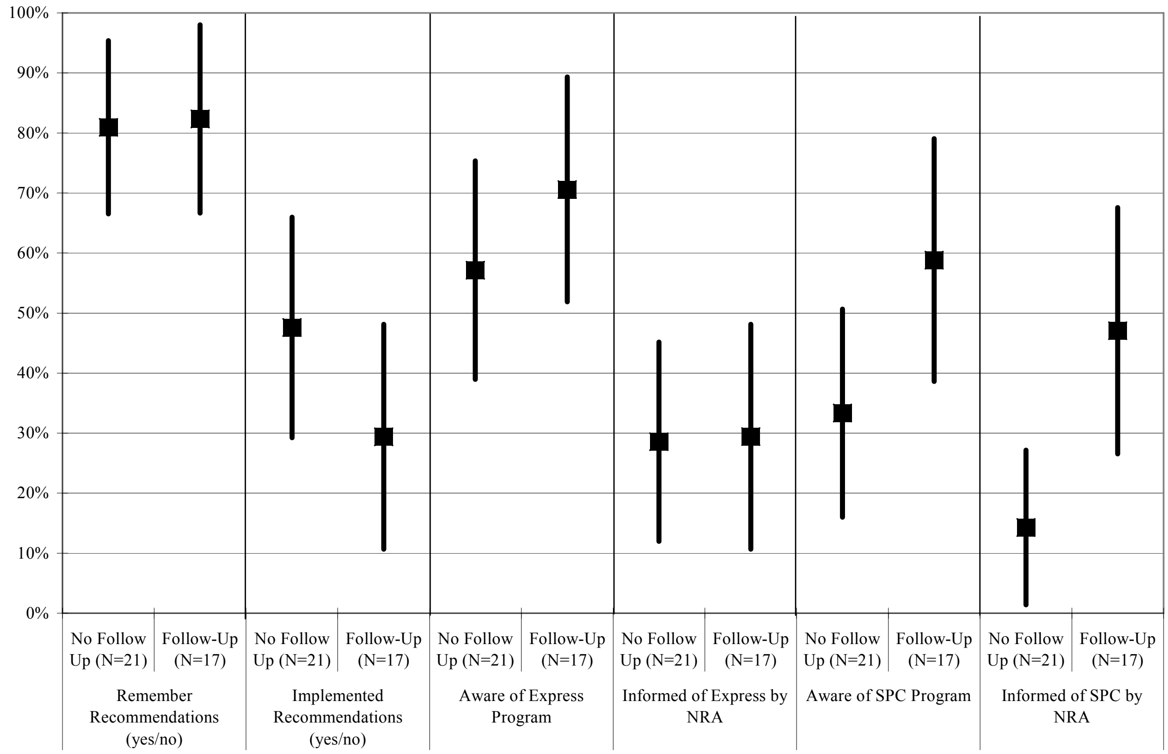
In Table 6-3, follow-up participants were also compared to those who did not receive a follow up in terms of recalling and implementing Audit recommendations, as well as awareness of the Express Efficiency and SPC Programs. Those who received the follow up were significantly more likely to report that they remembered the Audit recommendations and that they implemented the recommendations. They were also significantly more aware of the SPC program, and were more likely to say that they had been informed of the Express Efficiency program via the Audit. There were no significant differences between those who received and those who did not receive a follow up, in terms of awareness of the Express Efficiency program, and being informed about the SPC program through the Audit.

Table 6-3: Effect of Follow-Up Program on Key Audit Program Messages, Nonresidential Audit Program



PG&E Local program participants were also asked to report their recollection and implementation of Audit recommendations, as well as their awareness of Express Efficiency and the SPC program. There were no significant differences between those who received a follow-up call and those who did not receive a follow-up call. However, the comparison for those who were informed of the SPC program via the Audit approached statistical significance; those who participated in the follow-up tended to be more likely to report that they were informed of the SPC program through the Nonresidential Audit program.

Table 6-4: Effect of Follow-Up Program on Key Audit Program Messages, Local Program



6.11 Conclusion – Follow Up

Follow-up calls appear to have made a significant amount of customers more likely to implement recommendations from the Audit and almost never had a negative effect. This positive effect was the most pronounced for very small customers, though this may have been due to the relatively small sample sizes for the different customer groups. Follow-up calls were also appreciated by 97% of customers who received them suggesting that this was a very beneficial element to the Nonresidential Audit Program.

When comparing those who received follow-up calls to those who did not, those who received follow-up calls generally reported that they were more satisfied with the utility and with the Audit program, although these differences were not statistically significant for those in the PG&E Local program. Likewise, those who received follow-up calls were more likely to remember and implement Audit recommendation; however, this was not the case for PG&E Local participants.

6.11.1 Cross-Program Influences

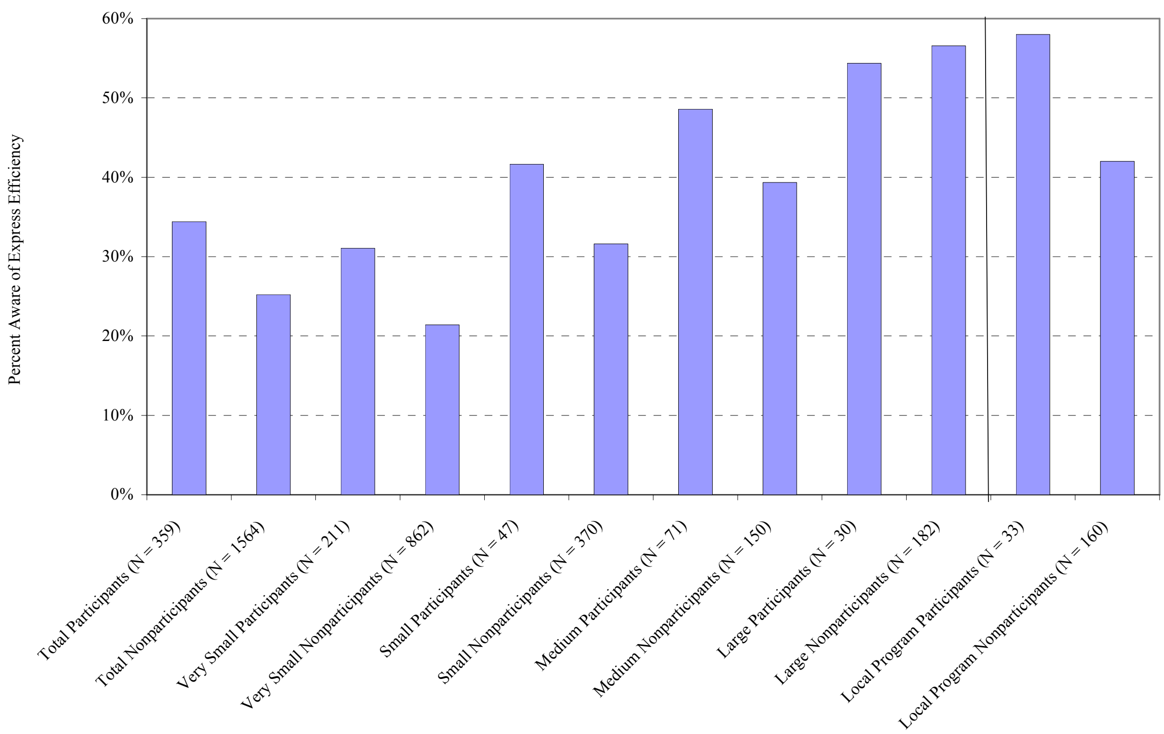
Cross-Program Influence on Participation in Express Efficiency and SPC

This section focuses on determining the Audit program's influence on participation in other utility retrofit programs such as Express Efficiency and SPC (Standard Performance Contract). The nonresidential audit program is seen as a feeder for utility rebate programs which offer financing for some of the measures recommended through the audit.

Figure 6-28 examines differences in awareness of the Express Efficiency program between participants and nonparticipants. Rates of awareness of Express Efficiency were roughly 10 percent greater among participants compared to nonparticipants. This was true across all customer sizes except for those classified as "large." In this case, large participants and nonparticipants had comparable levels of awareness. It is also worth noting that large customers reported the greatest levels of awareness across customer sizes.

PG&E Local participants also had relatively high rates of awareness of the Express Efficiency program, and this was approximately 15% higher than that of Local nonparticipants.

Figure 6-28: Awareness of Express Efficiency



Participants and nonparticipants were asked whether their firm had participated in the Express Efficiency program.[62] As Figure 6-29 shows, Audit participants were twice as likely as nonparticipants to self-report having participated in the Express Efficiency program. Again, this was true for all customer size classes, although the difference was less pronounced for "large" customers.

Among PG&E Local customers, 46% had participated, whereas 27% of Local nonparticipants had participated in the Express Efficiency program.

Figure 6-29: Participation in Express Efficiency

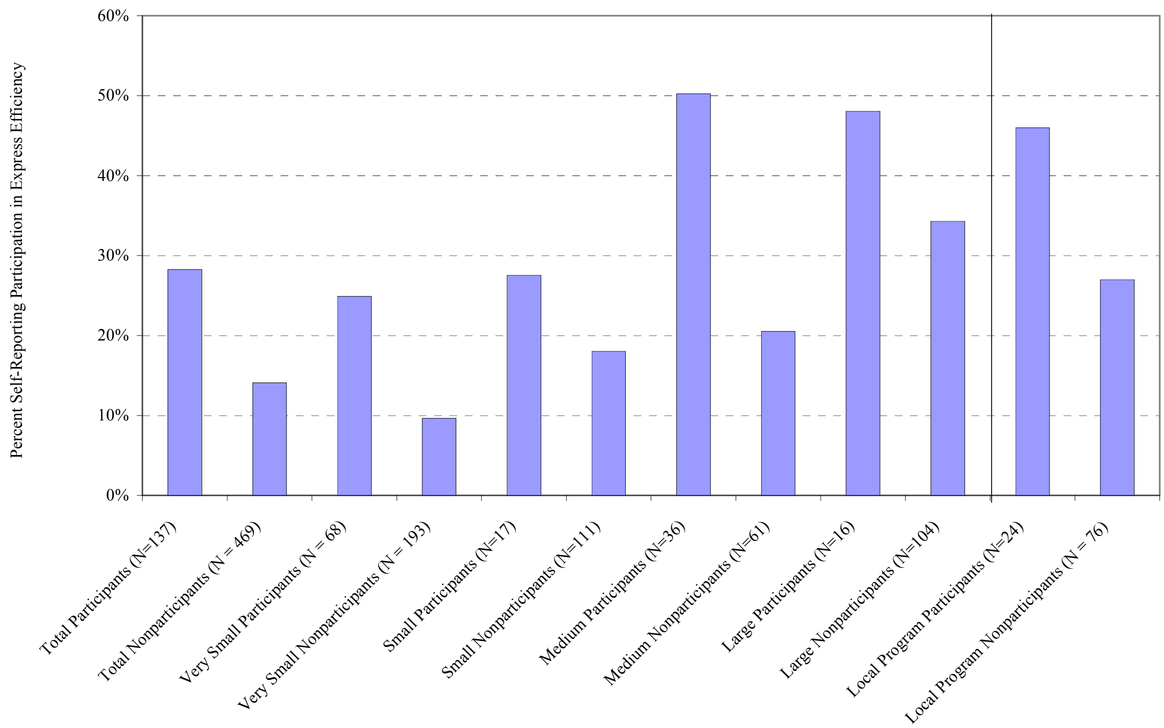


Figure 6-30 examines differences in awareness of the SPC program between Nonresidential Audit participants and nonparticipants. Participants were more aware of SPC than nonparticipants across all customer sizes. Medium and large customers were much more aware of the program than small and very small customers, with over a third of large

[62] Audit participants were asked if they had participated in the Express Efficiency rebate program since January, 2005. Audit nonparticipants were asked if they had participated in the Express Efficiency rebate program in the past 3 years.

customers indicating that they were familiar with SPC. Over 80 percent of small and very small customers were unaware of the program, likely due to the fact that they are not eligible for the program in most cases.

Medium sized participants are four times more likely to be aware than are similar sized nonparticipants, also, PG&E Local program participation had a great impact on rates of awareness of SPC; forty-five percent of participants were aware of the program, compared to only 25% of nonparticipants.

Figure 6-30: Awareness of SPC

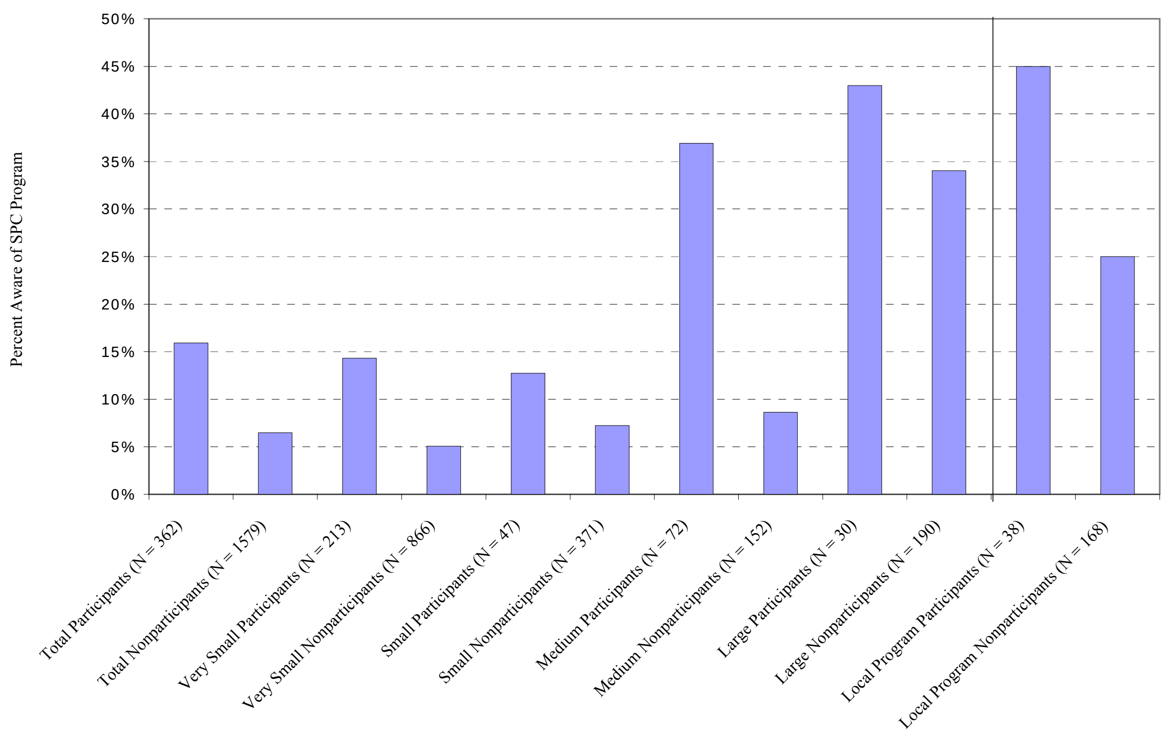
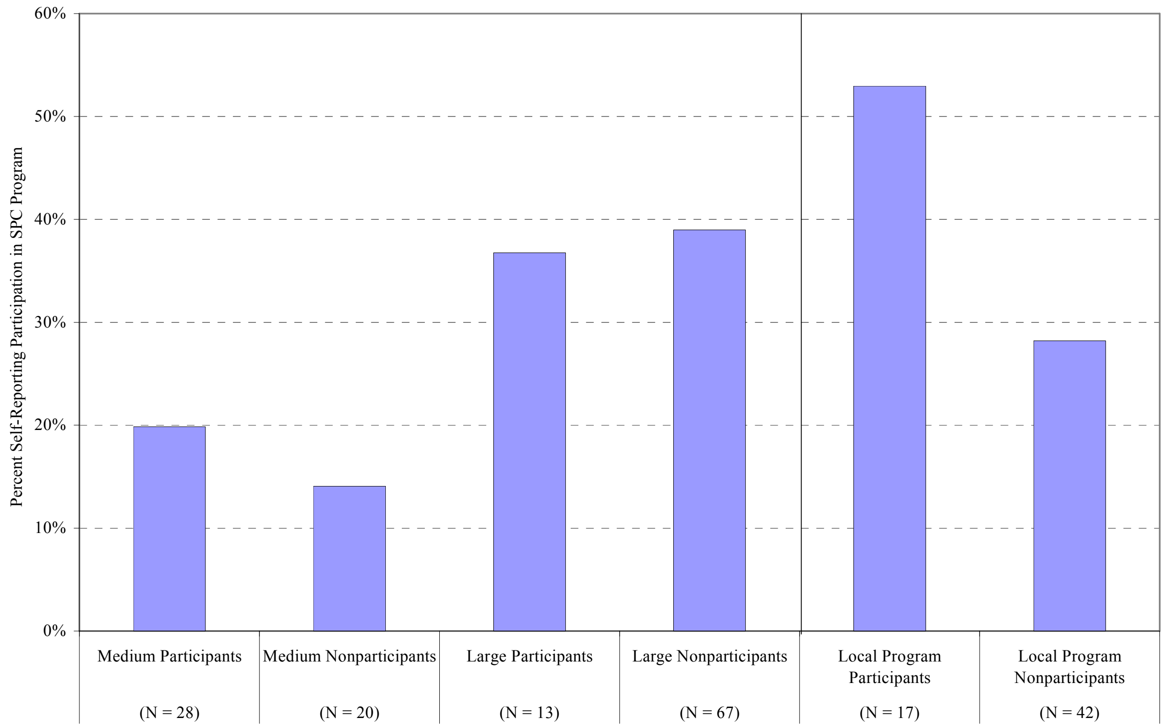


Figure 6-31 shows participation rates for customers who reported being aware of the SPC program. In general, large customers report higher participation rates than medium sized customers. In addition, aware participants are more likely to participate in SPC than are similarly sized aware nonparticipants. For large customers, participation in SPC was roughly the same for participants and nonparticipants.

Among PG&E Local customers, participation rates were substantially higher for participants than nonparticipants. In fact, PG&E Local Audit participants had higher SPC participation rates than any of the categories of non-local customers. It appears that an additional benefit of participation in the PG&E Local program may be a greater likelihood of participation in SPC.

Figure 6-31: Participation in Standard Performance Contract Program (SPC) among Aware Sub-Population



Cross-Program Influence on Awareness, Intentions, and Attitudes Toward Energy Efficiency

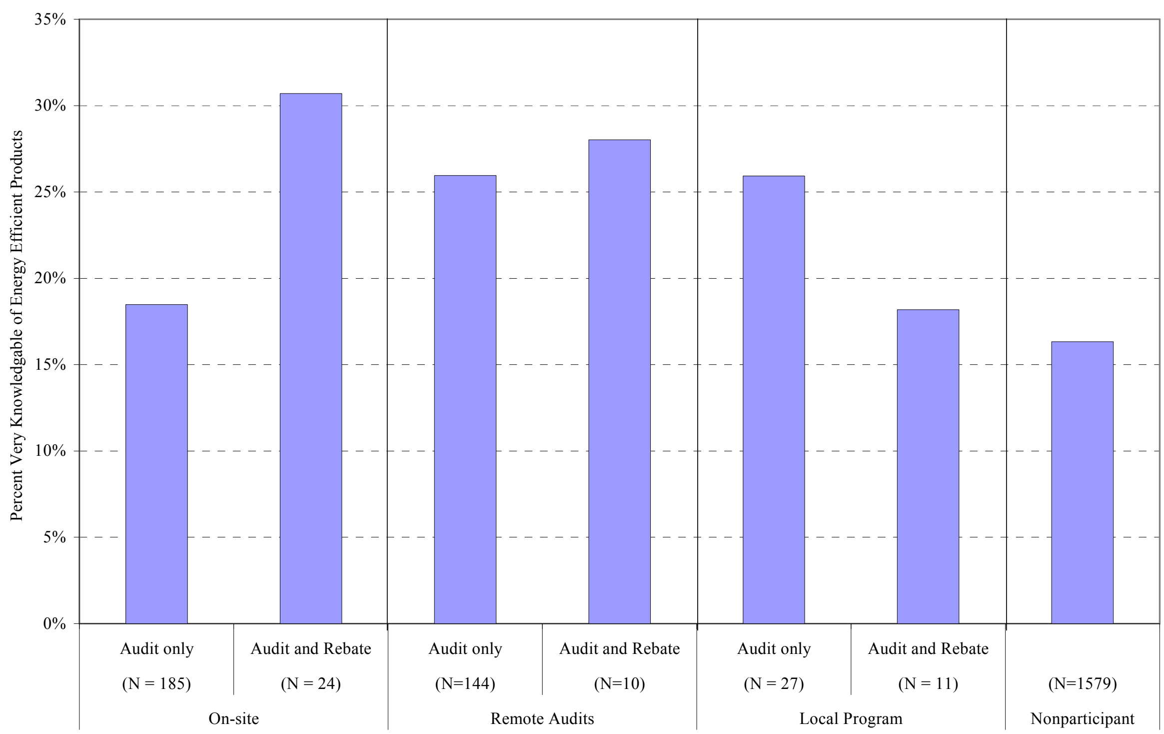
The next three figures examine knowledge of EE products, importance of energy efficiency, and intentions to install EE measures, comparing those who participated in both the Audit program and one of the rebate programs (Express Efficiency or SPC) with those who only participated in the Audit. It is expected that those who participate in the Audit and one of the rebate programs will exhibit greater knowledge of EE products, find energy efficiency more important, and will have greater intentions to install EE measures.

Figure 6-32 compares knowledge of energy efficiency products among participants who also took part in a rebate program (Express Efficiency or SPC) to that of participants who did not take part in a rebate program. In general, those who participated in a rebate program were more likely to report being very knowledgeable, giving a rating between 8 and 10 on the 1 – 10 scale. This was true across all delivery mechanisms, except for those who participated via

CD-ROM; however, only two respondents in this category participated in both the Audit and a rebate program. Higher knowledge rates among those who took part in a rebate program could mean that the additional program gives businesses an extra opportunity to learn about energy efficiency. Alternatively, those who go on to participate in a rebate program could already have more knowledge of energy efficient products; in fact, this could be a reason for participation in the rebate program.

Among PG&E Local Program participants, knowledge of energy efficiency appears to be the same or somewhat less for those who participated in both the Audit and a rebate program. The result is unexpected, and may simply be due to small sample sizes.

Figure 6-32: Knowledge of Energy-Efficient Products, Among Audit-Only Participants vs. Participants Who Also Took Part in a Rebate Program [63]



Intentions to install energy efficient products were also assessed on a 1 – 10 scale, with 10 being "extremely likely." Among those who participated in the on-site and phone Audits,

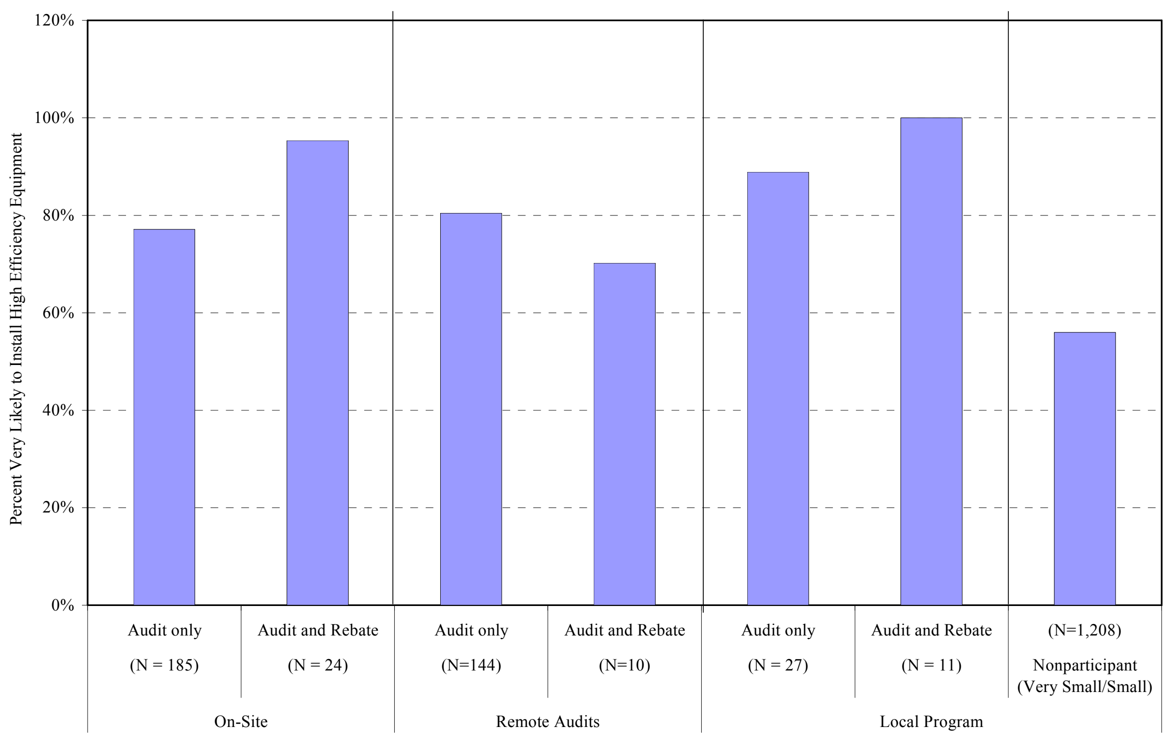
[63] Medium and Large nonparticipant scores are based on an average of responses to separate queries of their knowledge of energy efficiency opportunities in lighting and HVAC.

results suggest that those who also reported participating in a rebate program had greater intentions to install energy efficient products than those who participated in the Audit only. Among those who participated via mail and CD-ROM, intentions were somewhat lower for those who participated in both the Audit and a rebate program. However, sample sizes for these groups were quite small.

Among those in the PG&E Local program, 100% of those who participated in a rebate program reported that they were very likely to install energy efficient products in the future, compared to 89% of those who participated in the Audit only.

These results could suggest that, especially among larger customers (on-site and PG&E Local participants), participation in a rebate program may result in greater intentions to install energy efficient products. However, it could also be the case that pre-existing greater intentions are a motivating factor for participation in rebate programs. Additionally, results should be interpreted with caution due to small sample sizes.

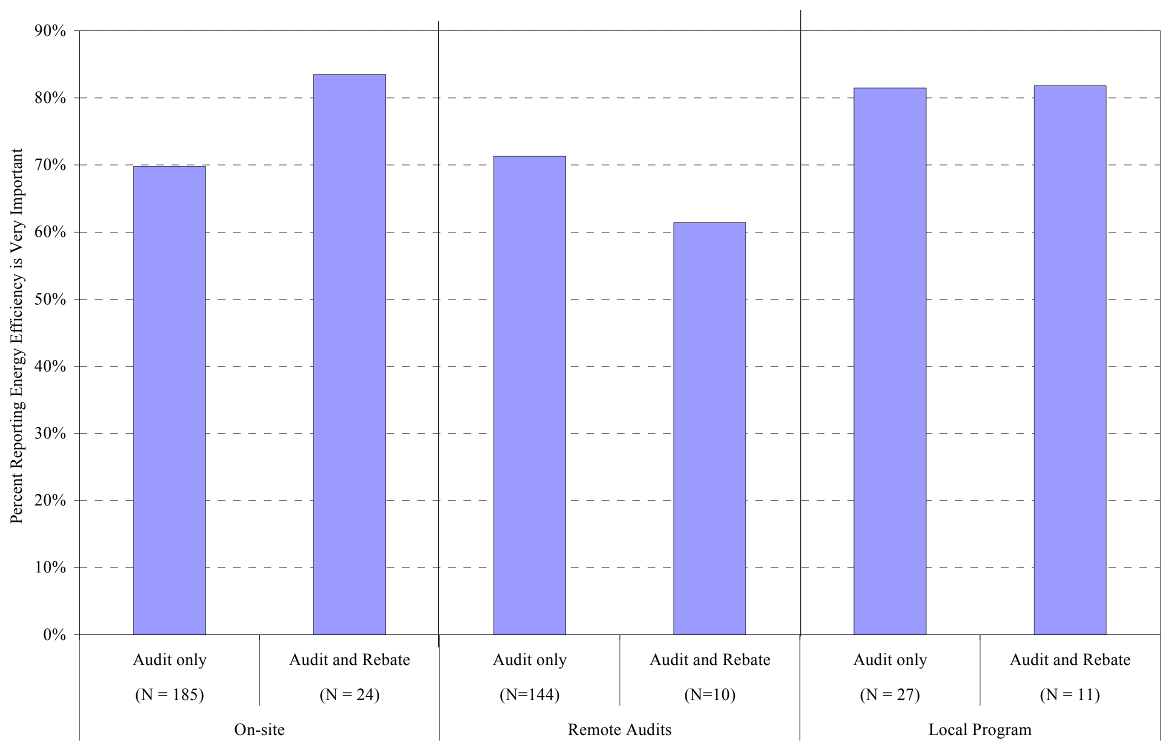
Figure 6-33: Likelihood of Installing Energy Efficient Products, Among Audit-Only Participants vs. Participants Who Also Took Part in a Rebate Program



Finally, attitudes toward energy efficiency were compared for those who participated in the Audit only and those who participated in both the Audit and a rebate program (Express Efficiency or SPC). Participants were asked to report how important the decision makers at their business find energy efficiency. Those who participated in the both the on-site Audit and a rebate program were about 10% more likely to report that energy efficiency was very important to the decision makers at their business. Those who participated both in the Audit via CD-ROM and in a rebate program also appear more likely to find energy efficiency very important, although the sample size is quite small. Among those who participated in the PG&E Local program, importance of energy efficiency was about the same for those who participated in the Audit only and those who also participated in a rebate program.

Perhaps the only group for whom participation in a rebate program increases attitudes toward energy efficiency are those who participate in the on-site Audit. Again, caution is needed in interpreting this, however, as those who went on to participate in the rebate program may have already placed higher importance on energy efficiency, compared to those who did not go on to participate in a rebate program.

Figure 6-34: Importance of Energy Efficiency, Among Audit-Only Participants vs. Participants Who Also Took Part in a Rebate Program



6.12 Conclusion – Cross-Program Influence

Findings for both the Express Efficiency and SPC program indicate that awareness is higher among Audit participants when compared to Audit nonparticipants. The difference is relatively small for most customer groups, suggesting that participation in the Audit program has a minimally positive influence on awareness of these two utility programs. These differences were less pronounced for "large" customers, suggesting that this group of customers is more likely to already be aware of these retrofit programs before participating in the Audit program.

Additionally, participation and awareness were also higher for Express Efficiency when compared to SPC. This suggests that the link between the NRA Program and Express Efficiency may be stronger than the one with SPC. Express Efficiency may offer services that fit the needs of a larger number of customers who participate in the NRA program, or marketing efforts for Express Efficiency through the NRA Program could be stronger than those for SPC.

Knowledge of energy-efficient products tended to be greater among those who participated in both the Nonresidential Audit and one of the rebate programs, either Express Efficiency or SPC for both participants and nonparticipants. This likely indicates that Express Efficiency is simply more accessible to most customers. The Audit may also emphasize links to Express Efficiency to a greater degree. Larger Audit participants (i.e., on-site participants) who took part in the rebate program also tended to report greater intentions to install energy efficient products, and this group also placed greater importance on energy efficiency.

Among PG&E Local participants, those who also participated in a rebate program did not appear to consistently have greater awareness, intentions, and attitudes toward energy efficiency.

6.13 Best Practices

This best practices section focuses on audit best practices and builds upon the previous 2003 Best Practices Assessment conducted as a part of the 2003 Nonresidential Audit Evaluation. The purpose of this section is to identify best practices among new and emerging audit approaches as well as existing delivery channels and methods that are already in place. Issues related to alternative audit formats, communication approaches, and specific follow-up opportunities are also addressed. Particular emphasis is placed on the emergence of wireless data management tools and their use in on-site audits.

This section attempts to address the research objectives identified in the best practices section of the research plan. Research objectives include:

- Extending the best practices research from the 2003 evaluation, specifically to emerging audit approaches,
- Exploring issues related to alternative audit formats, communication approaches, and specific follow-up opportunities, and
- Exploring recent innovations involving "hybrid" new technologies such as wireless PDAs, and lessons learned from other industries with experience incorporating these technologies.

The 2003 Nonresidential Audit Evaluation acted as the starting point for this best practices section. The evaluation provided an overview of all five types of audits offered to customers (mail, CD-ROM, online, phone and on-site) and identified general observations and recommendations for the program. The 2003 evaluation also included a chapter devoted to on-site audit best practices to evaluate the different approaches undertaken by the four Investor Owned Utilities (IOUs). Reports from the following sources were also reviewed as a part of this best practices research:

- Recent ACEEE proceedings – Published papers from the most recent ACEEE (American Council for an Energy-Efficient Economy) conference in 2006.
- Recent IEPEC proceedings – Published papers from the most recent IEPEC (International Energy Program Evaluation Conference) in 2005.
- Interviews with Statewide Nonresidential Audit Program managers at the four California IOUs and staff at Nexus, a third party audit implementation company.
- Utility databases and independent evaluation companies (i.e., NYSERDA, CALMAC, KEMA, Quantum, etc.)
- Energy industry publications (i.e., Energy & Power Management Magazine).
- Energy software company "road maps" for auditing software programs and their capabilities.

A large number of reports and information from these sources were reviewed to see if they were relevant to the Statewide Nonresidential Audit Program. Specifically, any reports that focused on energy audits, auditing techniques, or technology that is or could be used in energy audits were selected for a more detailed review. Best practices, lessons learned, recommendations and other successful elements of auditing programs and tools were compiled from these sources and used to develop this section.

This section begins by establishing a baseline for auditing best practices by defining the fundamental elements of a successful energy audit program. The section then explores successful auditing techniques and programs that have resulted in higher levels of participation and implementation of ECMs (energy conservation measures). Many of these techniques address several of the research objectives as they incorporate alternative audit formats, communication approaches, and follow-up opportunities that increase program impacts. The section then takes a deeper look at wireless data management systems, a "hybrid" technology identified as being of particular interest in the research plan. This section of the best practices assessment looks at this emerging on-site audit technology to identify how it can be used to enhance existing utility audit programs and practices.

6.13.1 Fundamental Auditing Practices

Existing best practice literature identifies several strategies for the implementation of a successful energy audit program. Auditing best practices were identified from previous research from California and other regions of the US and were used to compile this list of fundamental auditing practices. The practices included in this list have contributed to the success of previous utility energy audit programs and should be integral elements of similar programs.

It should be noted that many of these best practices, while applicable to most or all market segments, may be used differently for specific delivery channels and customer segments. Individual delivery channels and customer segments each have their benefits, challenges and specific needs (see Section 6.3.4) that must be recognized and taken into consideration when developing an effective audit program.

Programs achieve the highest level of success when they are able to design each program element to serve the specific needs of their target market(s). This key finding was reflected in the 2003 Best Practices Assessment for on-site audits emphasizing the importance of tailoring program delivery by customer size[64]. In addition to this element, best practices for energy audit programs are identified below:

- ***Identify customers to target*** – Utilities should try to identify specific customers who are best suited to receive program services and help meet program goals.
- ***Engage customers*** – Customers should be engaged in an efficient manner that communicates program credibility and minimizes customer hassle.

[64] 1-24, 2003 Nonresidential Audit Evaluation

- ***Identify measures for conservation*** – Opportunities for ECMs should be identified through a quick and accurate audit.

- ***Clearly communicate results with customers*** –Customers should be provided with a concise and clear document providing information on estimated costs, savings, rebates, and overall net benefits for ECM opportunities that have been identified.

- ***Clearly communicate program details*** – Customers should be presented with materials about the program that encourage them and provide them instructions on how to participate and install ECMs.

- ***Facilitate simple payment process*** – A quick and easy payment method (e.g., credit card) and other financing options should be presented to the customer at the time of the audit.

- ***Facilitate simple installation process*** –Providing customers with an easy method of finding a qualified contractor to install ECMs should be an integral part of the program, since customers tend to drop out when responsible for finding contractors.

- ***Sign a contract with the customer*** – This should be done relatively soon after the customer has been presented with appropriate information. When the customer knows exactly what will be done, what the estimated costs and savings are, and how the ECMs will be installed they become much more likely to say "yes."

- ***Validate savings*** – Validating savings for a portion of participants provides important information for policy makers and program managers on how effective programs are.

- ***Allow for continual feedback*** – Continual feedback allows for program managers to identify problems and make appropriate changes as they come up, keeps customers engaged with the program and the utility, and maintains important customer-utility relationships.

Ensuring that these practices are a part of an energy audit program tends to increase its overall impact and cost-effectiveness. Many of the best practices mentioned above are incorporated into the successful programs, practices and techniques highlighted in the rest of this section. Furthermore, the California IOUs participating in the Statewide Nonresidential Audit program incorporate many of these fundamental best practices as a part of their programs to varying degrees. However, by examining individual delivery mechanisms, customer segments, and programs as a whole with these fundamental auditing practices in mind, the IOUs can make sure that all elements of their auditing programs are following these best practices and delivering an effective result for all stakeholders.

6.13.2 Successful Auditing Techniques and Programs

Direct install programs with audits can increase ECM installations in the small and hard-to-reach markets.

This section highlights Southern California Edison's successful implementation of a direct install program. SCE expanded their direct install program in the summer of 2005 at the request of the CPUC. The *Summer Initiative Direct Install Program* was similar to SCE's Nonresidential Audit Program, but it focused on having contractors provide all program services, provided direct installations of ECMs at no cost, and made contractors responsible for completing all ECMs a customer committed to after an audit. Because the customer did not have to finance any of the measures or take any additional action it became very easy for contractors to get a "yes" for participation and installation.

The direct install approach proved to be very successful for getting ECMs installed in hard-to-reach markets. SCE's 2005 Summer Initiative Direct Install Program achieved penetration rates of nearly 90% in the small hard-to-reach commercial customer segment when measures were provided at no cost. This program included many of the best practice program elements discussed above and achieved high participation by making contractors responsible for recruiting participants and by addressing the barriers faced by different customer segments.

In addition to Edison's Summer Initiative Direct Install Program, the 2003 Nonresidential Audit Evaluation Best Practice Assessment identified direct install programs as a possible preferred delivery channel for bringing energy efficiency to smaller customers (under 20 kW market). Citing additional third party programs of this nature in San Francisco, the East Bay and other locations, this type of approach, though relatively expensive, has proven to be effective in delivering energy efficiency equity to the small customer hard-to-reach market segment and achieving a high level of ECM installations.

Utilities should attempt to determine the cost-effectiveness of direct install programs before implementing them to make sure they are delivering energy savings at a reasonable cost. Though these programs are effective in increasing ECM installations in the small and hard-to-reach customer markets, they may be too expensive for certain measures or utility programs. Direct install programs may not be practical for larger customers due to the more complicated nature of ECMs typically recommended to this customer segment, such as complicated HVAC and boiler systems.

Collaboration with Community Based Organizations (CBOs) can increase audit program participation and ECM installation.

SCE has frequently collaborated with CBOs (e.g., local chambers of commerce or trade associations) as a part of the Statewide Nonresidential Audit Program to encourage enrollment and increase the installation of ECMs. CBOs are first used to reach out and educate customers to encourage enrollment. CBO members will receive program information and printed materials from both SCE and the CBO prior to initial contact with an SCE staff member. Because of this initial outreach, customers are often very willing to agree to an audit when approached by SCE.

CBOs are also used to increase the installation rate of ECMs. SCE is able to provide customers receiving an audit with a list of contractors, but they cannot recommend one over another. This is typically a point in the program where participation falls off and customers do not realize savings from the audit. However, CBOs are able to suggest one of their members to install ECMs recommended through the program, which helps overcome the barriers customers face of finding a qualified contractor and the barriers contractors face in trying to market to small customers.

Collaboration with CBOs has increased ECM installations and reduced dropout rates for SCE on-site audit customers. SCE data suggests that ECMs are installed by 40-50% of customers who have on-site audits when CBOs are used to facilitate the installation process. This number drops to 10% when customers must select a contractor on their own. By encouraging participation in the program and eliminating the barriers customers traditionally face with installing ECMs, SCE's work with CBOs has dramatically improved energy savings from the Nonresidential Audit Program.

Lower cost delivery channels can be more appropriate for smaller customers.

On-site audits were determined to be cost-ineffective in comparison to other delivery mechanisms for small customers when links to rebate and incentive programs, installation contractors and financing options were not included. The 2003 Nonresidential Audit Evaluation's On-Site Audit Best Practice Assessment chapter indicated that the "remaining portfolio of 'remote' delivery mechanisms offered by the program are considered a more cost-effective product for the very small customer class." Delivery mechanisms falling under this category include mail, CD-ROM, phone and online audits. Furthermore, smaller customers typically only need generic information about ECMs and energy efficiency that can easily be provided by these four delivery mechanisms. These delivery mechanisms may not be appropriate for larger customers or facilities requiring specific and complex information that may only be available through an on-site audit.

Since the 2003 report, limited research and evaluation has been conducted on the current effectiveness of these delivery mechanisms, but because of their low cost, they likely continue to provide an effective way to reach a large number of small to very small customers through the Statewide Nonresidential Audit Program.

Linking other related programs with the audit can increase participation in all utility programs.

A common best practice is to link appropriate rebate or incentive programs with utility audit programs. Existing literature provides strong evidence that these linkages increase a customer's likelihood to install ECMs both directly after an audit and in the future. Programs are most successful when they can link programs in a way that minimizes customer hassle. Each of the California IOUs already practice this at some level

Incorporating wireless data management systems with on-site audits can increase the audit's effectiveness and impact.

Wireless data management systems have been emerging as a popular mechanism for coordinating and conducting on-site energy audits. These systems generally use a wireless format and interface with wireless PDAs, computers, printers, and other hardware to perform on-site energy audits quickly and efficiently. Wireless data management systems give on-site auditors several tools to work with that are normally not available in the field. When used effectively, these systems incorporate many of the fundamental auditing best practices described earlier in this section. They also give utility staff greater mobility, provide quick and applicable results for the customer, and allow the utility to efficiently collect and store customer information in the field.

Experience from Southern California Edison's use of wireless data management systems in several of their energy programs has shown how such systems benefit all stakeholders (customers, utility staff and implementers) involved. Edison representatives use their hand-held computers to quickly capture site information (e.g., site area, lighting fixture counts, HVAC data, lamp/ballast types, window area, etc.) during the audit. This information is sent wirelessly back to a host server that returns the computed costs and savings in seconds. The mobile computer connects wirelessly to a portable color printer and generates a summary report and completed rebate form if desired by the customer. This process quickly and efficiently engages the customer, minimizes errors, and improves efficiency. This allows the representative to spend more time with the customer discussing the program and answering questions instead of tediously performing energy calculations and filling out forms.

Wireless data management systems were successfully used in two of the programs discussed above (Edison's implementation of the Statewide Nonresidential Audit Program and their Summer Direct Install Program) to achieve high levels of program participation and ECM installations. These systems are being used more often in on-site energy audit programs sponsored by utilities and are producing similar good results. PECI (Portland Energy Conservation, Inc.) has used a wireless data management system similar to those used in the

Edison programs to develop a successful on-site audit program focused on delivering energy efficiency to grocery stores and supermarkets.

The development of effective wireless data management systems should focus on three specific areas: the type of data to be provided and collected, hardware and software that will be involved, and information needed by various groups involved with the program. These three areas are crucial elements of an effective wireless data management system and are discussed in further detail below.

- ***Types of data*** – Best practices literature identifies six types of data that should be a part of an effective data management system.
  - **Customer Data** – information such as customer names, addresses, size, rate schedule, and historical usage.
  - **ECM Data** – information on approved lists of measures, methods for calculating savings, incentives, and pricing.
  - **Site Data** – records existing on-site equipment information and feasible ECMs identified during the audit.
  - **Program Data** – includes lists of participants, participation rates, program goals, conversion rates, approved contractors, payment structures, program budgets, and actual allocations.
  - **Best Practice Data** – includes information about best-practice energy use (i.e., watts/sq. ft.) and can be used to evaluate ECM penetration, auditor effectiveness, and program optimization.
  - **Customer Relationship Management (CRM) Data** – captures customers' satisfaction levels and specific needs. Can also be used to enroll customers in related utility-sponsored workshops that may be of interest.

- ***Hardware and Software*** – Specific hardware and software allow effective input and management of data.
  - **Relational Database and Web Server** – acts as the center and foundation of the wireless data management system; where all data is stored and shared.
  - **Web-Based Applications** – allows multiple parties the ability to access program and customer specific information to generate reports from multiple locations
  - **Mobile Computing Platform** (i.e., PDAs or Tablets) – used to input information on-site and conduct related analyses
  - **Portable Printers** – allows customer-specific reports and other related hard copy materials (i.e., contracts) to be generated on-site.

- ***Stakeholder Needs*** – The data management system should allow various program stakeholders to perform specific tasks and have access to the information they need.

- **Program Managers** – use information being inputted in real-time to track program goals, accomplishments and progress and manage employees.
- **Auditors** – use program data to generate custom reports for customers and conduct audits.
- **Contractors** – use the system to receive electronic versions of custom reports indicating specific ECMs to be installed and qualifying rebates
- **Program Evaluators** – use data collected through the system to evaluate programs more effectively.

Wireless data management systems are often transmitting confidential customer information and must be secure in order to protect individuals from potential harm. Having a relational database and web server are critical elements of a wireless data management system, but the system must also be able to securely store and transmit all the data it is processing. UPS (United Parcel Service), operator of the world's largest wireless network, has been using wireless data management systems to some extent since 1985. The company has moved well beyond the lowest level of wireless security (WEP – Wired Equivalent Privacy) to ensure that only authorized devices can communicate with the company's wireless network. Utilities should try to follow the paths of companies like UPS who have extensive experience developing secure and effective wireless data management systems when using similar tools for their own programs.

In general, wireless data management systems provide benefits over traditional on-site auditing practices. They produce quick, current, and personalized data for customers, improve program management and efficiency for the utility, and make it easier for contractors and implementers to install more ECMs as a result of the audit.

6.14 Conclusion – Best Practices

This best practices section focuses on both the technology and program strategies that, when incorporated, improve the effectiveness of utility energy audit programs. Auditing technology will continue to improve and become easier and cheaper to incorporate with existing utility programs. While utilities should pursue efforts to use technology that improves the delivery of their programs, they should make sure that these programs also incorporate proven best practice strategies in order to ensure they are realizing maximum benefits. Utilities that can develop auditing programs that use current and effective technology, focus on including fundamental auditing best practices, and pursue some of the strategies discussed in this section will be able to achieve the greatest results.

7

Long Term Assessment

The Long-Term Assessment characterizes the longer-term benefits of the Audit program, emphasizing issues of how measure and practice adoptions unfold over time, how long the audit remains a useful energy efficiency reference guide and in what ways it is most often used. To do this, participant adoptions are measured over time and the audit influence on those adoptions is assessed. Similarly, program market effects are examined over time, including energy efficiency knowledge and intentions to install efficient equipment in the future.

It is an essential role of the audit program to provide a report or list of energy efficiency recommendations that can be referenced over time, so that customers may use the audit to find information on specific measures when the need for that information arises. The extent to which customers made use of the audit report in the years following the initial presentation of results is examined, including the longevity characteristics of the audit, long-term usefulness and customer audit recall.

A Long Term participant survey was conducted to focus on the population of participants that completed Audit Program participant surveys in past evaluation studies. The goal was to build panel data from which to analyze the impacts and market effects of the audit over time. There were a total of 401 survey completes with 2002 and 2003 program participants, of which 305 were completed with previously surveyed participants. Despite our best efforts, 400 surveys could not be completed with the available sample, so the remaining 96 surveys were completed with 2002/2003 participants that had not been surveyed before.

The Long Term Assessment also draws on the 800-point PY 2003/2004 participant impact survey, the 200-point cross program impact survey and the 1,586-point nonparticipant survey. In addition, the Long Term Assessment utilizes data collected from previous EM&V studies. Goals of the Long Term Assessment include the following:

- ***Examine Participant Adoption Rates as a Function of Time Elapsed Since the Audit.*** Findings in previous evaluations have indicated there can be a substantial lag between the audit and adoption of recommended measures. This Study component is designed to gain a fuller understanding of Audit Program impacts and how they unfold over time.

- Examine Participant Adoption Rates as a Function of Customer Size and Measure Complexity. Several hypotheses were investigated as part of the long-term analysis.
  - First, it was hypothesized that larger customers would generally take longer to implement recommended measures, both because those measures were larger in scale and because larger firms were assumed to have more complex decision making processes. As a result, we would expect to see relatively high adoption rates from 6 months to 2 years after the audit.
  - Second, it was hypothesized that more complex measures would take longer to implement. This would also be expected to result in higher adoption rates 1-2 years after the audit for process measures than for lighting and cooling measures.
- ***Document Persistence of Audit-Based Market Effects.*** The Audit Program is in part an educational tool designed to raise knowledge and awareness of energy efficiency opportunities and the associated benefits. It has been well-documented in past Evaluations that participants emerge from the Program with greater technical knowledge and a more favorable view of energy efficiency improvement opportunities. The Long Term Assessment was designed to measure how these market effects persist over time.

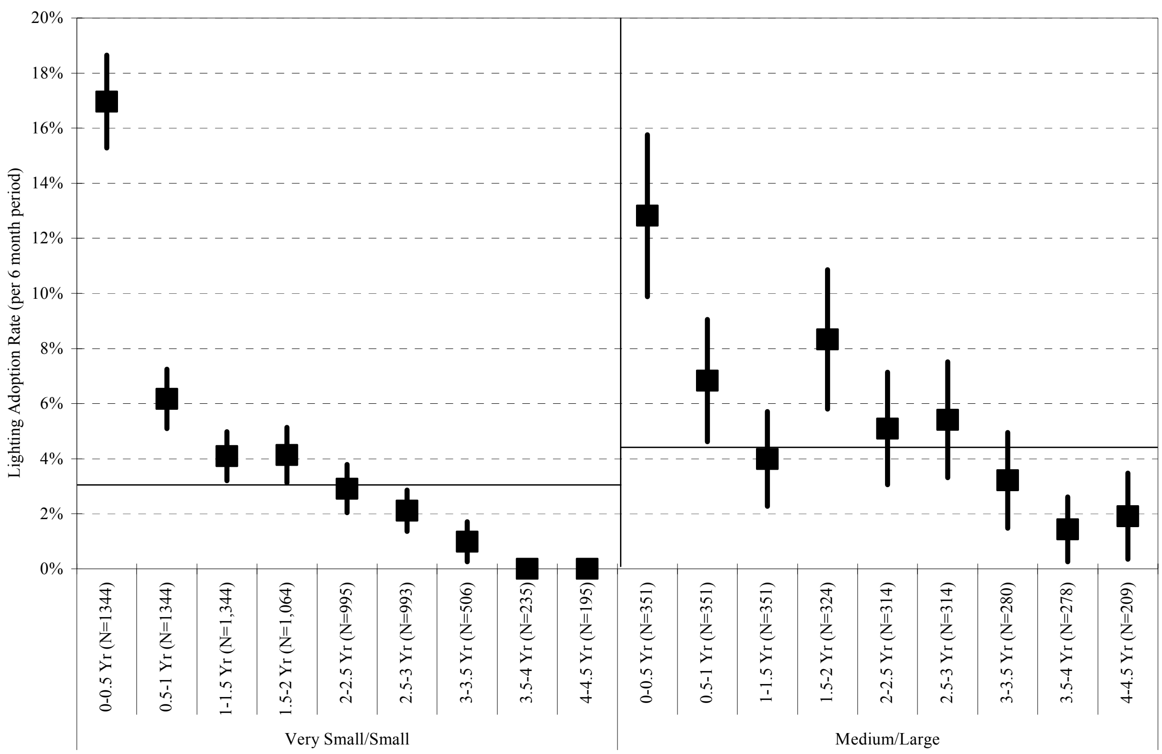
Following this introduction, this chapter begins with a discussion of the long-term benefits of the audit, including adoptions of various types of measures and conservation actions over time, as well as the audit influence on those adoptions and actions. Next, market effects of the audit are analyzed, including participant awareness of other energy efficiency programs, recall of audit recommendations, and revisiting of audit findings. Finally two indicators of efficiency awareness are investigated over time to study the long-term market effects of the NRA program: the self-reported knowledge of energy efficiency opportunities and intentions to purchase energy efficient equipment. The chapter closes with conclusions regarding the long-term effects of the program and accompanying recommendations.

7.1 Long-Term Benefits of the Audit

This section assesses the timing of customer adoptions over time relative to the initial audit. For example, customers – particularly those with long decision making processes for complex measures – may implement some program recommendations after a significant period of time has passed. For each group of measures (lighting, cooling, gas, process), a nonparticipant rate of adoptions was determined as a point of reference from the results of 1,586 surveys conducted in 2007 of 2004-05 nonparticipants. For lighting, the nonparticipant rate of adoptions is 4.1 percent over a typical 6 month period for medium and large customers and 2.8 percent for small and very small customers.

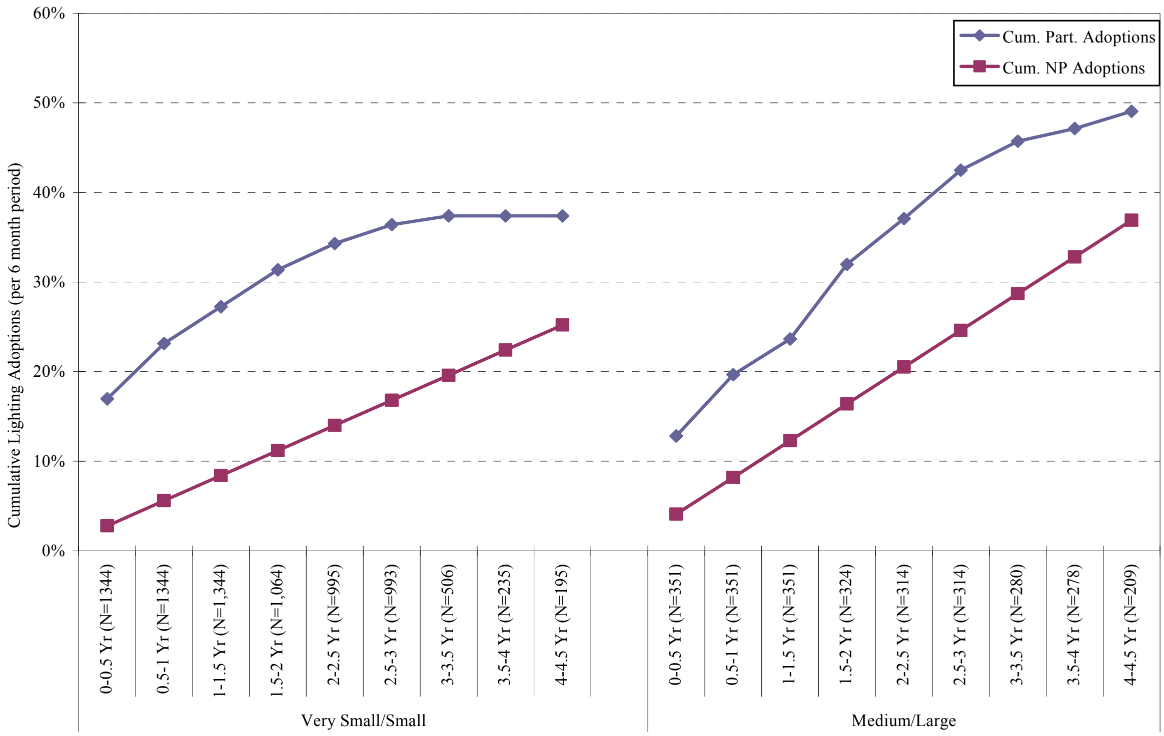
The percentage of adoptions for each six month period following the audit is shown for lighting measures in Figure 7-1 with the vertical bars representing the 90 percent confidence intervals around the mean values shown. As hypothesized, smaller firms had a high rate of lighting adoptions in the first six months after the audit, after which adoption rates fell sharply. After two years, the rate of lighting adoptions by very small and small customers had fallen to the baseline rate of 2.8 percent; after more than 2.5 years it was significantly lower, with no adoptions reported after 3.5 years. For medium and large customers, the initial surge in lighting adoptions was not as high, but neither was the subsequent decline. Lighting adoptions for medium/large customers were above the baseline rate of 4.1 percent for most of the first 3 years, and only fell significantly below the baseline after 3.5 years. The extent to which the adoption rate for medium/large customers remained above the baseline from 1.5 to 3 years after the audit tends to support the hypothesis that larger customers take longer to implement measures.

Figure 7-1: Lighting Adoptions Over Time Relative to the Audit



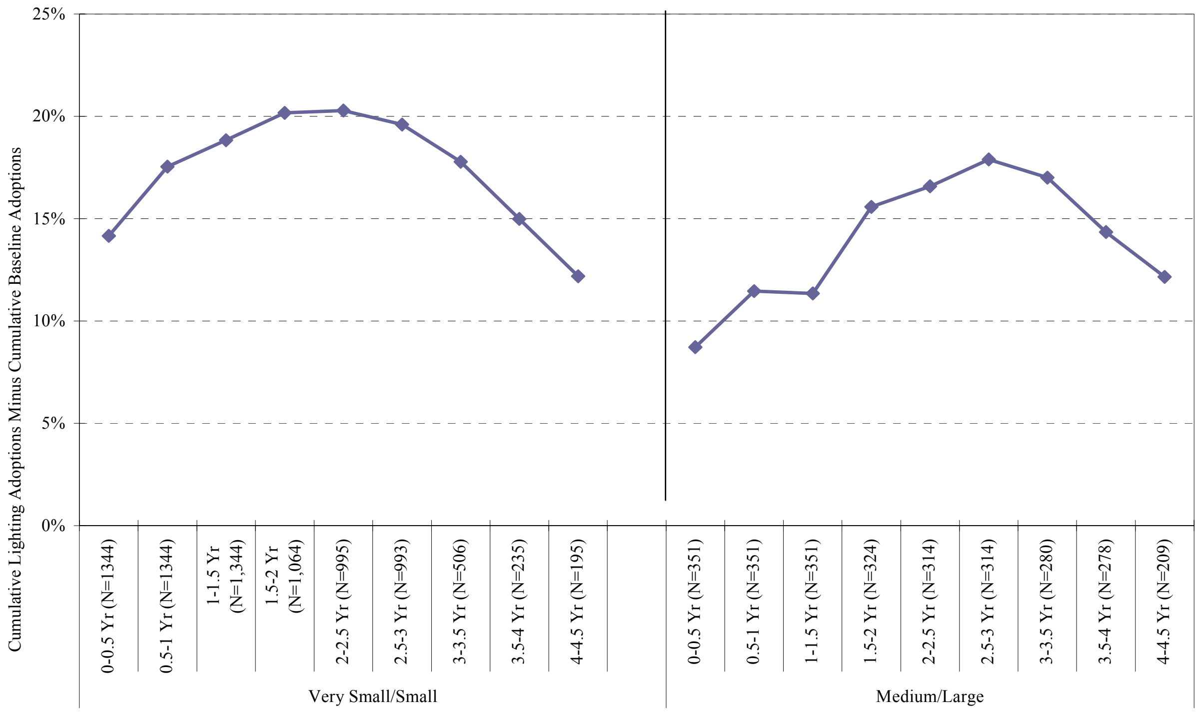
An alternate way of looking at the lighting adoption data is to consider cumulative adoptions in the periods after the audit, shown in Figure 7-2. These graphs highlight the higher level of overall adoptions for medium and large customers (with cumulative adoptions approaching 50 percent after 4.5 years), but also call attention to the greater relative impact of audits on small and very small customers.

Figure 7-2: Cumulative Participant Lighting Adoptions Over Time Relative to Nonparticipant Baseline



The importance of audits in influencing small customers can also be seen by looking at the difference between the two cumulative adoption curves, shown in Figure 7-3, which represents the net increase in adoptions over time among program participants. In part because of the lower nonparticipant baseline adoption rate for small customers, the difference between the cumulative participant and baseline adoptions is consistently greater (until 4-4.5 years out) for small than for medium/large customers.

Figure 7-3: Net Lighting Adoptions* Over Time Relative to the Nonparticipant Baseline

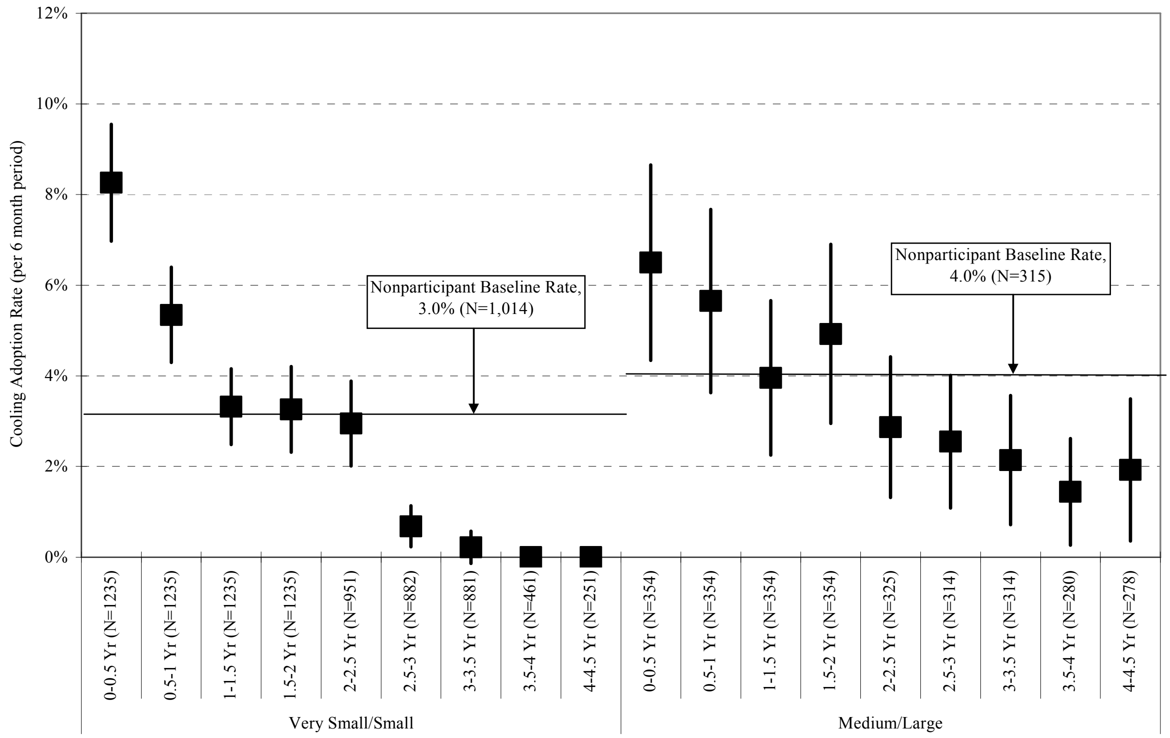


* Cumulative participant adoptions minus cumulative nonparticipant adoptions for each 6-month period after the audit

Note also that the difference between participant adoptions and the non participant baseline peaks from 1.5-2.5 years after the audit for small customers but does not peak until 2.5-3 years for medium and large customers, thereby lending support to the hypothesis that larger customers may take longer to adopt recommended measures. Interestingly, the net increase in cumulative lighting adoptions above baseline is almost identical for small and medium/large customers after 4.5 years.

For cooling measures, both the initial and longer term rates of adoptions are significantly lower than for lighting, and cooling adoptions for both very small/small and medium/large customers are higher than the nonparticipant baseline rate for only one year. Beyond 2.5 years, all participants have lower adoption rates than the baseline, as shown in Figure 7-4.

Figure 7-4: Cooling Adoptions Over Time Relative to the Audit



While small customer adoptions increase significantly in the first year after the audit, there is no evidence of a later increase in adoptions among medium/large customers, other than a minor uptick in adoptions 1.5-2 years after the audit.

Because of the decline in participant adoptions after a relatively short time, cumulative cooling adoptions among nonparticipants exceed those for participants 3.5 years after the audit among both very small/small and medium/large customers. Figure 7-5 confirms that cumulative participant adoptions are only slightly greater than the baseline level for medium/large customers; for small customers there appears to be a greater initial impact, but for these customers, too, cumulative adoptions ultimately fall below the baseline total. By the end of 4.5 years after the audit, there is no net increase in cooling adoptions attributable to the program. (It should be recalled that this refers only to the number of cooling adoptions – not to their scope or the associated energy savings, which could well be greater for participants.)

The results shown in Figure 7-5 also imply that the audit may trigger early replacement of AC systems in some instances, prior to failure, when replacement presumably occurs for most nonparticipant systems. The same can be said, to some degree for lighting systems in Figure 7-1 and for gas measures in Figure 7-7.

Figure 7-5: Cumulative Cooling Adoptions Over Time Relative to the Nonparticipant Baseline

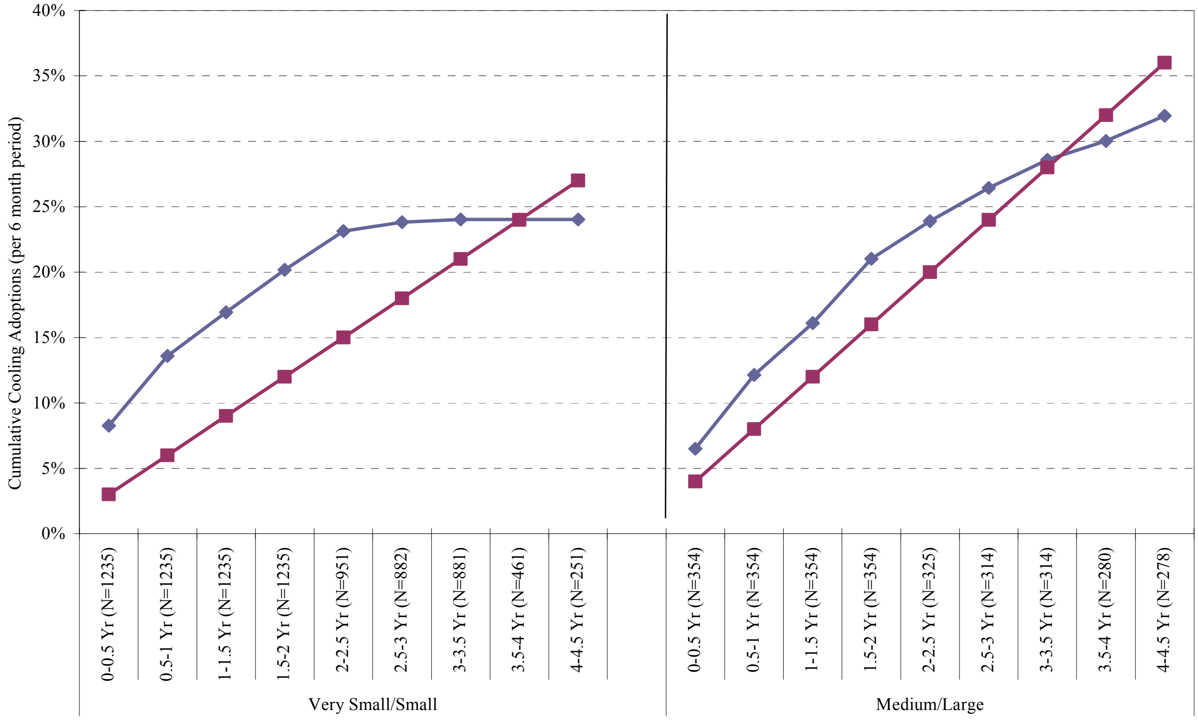
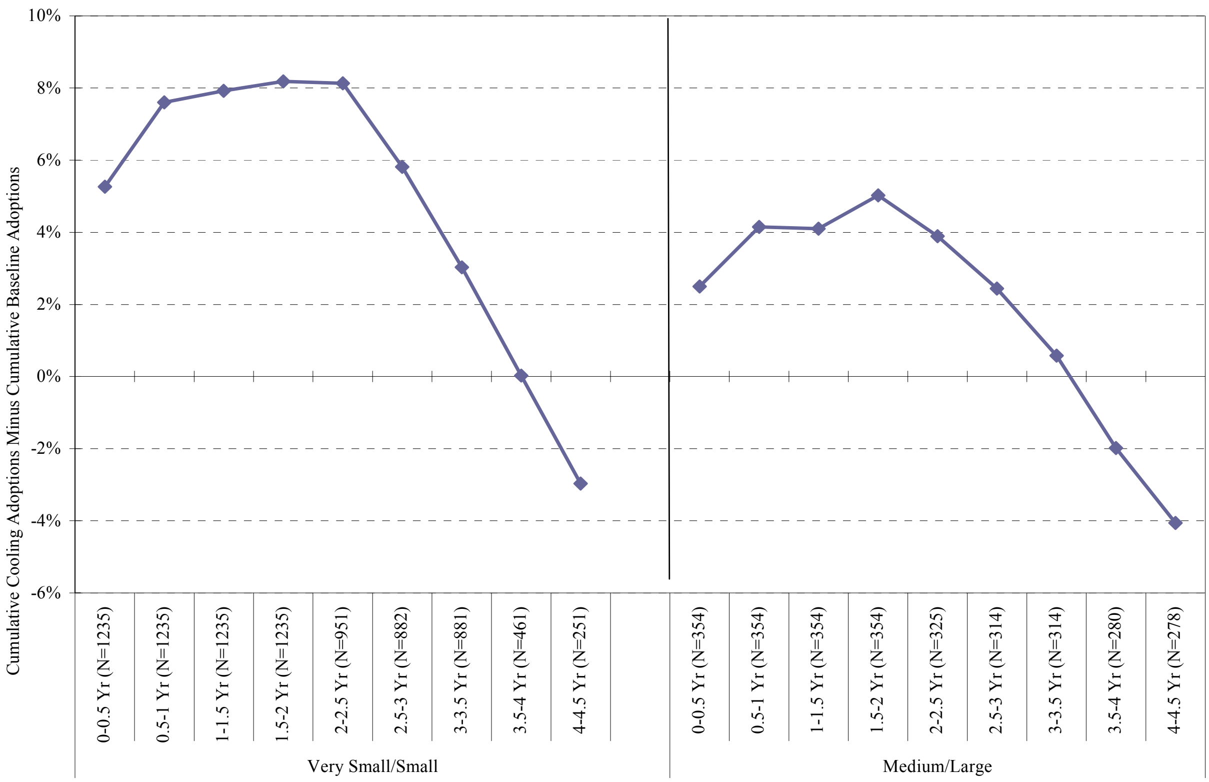


Figure 7-6 highlights the limited impact of the program on cooling adoptions, since the difference between cumulative program induced adoptions and cumulative baseline adoptions peaks at just 8 percent for small and 5 percent for medium/large customers. Moreover, the difference drops sharply after 2.5 years for small customers and after 2 years for medium/large customers, ending up below zero.

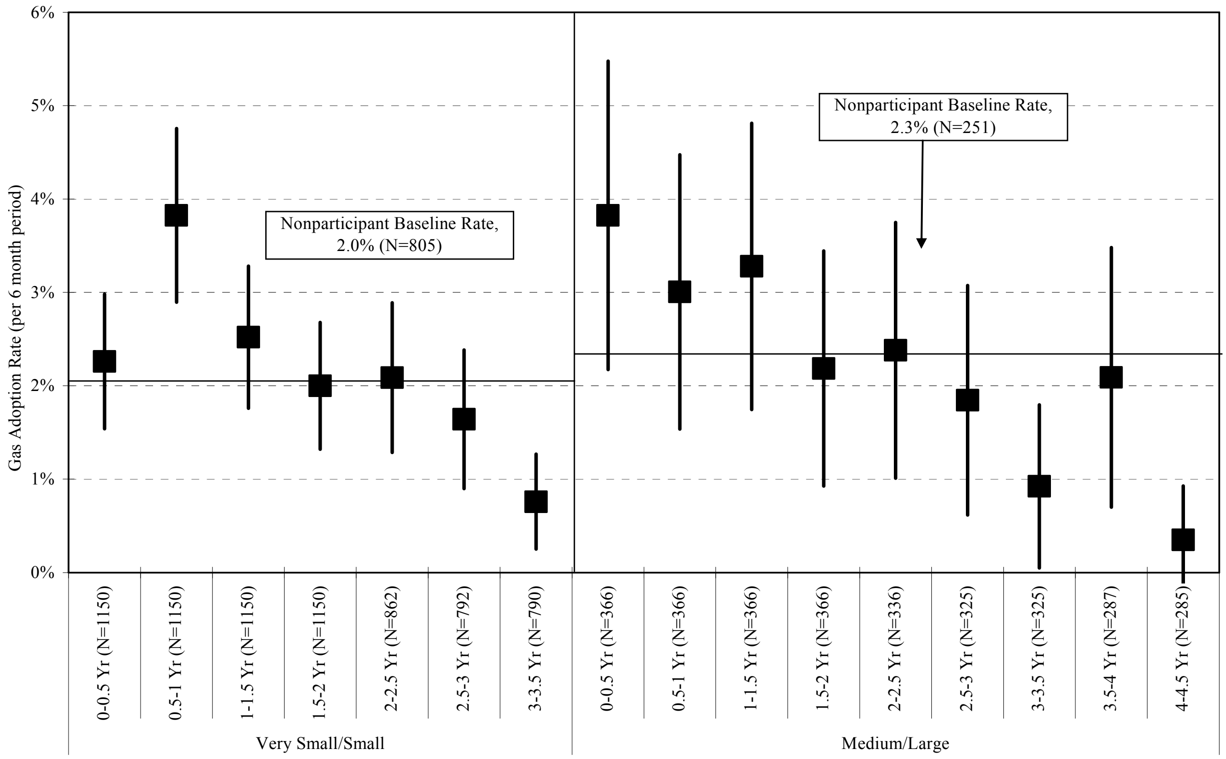
Figure 7-6: Net Cooling Adoptions* Over Time Relative to the Nonparticipant Baseline



* Cumulative participant adoptions minus cumulative nonparticipant adoptions for each 6-month period after the audit.

As shown in Figure 7-7, for gas measures long-term program impacts are modest, but longer lasting. Gas adoptions by audit program participants never exceed the baseline level by more than 2 percent, but do not decline below the non-participant baseline level until 3 years after the audit for both very small/small and medium/large customers.

Figure 7-7: Gas Adoptions Over Time Relative to the Audit



As shown in Figure 7-8 and Figure 7-9, the increase in cumulative net participant adoptions shortly after the audit is not offset by the lower than baseline participant adoptions in later periods. On the other hand, the cumulative gain in adoptions is only about 6 percent over 3.5 years for very small and small customers and 11 percent over 4.5 years for medium and large customers.

Figure 7-8: Cumulative Gas Adoptions Over Time Relative to the Nonparticipant Baseline

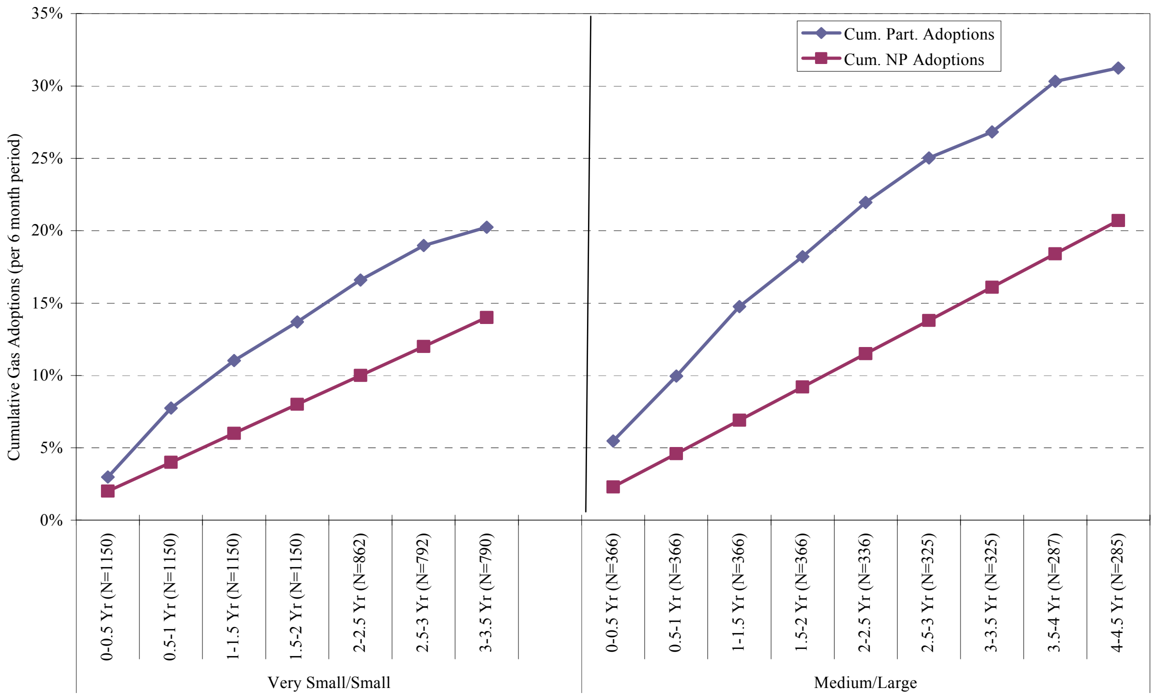
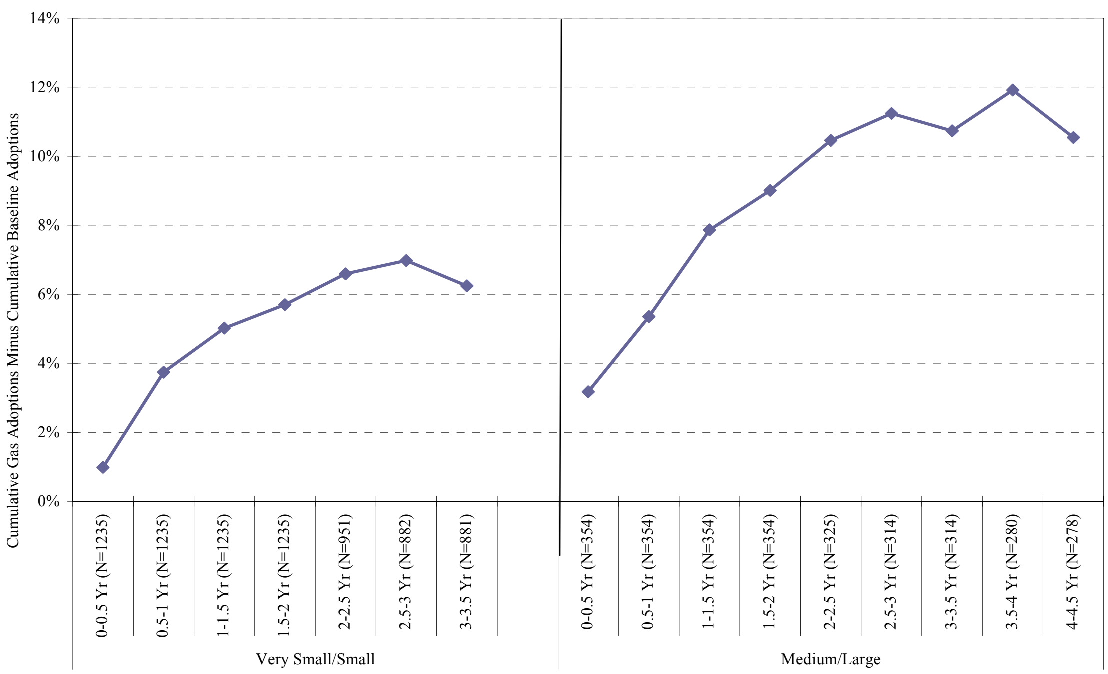


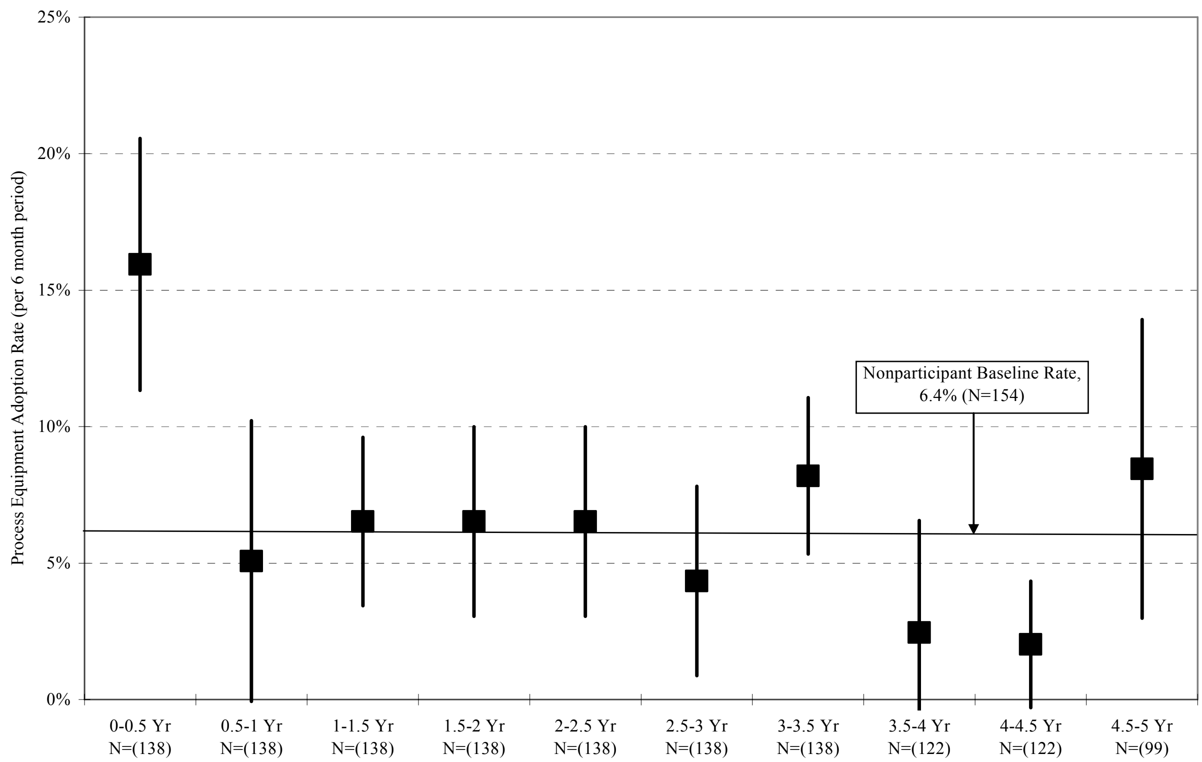
Figure 7-9: Net Gas Adoptions* Over Time Relative to the Nonparticipant Baseline



* Cumulative participant adoptions minus cumulative nonparticipant adoptions for each 6-month period after the audit.

Process measures were analyzed only for the limited number (154) of industrial customers and therefore were not broken down by customer size. Results are shown in Figure 7-10. While there was a significant increase in process adoptions in the first six months after the audit, adoptions quickly reverted to much lower levels slightly above or below the nonparticipant baseline level of 6.4 percent. However, cumulative process adoptions remained above baseline levels throughout the five years following the audit.

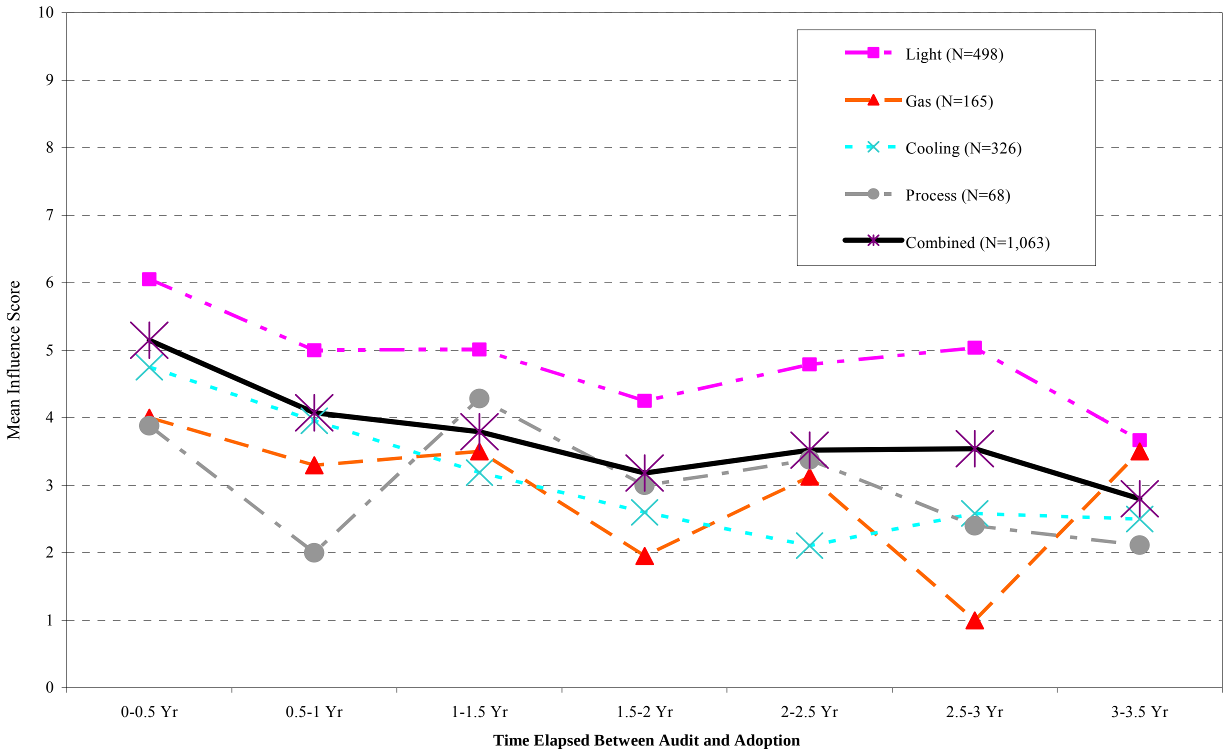
Figure 7-10: Process Adoptions Over Time Relative to the Audit, Medium and Large Customers



For all equipment installations, participants were asked to rate the influence of the audit on their equipment adoption, using a 1 to 10 scale, where 1 is not at all important and 10 is extremely important. The results are shown in Figure 7-11. Results are not presented beyond 3.5 years because the number of participants installing any measure dropped from 25 for 3-3.5 years to 12 for 3.5-4 years, making the mean values for individual end-use categories unreliable.

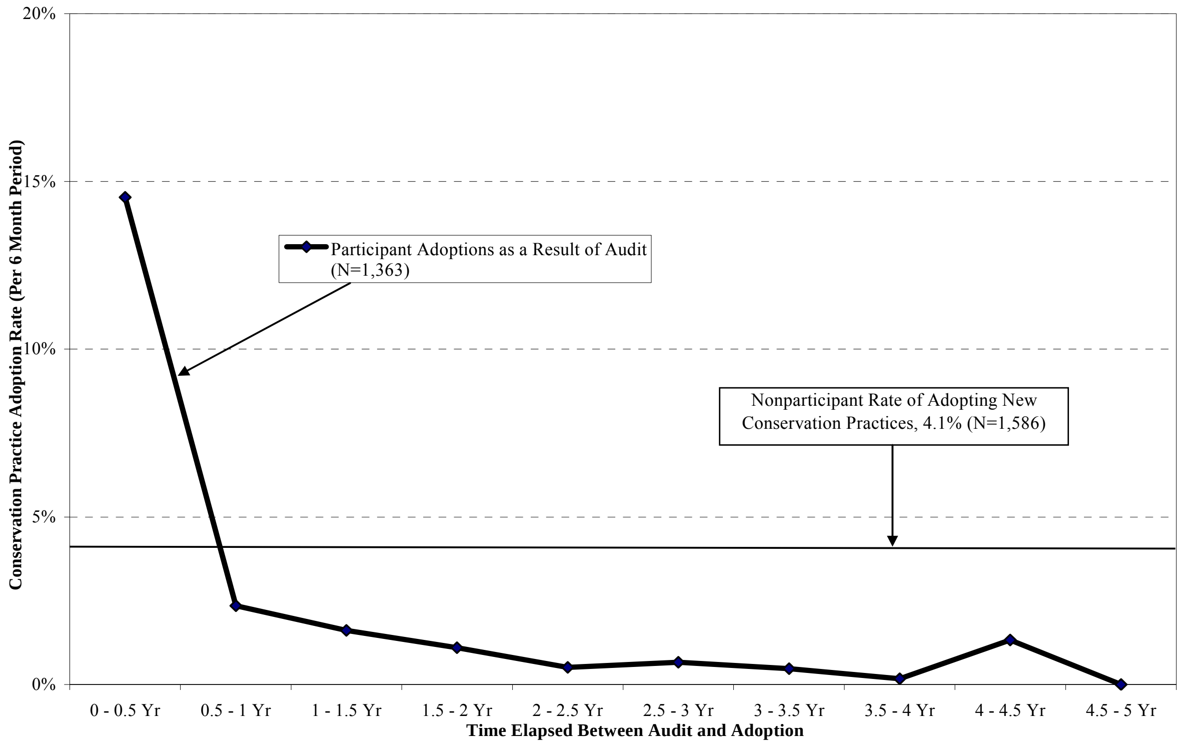
Figure 7-11 shows that over the first 3.5 years after the audit, the influence of the audit generally declines. For all measures combined, the mean influence score declines from 5.1 in the first 6 months to 2.8 for measures installed in years 3-3.5 after the audit. Lighting installations were the most influenced by the audit, with an influence score that averaged 6.0 in the first 6 months and 5.0 even for adoptions 2.5-3 years after the audit. Installations of gas measures were generally the least influenced by the audit, with the influence score declining from 4.0 in the first 6 months to 1.0 in years 2.5-3. Reasons for the relative influence of audits may be linked to the degree of recall of recommended measures – discussed later in this chapter.

Figure 7-11: Self Reported Audit Influence on Equipment Adoptions Over Time, Includes the 2002 Impact Survey and the 2004/05 Participant and Long Term Surveys



In addition to providing information on equipment installations, survey respondents were asked about conservation practices they had adopted as a result of the audit. Figure 7-12 shows the rate at which Audit participants that adopt a conservation practice as a result of the audit, and how that rate changes as the Audit become further back in time. Even more than equipment installations, conservation actions attributed to the audit increased sharply in the first six months after the audit, but then declined below the 4.1 percent nonparticipant baseline level for the remaining 4.5 years. They did not exceed 1.6 percent in any period more than one year after the audit. The decline in actions attributed to the audit emphasizes the extent to which conservation actions recommended by the audit are either adopted early or not at all.

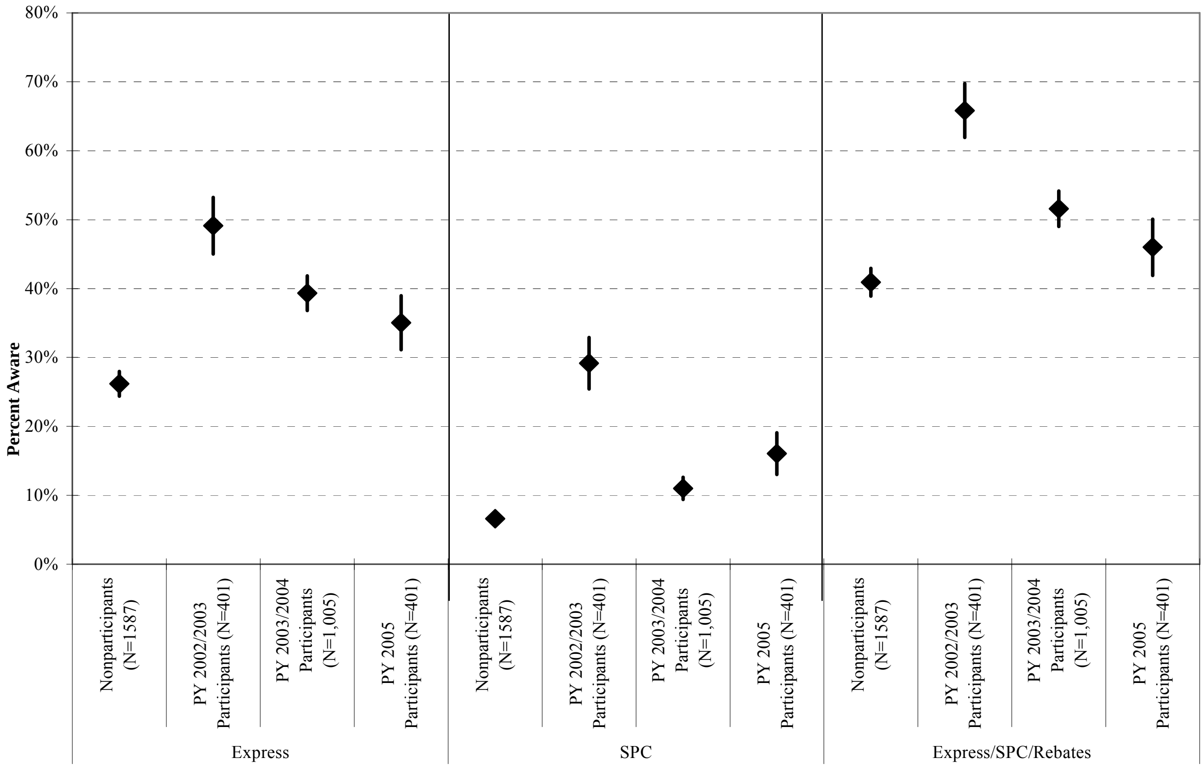
Figure 7-12: Conservation Actions Begun as a Result of the Audit



7.2 Market Effects Comparisons

One of the goals of the NRA program is to increase customer awareness of other programs available to nonresidential customers. The extent to which customers who participated in the NRA program at various times currently report being aware of both specific programs and utility programs overall is presented in Figure 7-13.

Figure 7-13: Program Awareness Comparison of Nonparticipants and Various Participant Cohorts



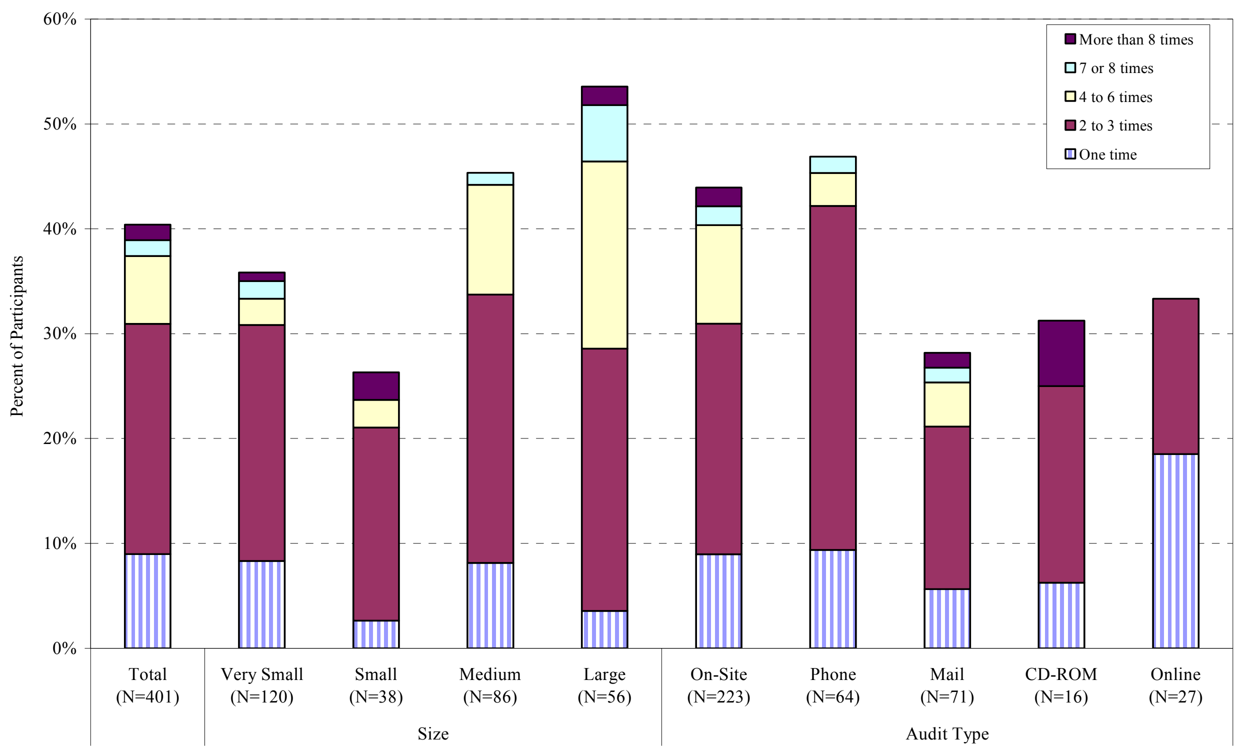
Contrary to expectations, the earliest participants appear to have higher levels of current program awareness than customers who participated in the NRA program more recently. Awareness of all programs as of 2007 was highest for 2002/2003 NRA participants, about two-thirds of whom reported being aware of the Express Efficiency Program, the SPC program, or utility rebates in general. These 2002/03 participants also had the highest awareness of the Express and SPC programs individually. Similarly, 2003/2004 participants were more likely than PY2005 participants to be aware of Express Efficiency and utility programs in general, although they were less likely to be aware of the SPC program. All participant cohorts had higher program awareness levels than nonparticipants.

7.2.1 Longevity of Customer Audit Recall

This section covers issues related to the "useful life" of the audit. For how long and how often do participants revisit the audit report? What information were participants seeking when they revisited the report? Did they find it? How much do participants remember from the audit report? What recommendations do they recall? These issues of audit longevity are linked to the eligibility requirements associated with various types of audits. Currently, participants are eligible once every three years for on-site, phone and mail participation, although they may use CD ROM software and online resources as often as desired.

Figure 7-14 below presents the frequency with which customers review their audit report. The height of each bar represents the portion of the total participant population that went back to their audit report to review it more than once, indicating that slightly more than 40 percent of participants did so. The chart shows that 46 percent of phone participants and 44 percent of on-site participants reviewed their audit report more than once. The portions of mail, CD-ROM and online audit participants that revisit their report are lower, with fewer than one-third of these participants re-reviewing their audit. On-site participants had the highest percentage reporting that they revisited their audit report frequently, with about 13 percent noting that they revisited their report more than 3 times.

Figure 7-14: Percent of Participants that Re-Review Their Audit Reports by Size and Audit Type



The likelihood of revisiting the audit report also varies with customer size. Medium (45 percent) and large (53 percent) customers were significantly more likely to revisit their audit reports than very small (36 percent) or small (27 percent) customers. Medium and (especially) large customers were also much more likely to review their audits frequently:

about 25 percent of all large customers reported reviewing their reports 4 or more times, compared to about 5 percent of small and very small customers.

Among all customers who revisited the audit report, 40 percent said they were looking for information on low-cost no-cost conservation actions, while 58 percent were interested in general and cooling- and lighting-specific equipment recommendations and 26 percent were looking for other information, as shown in Figure 7-15. (Totals exceed 100 percent because some customers were looking for more than one kind of information.) Very small and large customers were most likely to seek out information on lighting equipment, while medium customers had the largest percentage (34 percent) interested in general equipment recommendations.

Figure 7-15: Information Sought by Customers Revisiting the Audit Report – by Size

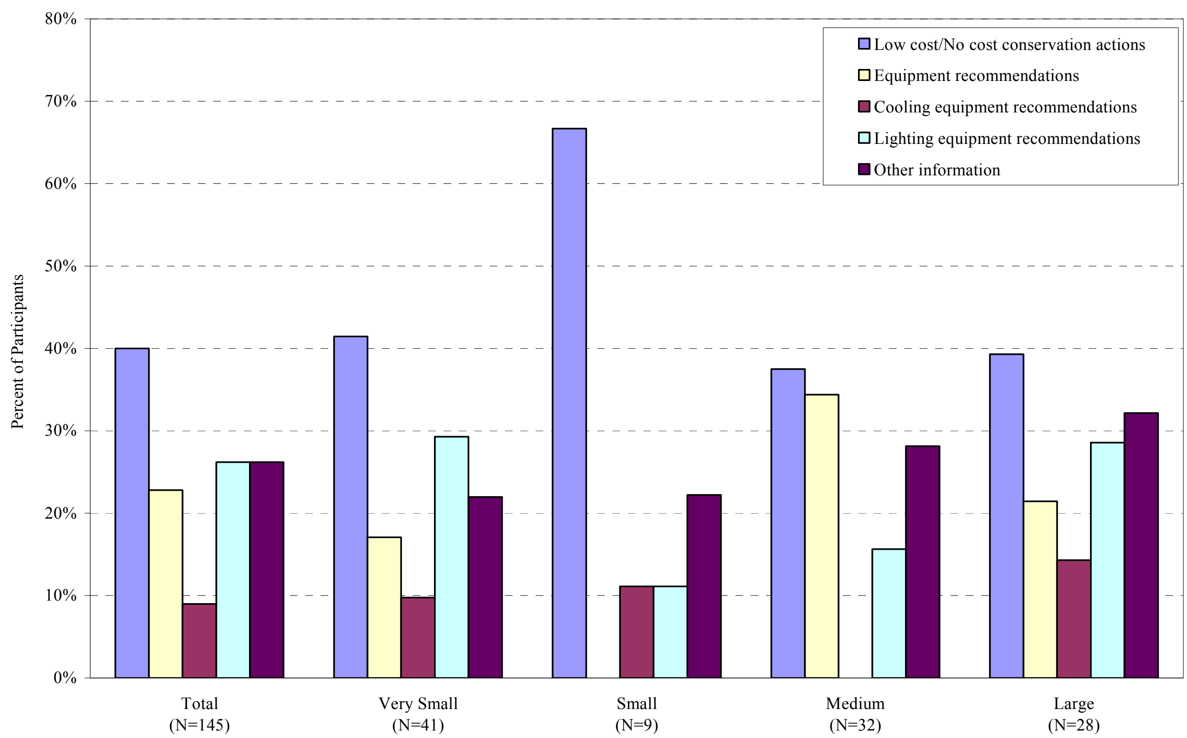
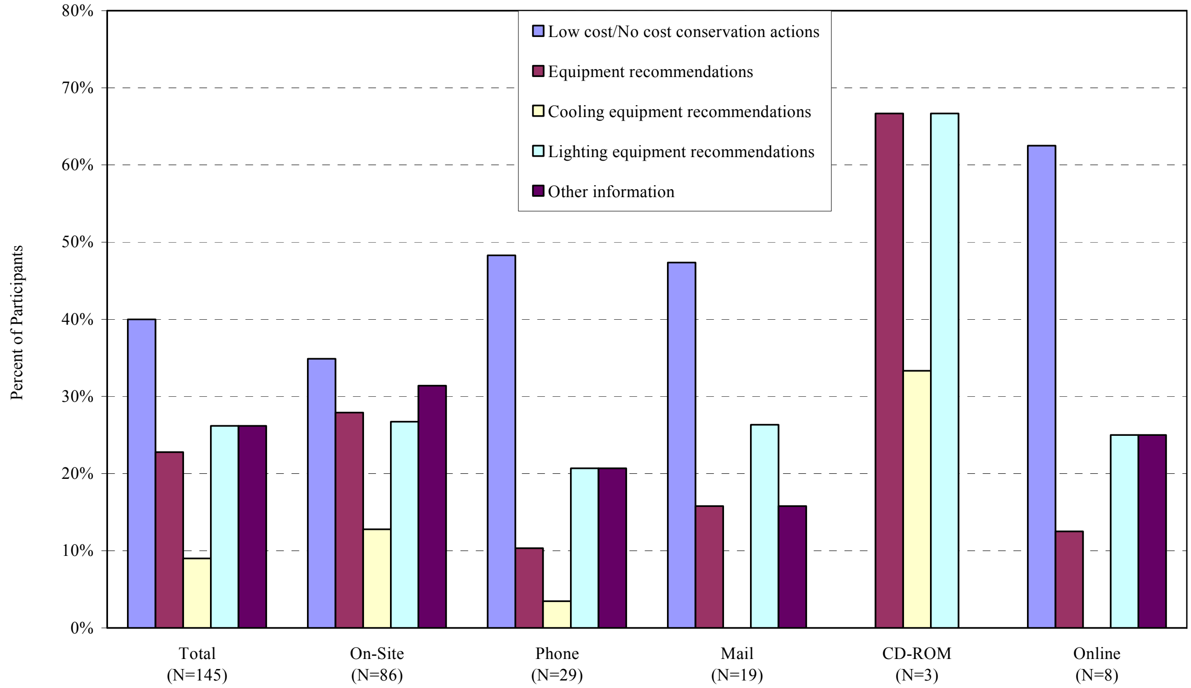


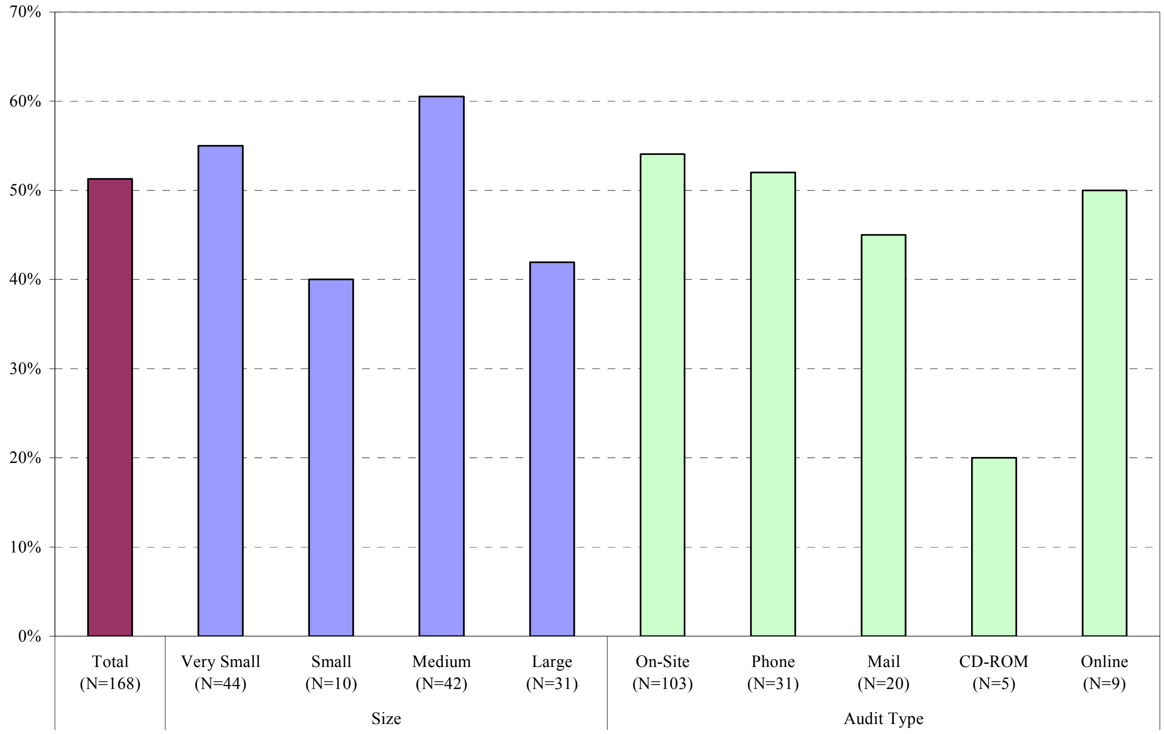
Figure 7-16 shows that telephone and mail audit participants had above average interest in low cost/no cost conservation actions, but below average interest in general equipment recommendations (the number of online and CD-ROM audits was too low for results to be meaningful.) Onsite participants, on the other hand, were more likely than phone and mail participants to seek out information about general equipment recommendations, cooling equipment recommendations, and other information.

Figure 7-16: Information Sought by Customers That Revisit The Audit Report, by Audit Type



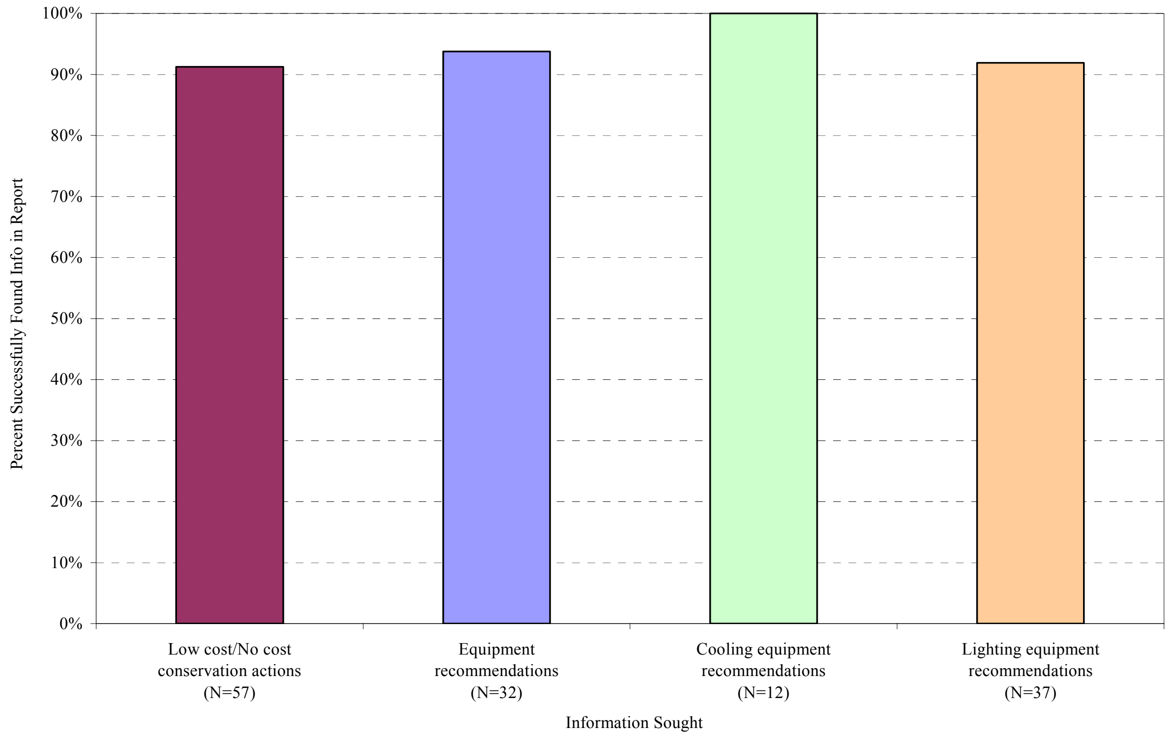
Overall, more than half of audit participants that revisited the audit recommendations more than 4 years after the audit still found those recommendations useful, as shown in Figure 7-17. Higher percentages of very small (55 percent) and medium (61percent) participants found the recommendations still useful, while small (40 percent) and large (42 percent) customers were less likely to report that the recommendations were useful after more than 4 years. Across audit types, 45 to 54 percent of all but CD-ROM participants found the recommendations still useful; among CD-ROM participants, only 1 of 5 said they were still useful.

Figure 7-17: Among Participants that Revisited the Audit Report, Percent Reporting Recommendations to be Useful More Than 4 Years Following The Audit



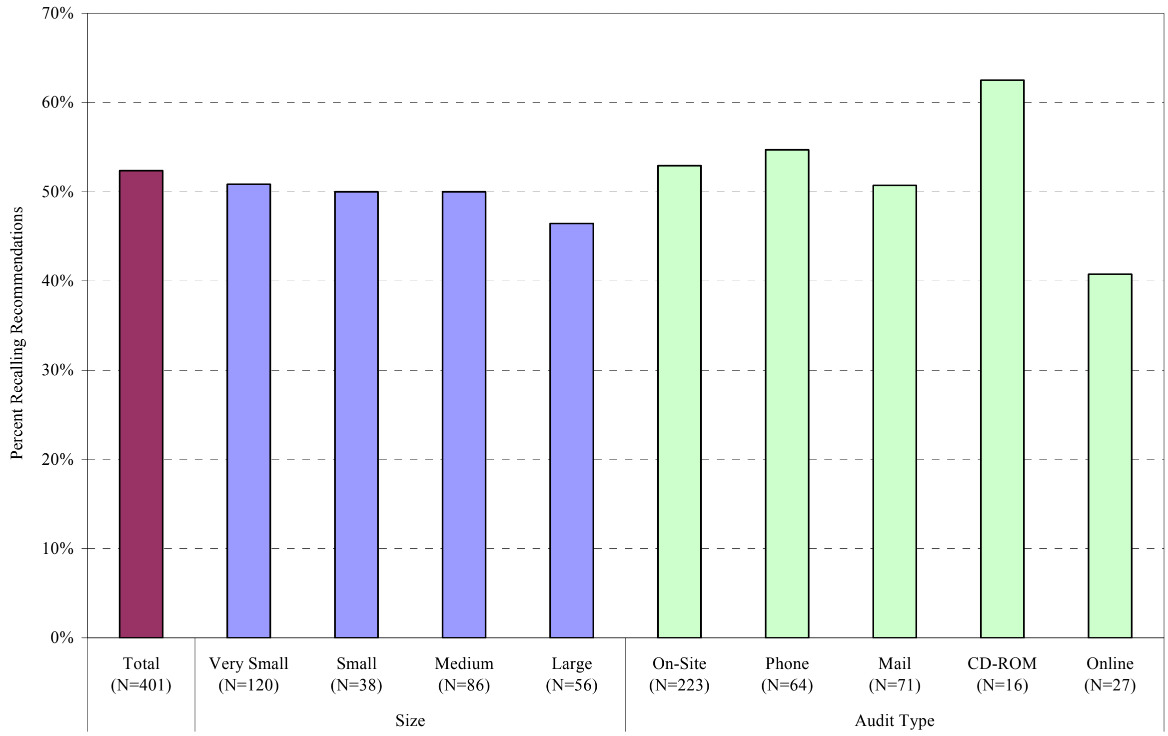
As shown in Figure 7-18, below, almost all of the audit participants who sought information said they were successful in finding that they were looking for. The percentage successful ranged from 91 percent for no/low cost measures to 100 percent for cooling recommendations.

Figure 7-18: Success in Finding Information Sought when Revisiting Audit Report



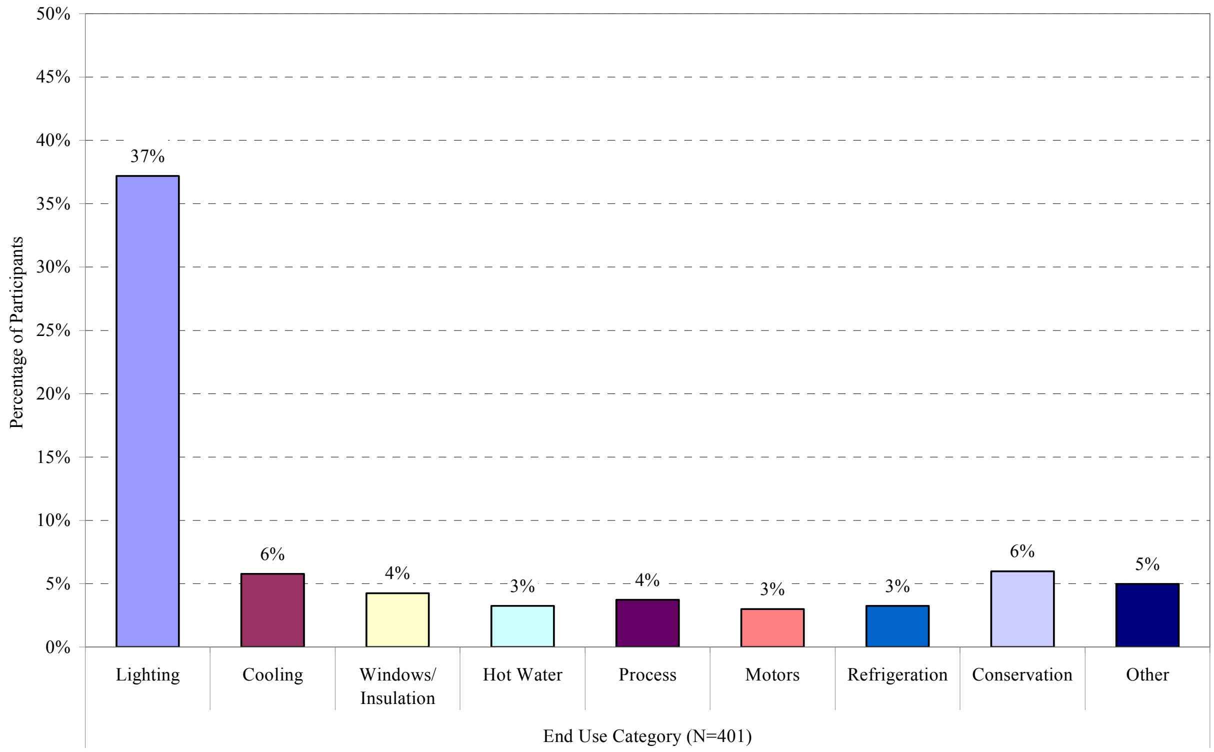
As shown in Figure 7-19, more than half of 2002-03 participants recalled at least one audit recommendation when surveyed in 2007, more than 4 years after the audit. Online audit participants were the least likely to recall at least one recommendation (41 percent), while CD-ROM participants were the most likely (63 percent). By size, large participants were somewhat less likely (47 percent) than other customer groups (50 percent for small and medium; 51 percent for very small) to recall at least one recommendation.

Figure 7-19: Participant Recall of at Least One Audit Recommendation



Among the 210 PY 2002-03 participants who recalled at least one audit measure in 2007, more than 70 percent (or 37 percent of all participants) recalled lighting recommendations – more than all other types of recommendations combined. Figure 7-20 shows the percentage of all 2002-03 audit participants who recalled different types of measures when surveyed in 2007. Compared to the 37 percent who recalled lighting recommendations, only 6 percent of audit participants recalled cooling or conservation measures, while 4 percent recalled windows and insulation or process measures.

Figure 7-20: Percentage of Program Year 2002 and 2003 Participants Recalling Various Types of Recommended Measures



In all, the 2002-03 participants recalled a total of 291 recommendations from their audit reports – an average of 1.4 recommendations for each of the 210 participants that recalled at least one. Lighting accounted for 59 percent of the recommendations recalled; percentages of other recommendations recalled are presented in Table 7-1. Cooling recommendations and conservation measures each accounted for about 9 percent of the recommendations recalled; window and insulation measures represented about 7 percent, and hot water, process, and refrigeration measures each accounted for 5 percent. After lighting changeouts, the single recommendation most often remembered was to change thermostat settings, which accounted for 6 percent of the recommendations recalled.

Table 7-1: Recommendations Recalled 4 to 5 Years After the Audit

Recommendations Recalled by Participants 4-5 years after the Audit	Percent
Lighting	
Change lighting	53%
Install/change lighting controls	3%
Change ballasts	2%
Total Lighting	59%
Cooling	
Change cooling system	5%
HVAC changes, unspecified	1%
Fuel/technology change for heating/cooling	2%
Total Cooling	9%
Windows and Insulation	
Weatherstripping	2%
Insulation	3%
Ductwork improvements	1%
Window changes	1%
Total Windows and Insulation	7%
Hot Water	
Boilers	2%
Water heater improvements	2%
Total Hot Water	5%
Process	
Compressor changes	2%
Reduce process convection	2%
Process changes	1%
Total Process	5%
Motors	
Energy efficient motors	4%
Refrigeration	
Energy efficient refrigerator	5%
Conservation	
Change thermostat setting	6%
Shift production hours	2%
Turn off equipment when not being used	1%
Total Conservation	9%
Total Number of Recommendations Recalled	291

7.3 Long Term Market Effects

To study the long-term market effects of the NRA program, two indicators of efficiency awareness were investigated over time: the self-reported knowledge of energy efficiency opportunities and intentions to purchase energy efficient equipment.

- Self-reported knowledge of energy efficiency was determined as the percentage of respondents in each group who gave an answer of 8 or higher when asked “How knowledgeable are you about energy efficiency, using a 1 to 10 scale, where 1 is not at all knowledgeable and 10 is extremely knowledgeable."

- The intention to purchase energy efficient equipment was determined as the percentage of respondents in each group who gave an answer of 8 or higher when asked "How likely will you be to actively consider energy efficient equipment in the future, using a 1 to 10 scale, where 1 is not at all likely and 10 is extremely likely."

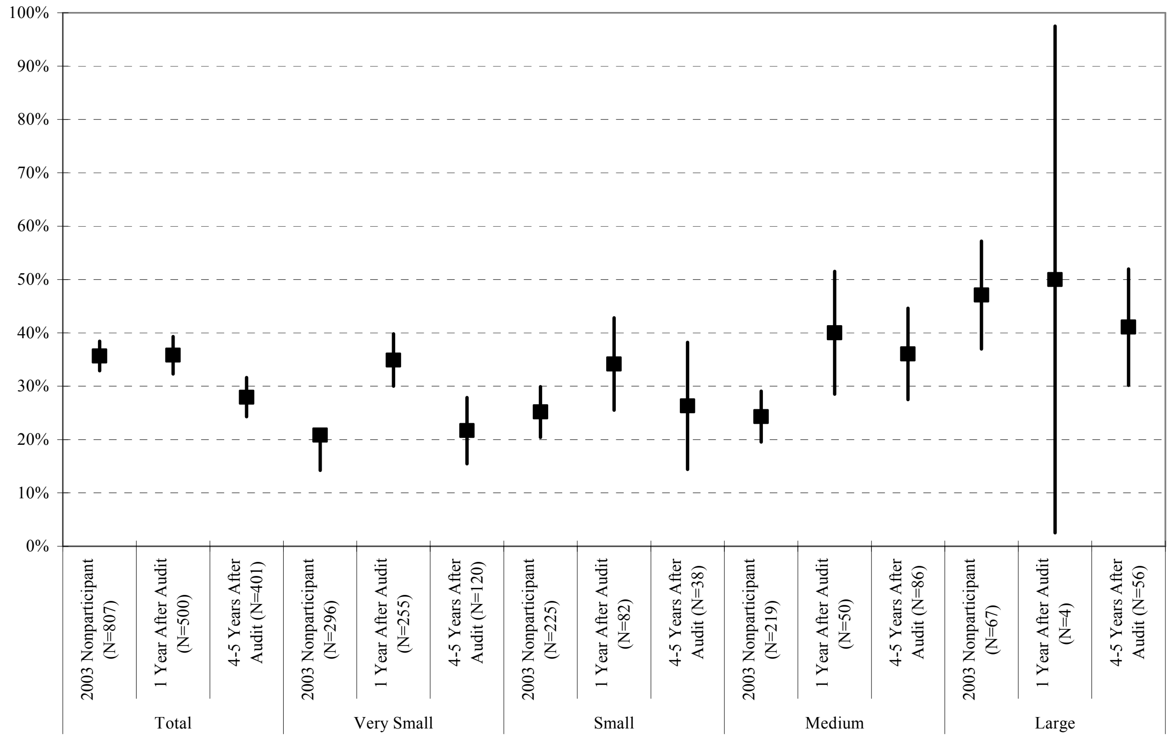
Baseline values were derived from a survey of 807 nonresidential customers who were 2003 non-participants, and were compared to two sets of follow-up survey data.

1. One set of participant responses came from a survey of 500 PY 2002 participants conducted one year after the audit and from a second survey with a sample of 401 2002-03 participants conducted in 2007, 4-5 years after the audit. (The latter is the Long Term Survey referenced throughout this chapter.)

2. The second set of responses were those from a panel of 119 participants who were interviewed one year after the audit and again 4-5 years after the audit (panel participants were a subset of the larger survey samples.)

Figure 7-21 compares the percentage of surveyed customers in the larger participant sample (item 1 above) who consider themselves very knowledgeable of energy efficiency opportunities to the percentage of non-participants. For large customers, the percentage of 2002-2003 participants purporting to be very knowledgeable about energy efficiency opportunities, while slightly higher than the percentage of knowledgeable nonparticipants one year after the audit, declined to less than the nonparticipant awareness level after 4-5 years. For all other size categories, the percentage increased one year after the audit and declined after 4-5 years, but not below the initial nonparticipant level.

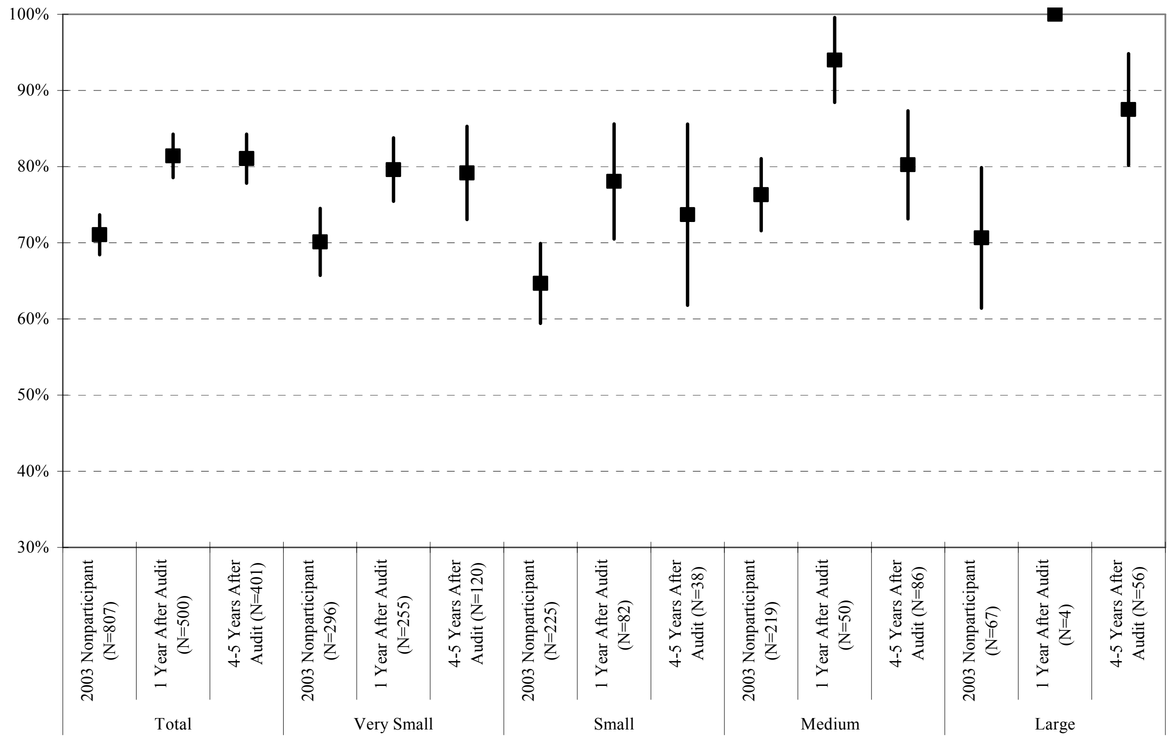
Figure 7-21: Customers Purporting to be Very Knowledgeable of Energy Efficient Opportunities, Changes over Time with 2003 Nonparticipant Baseline



The same group of customers was asked how likely they were to purchase energy efficient equipment in the future. The percentage responding with an 8 or higher is shown by customer size in Figure 7-22. First, it should be noted that the percentage saying they are likely to purchase energy efficiency equipment in the future is consistently high, even for nonparticipants (70 percent overall). In addition, in all time periods, the percentage of respondents saying they are very likely to purchase energy efficient equipment is higher for medium and large than for small and very small customers, including both participants and nonparticipants.

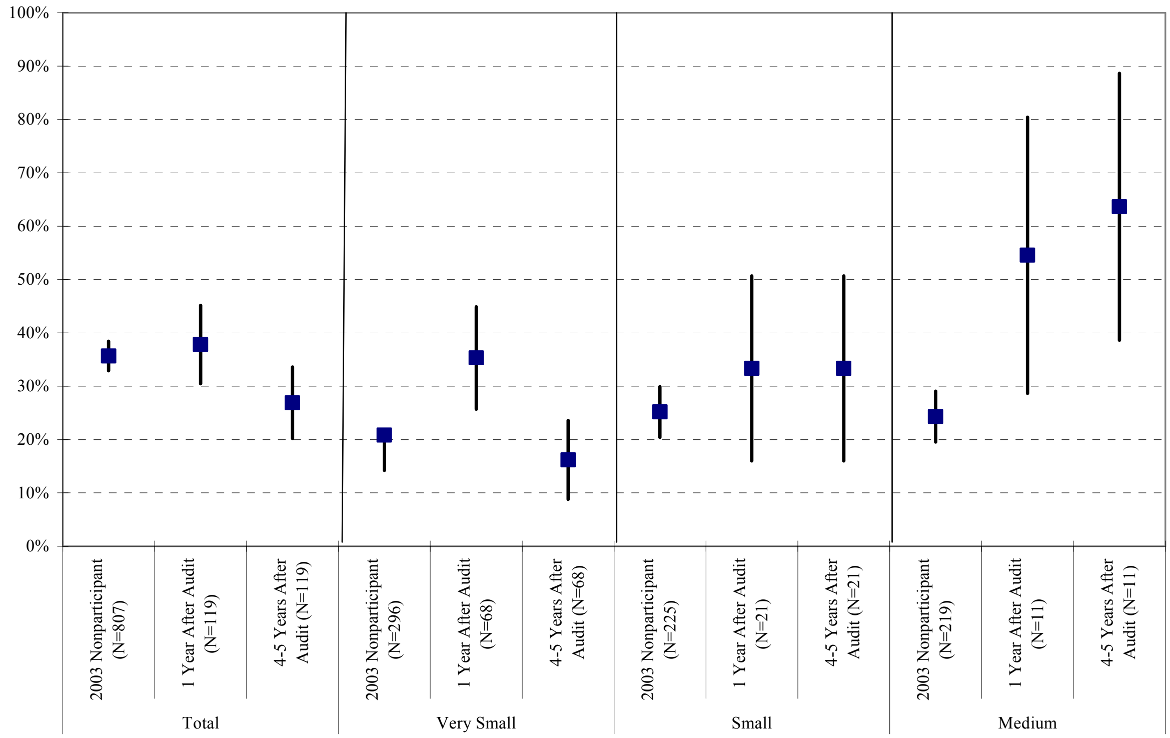
Larger customers also reported a greater increase in their likelihood to purchase (compared to the nonparticipant baseline) when surveyed one year after the audit: for medium customers the percentage likely to purchase efficient equipment was 18 percent higher than the nonparticipant baseline; for large customers the percentage was 22 percent higher, compared to 12 percent for very small and small participants. Note, however, that the likelihood of purchasing energy efficient equipment also declined more sharply for medium (14 percent) and large (12 percent) participants when they were interviewed 4-5 years after the audit than for very small (.5 percent) and small (4 percent) participants.

Figure 7-22: Likelihood to Purchase Energy Efficient Equipment in the Future, Changes over Time with 2003 Nonparticipant Baseline



The same two variables (self-reported knowledge of energy efficiency opportunities and likelihood of purchasing energy efficient equipment) were investigated for a single group of 119 participants surveyed both one year after the audit and 4-5 years after the audit. Results for self-reported knowledge of energy efficiency are shown in Figure 7-23.

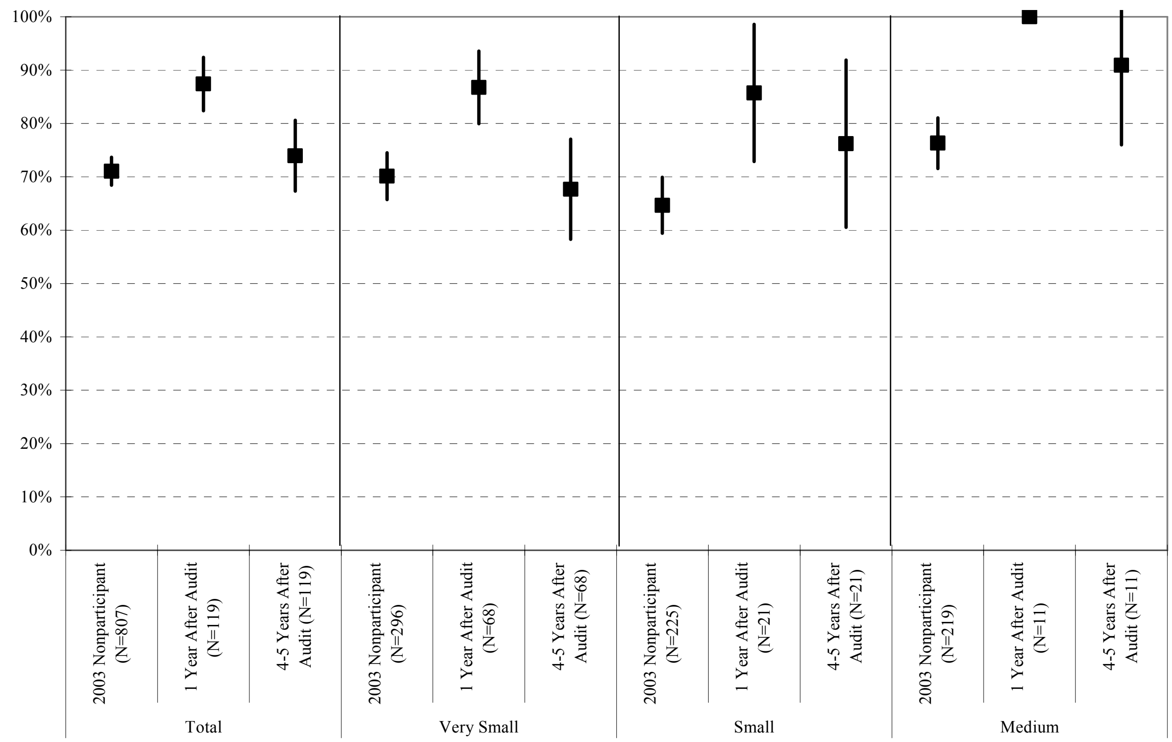
Figure 7-23: Customers Purporting to be Very Knowledgeable of Energy Efficient Opportunities, Panel Data Results with 2003 Nonparticipant Baseline



Overall, a somewhat greater percentage of panel participants interviewed one year after the audit reported themselves very knowledgeable of energy efficiency opportunities than did nonparticipants; when surveyed 4-5 years after the audit, however, the percentage of panel participants claiming to be very knowledgeable had declined below the nonparticipant baseline level. Very small customers (who represent over half the panel) were responsible for the decline in the percentage of very knowledgeable responses: the percentage of very small participants describing themselves as knowledgeable declined from 25 percent one year after the audit to 18 percent 4-5 years after the audit. In contrast, the percentage of knowledgeable small panel participants remained the same, while the percentage of medium customers increased slightly. (Because there were just 11 medium customers in the sample, the increase for this group was not statistically significant, as shown by the wide error bands in the graph.)

Panel participants also responded to questions regarding their likelihood of purchasing energy efficient equipment, as shown in Figure 7-24. While the previous analysis showed virtually no decline in the overall percentage of participants intending to purchase energy efficient equipment from one year after the survey to 4-5 years after the survey, the panel data show a decline from 87 to 74 percent. This decline appears to be primarily due to the 19 percent decline for very small customers.

Figure 7-24: Likelihood to Purchase Energy Efficient Equipment in the Future, Panel Data Results with 2003 Nonparticipant Baseline

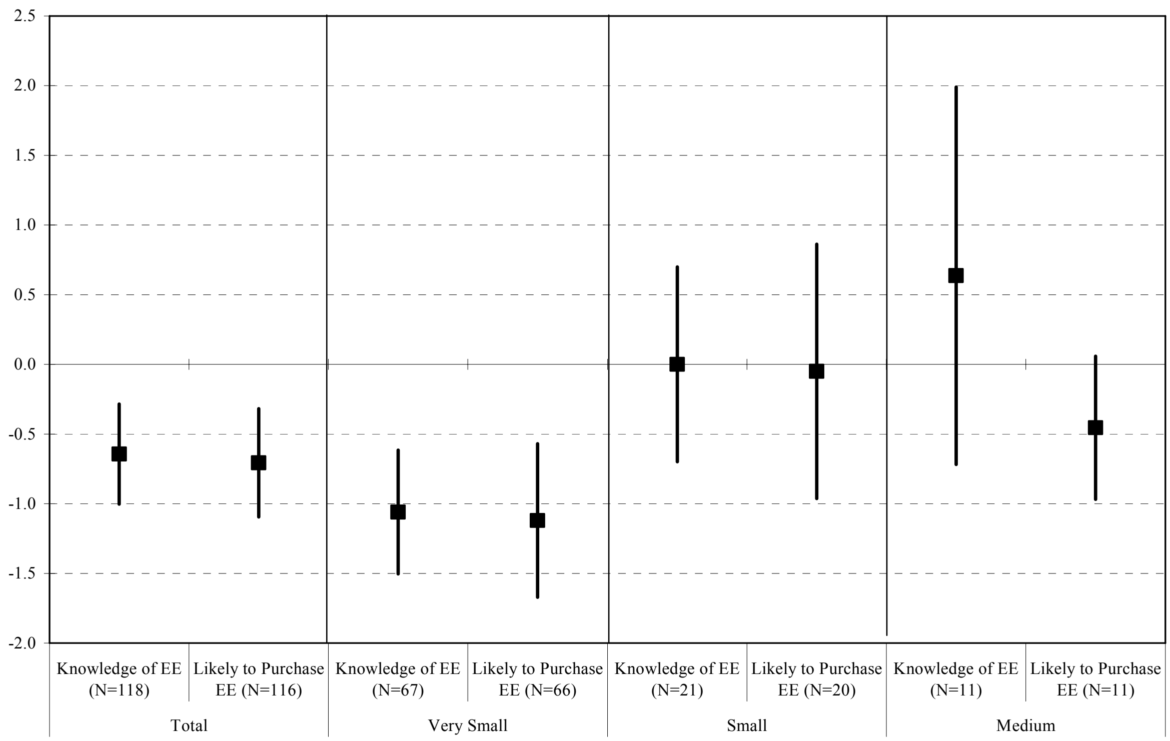


The panel data and the comparison of data from surveys of separate participants seem to offer conflicting findings regarding the permanence of audit effects on purchase intentions. The larger sample suggests that very small customers retain their increased likelihood of purchasing energy efficient equipment in the future, while the panel data show a marked decline in purchase intentions over time, particularly for very small customers.

Results from the panel data do show the same pattern as the comparative cross-sectional results presented previously in that the likelihood of purchasing energy efficient equipment is consistently higher for medium than for small and very small customers, including both participants and nonparticipants (there were too few large customers in the panel for meaningful results.)

An alternative way of analyzing the persistence of program effects is to compare the mean respondent scores on knowledge of energy efficiency and likelihood of purchasing energy efficient equipment over time. Figure 7-25 shows the difference between the mean scores for panel respondents when they were interviewed 4-5 years after the audit compared to when they were interviewed one year after the audit. Using the same 1 to 10 scales, there was an overall decrease of about 0.64 in the mean knowledge of energy efficiency and a decrease of about .71 in the mean likelihood of purchasing energy efficient equipment. Both changes were statistically significantly different from 0.

Figure 7-25: Mean Change in Self Reported Knowledge of Energy Efficiency and Likelihood to Purchase from 1 Year to 4-5 Years After the Audit, Panel Data Results



Very small customers showed the largest decline for both knowledge and likelihood of purchase, while the means for both items were essentially unchanged for small customers. Medium participants reported an increase in the mean knowledge of energy efficiency (.64) and a small decline in likelihood of purchase (-.45), but neither difference was statistically significant.

Finally, both nonparticipants and respondents to the long-term survey were asked whether they had specific intentions to purchase various types of energy efficient equipment. Results are shown in Table 7-2. While 19 percent of both nonparticipants and former audit participants said they planned to adopt efficient process measures in the future, the percentages were higher for participants with regard to other types of adoptions. The difference was greatest for lighting, where the percentage planning to adopt was more than twice as high among participants responding to the long-term survey.

Table 7-2: Intentions to Adopt Energy Efficient Equipment, Participants versus Nonparticipants

Future Adoption Intentions	Total		NonPart		LongTerm		Audit Type				
	NonPart Survey	Long-Term Survey	Very Small /Small	Medium /Large	Very Small /Small	Medium /Large	On-Site	Phone	Mail	CD-ROM	Online
Process	19%	19%	.	19%	5%	25%	24%	0%	0%	25%	0%
Lighting	8%	17%	8%	15%	14%	25%	20%	14%	7%	25%	19%
Cooling	6%	9%	5%	13%	4%	14%	12%	2%	3%	13%	11%
Gas	4%	7%	4%	5%	6%	9%	8%	6%	3%	25%	0%
Other	4%	8%	4%	.	9%	9%	11%	6%	1%	13%	0%
Number of points (n) in sample											
Process	154	106	0	154	19	68	78	13	5	4	6
Lighting	1,586	401	1,239	347	158	142	223	64	71	16	27
Cooling	1,586	401	1,239	347	158	142	223	64	71	16	27
Gas	1,586	401	1,239	347	158	142	223	64	71	16	27
Other	1,239	401	1,239	0	158	142	223	64	71	16	27

Participants who had on-site and CD-ROM audits were more likely to report future adoption intentions than phone, mail, or online participants, particularly for process and lighting measures. By size, medium/large customers had higher planned adoption rates than their very/small counterparts among both participant and nonparticipants. Customer size appears to be more important than audit participation in determining adoption plans: medium/large nonparticipants had a higher rate of adoption intentions than very small/small participants for process, lighting and cooling measures.

7.4 Conclusions and Recommendations

Perhaps the most striking finding from the Long-Term Assessment is the importance of lighting measures to the success of the NRA program, as illustrated by the following results.

- Lighting measures had the highest adoption rates in the period following the audit, both overall and relative to nonparticipant baseline.
- Lighting adoptions were the most influenced by the audit, as measured by customer-reported influence scores.
- Lighting measures had the highest level of recall among 2002-03 participants who recalled at least one audit recommendation in 2007– more than all other types of recommendations combined.

- The percentage of customers planning to adopt energy efficient lighting was more than twice as high among participants as nonparticipants.

In addition to the critical role played by lighting, other overall results include:

- Audit effects appear to peak within a year after the audit and then decline significantly by 4-5 years later for all measures. Small and very small customers show a more rapid increase in adoptions and greater initial net increase in adoptions, but the initial effects fade faster than for medium and large customers. Medium and large customers are also significantly more likely to revisit their audit reports than very small or small customers.

- Audits continue to be useful for several years, with about 40 percent of participants revisiting their audit report, and more than 30 percent revisiting it at least twice in the four years following the audit. More than 90 percent of participants who searched for specific information said they found it. The longevity of audit effects is also confirmed by the finding that more than half of 2002-03 participants recalled at least one audit recommendation when surveyed 4-5 years after the audit.

- With regard to long-term market effects, findings indicate that knowledge-related market effects appear strong among participants one year after the audit, but appear to be gone after 4 to 5 years. Despite these apparent declines in market effects, the percentage of participants with specific intentions to adopt efficient equipment was significantly higher than for nonparticipants, even after 4-5 years.

Results of the analysis of long-term audit effects lead to several recommendations that may enhance the long-term effectiveness of the audits.

- Target small customers for more frequent audits – Long-term results clearly show a significant initial increase in adoptions for small customers, but also a rapid subsequent decline. Promotion of more frequent audits and, if necessary, a change in program requirements to allow more frequent on-site audits would be appropriate for all customers, but appear to be particularly important for very small and small customers.

- Remind customers to use the results of their audit by sending annual follow-up reminders to participants
  - Since participants continue to find useful information in their audits for several years after they receive the initial report, it would be worth encouraging them to revisit their audit report with an annual email. For those who completed an online audit, a link to the results would be appropriate, while it may also be possible to provide an extra copy of the results for those who received in-person or phone audits

- In addition, the follow-up could encourage past participants to consider an updated audit if there have been changes to their equipment or their business operations.
- To minimize the amount of customer time required for an update, it may be possible to provide online access to a form with data from the previous audit. This should be fairly easy for audits that were performed online in the first place, and may also be practical for in-person or telephone audits, which typically input customer characteristics into a software package to generate the audit results.

8

Recommendations

This Chapter presents the program implementation and evaluation recommendations that arise from the findings of this and previous Studies.

As discussed throughout this report, adoptions made through rebate programs are not counted toward NRA and Local Program impacts, due to the potential for double counting. Nonetheless, one of the primary functions of Audit programs is the provision of information and referrals for accomplishing measure installations *through incentive programs*. As shown in the Cross Program Assessment, about 70 percent of this Studies assessment of net program value of the 2004/2005 NRA program is due to adoptions occurring through rebate programs. Similarly, about 95 percent of the value of the Local Program originates from the installation of rebated measures. The act of removing all rebated adoptions from official measures of program accomplishments fails to acknowledge the heart of NRA and Local Program accomplishments.

We recommend that future Evaluation efforts report and detail impacts of measures from rebated *and* non-rebated equipment, remaining diligent in distinguishing the two. Measures reported as rebated during surveys should be well documented, including gathering the source of rebate, source of awareness of the rebate program, and implementing survey batteries supporting a self-report based attribution and free ridership analysis similar to the one implemented in this studies' Cross Program survey[65].

The results of this Study also have implications for the Evaluation methods applied to incentive programs. Current net-to-gross studies for incentive programs do not specifically address the NRA program contribution, leaving program-attributable impacts uncounted from a statewide perspective. This is an area for potential refinement in future Evaluation cycles. As part of the assessment of incentive program net-impacts and net-to-gross ratios, provisions should be made for cross program participants. For customers that had an Audit

[65] A self-report battery consistent with major commercial or mass market protocols for self-report based free ridership assessment.

prior to incentive program participation, the net-to-gross ratio estimation should take into account effects of both programs.

We recommend future Audit Evaluation Studies investigate the reasons for efficient measure installation outside the rebate programs by Audit participants. Installation outside the rebate programs implies customers either are not aware of the incentive, which is important feedback to the Audit program, or perceive incentive participation as not worthwhile (important feedback to the incentive program.) Continuing to measure and study these aspects of efficient measure adoption will provide important feedback for both Audit and incentive programs.

Given the Study findings of substantial value generated by the NRA and Local Program from measures installed through rebate programs, we recommend the IOUs continue to work toward better connections between the NRA/Local Program and the incentive programs. The Local Program exhibits substantial achievements in referrals to the Express Program, and the highest rate of Express Efficiency program awareness (57%) but could potentially improve follow through into the SPC program.

Among NRA participants there is still room for improvement in raising awareness of the incentive programs among Audit participants. Currently about 35 percent of very small/small Audit Participants, and about 50% of Medium/Large participants are aware. Local Program does the best at making parts aware, and also has the highest crossover rate, with 57% aware.

We recommend the IOUs consider additional marketing, such as additional incentive program collateral presented with Audit reports. Perhaps this could include rebate program icons with brief slogan and website information. Specifying the rebates available for each recommendation along with the expected savings may also be useful.

Findings from the Impact Analysis indicate that all IOUs should increase Audit emphasis on the gas appliance end-use category, with the exception of SCG. SCG continues to be effective in gaining customer follow through on gas equipment recommendations. From this, we conclude there is potential for similar success from other IOUs, provided there is additional emphasis in the reports.

Findings from the Gap Analysis indicate there are imbalances between the measures adopted by participants and those recommended in the Audit. All IOUs should increase Audit emphasis on cooling, and water heat recommendations. Despite a much greater emphasis in Audit reports on lighting recommendations, there is nearly as much gross impact generated from cooling installations as from lighting installations. The lighting measures have a much higher net-to-gross ratio associated with them, and so are ultimately responsible for most of the Audit program impacts. However, the frequency of audit cooling measure recommendations generally lags behind adoption rates for cooling equipment in the population. For these reason, we believe the NRA program would benefit from an increased emphasis on cooling recommendations. This may be more easily implemented in the Medium/Large segment where recommendations are more readily customized and the program already demonstrates an ability to achieve lower free ridership rates for cooling measures[66]. At the same time, there is a lot of potential for increased net impacts in the Very Small/Small segment, as illustrated by the relatively high gross adjusted impacts and low net impacts.

In addition, the Process Assessment findings suggests that the Audit program does not confer as much awareness of HVAC/cooling measure opportunities as it does lighting opportunities, also indicating cooling measure recommendations as an area of potential improvement for the program.

In a similar vein, water heat recommendations should be increased some to reflect customer activity and to more fully exhaust potential energy savings opportunities. Finally, all IOUs should ensure appropriate emphasis on industrial process recommendations in Audit reports generated for Medium/Large companies.

One utility program manager said during his interview for this Evaluation: “Our marketing group has determined that audits are *the* major marketing mechanism for Energy Efficiency.” This presents a significant strategic decision. If audits can be marketed effectively to ensure the broadest possible participation, then the utility can most effectively promote all its programs, measures and services. To this end, we recommend increased marketing, and possibly creating a website built around the online audit, acting as a “hub” for information and services.

The online audit could potentially be enhanced as a “hub” to additional IOU services. For example, customers could start at the online Audit site, entering some basic information into a form, and then be guided, as appropriate, to additional information and services. This might include:

- the ability to sign up for an on-site audit for large, complex facilities,
- access to live chat with IOU service representatives,

[66] Medium/Large segment on-site audits in the PG&E and SCE service territories achieve relatively low free ridership for cooling measures, at 23 and 43 percent, respectively.

- links to appropriate incentive program applications and information,
- links to business type specific general energy efficiency information and conservation practices,
- links to energy star, ACEEE, and/or CBOs

The IOUs could consider placing the URL for the online Audit web-address on all paper and electronic bills, as an alternative or supplement to the customer service numbers that are typically provided.

Concerns about the environment has sparked new levels of interest in photovoltaic technology and other renewables, as well as demand response programs, carbon trading, and other new environmental strategies. It would be a timely step for the IOUs to begin incorporating information on these kinds of programs and opportunities into both Audit marketing and Audit reports. This type of outreach is likely to strike broad appeal. For example, Audit reports could provide information and encouragement for signing up for demand response and/or other load control programs, to request “green” power, and/or install co- or self-generation power. The “green business” certification program has been successful in California, as indicated by its frequent mention from surveyed customers. The linking of Audits with this or other certification programs is another potential enhancement. At a more basic level, the Audit Program could benefit from increased emphasis on the environmental benefits associated with Audit participation. The environmental benefits of the Audit, such as reduced carbon emissions could be highlighted in marketing materials in addition to monetary savings.

Along these same line, “How to do an Audit” curriculum would better meet the interest of the students with a greater emphasis on these kinds of opportunities. More specifically, feedback from Students in the program indicates an interest in additional education, training and support from the utilities that is focused on emerging renewable and energy efficiency technologies. There is a high level of interest in solar technology and learning how the utilities could help individuals install solar projects at their facilities. Students indicated that they were interested in solar technology and would like to learn more about these topics.

Continuation and expansion of the follow-up program efforts is another recommended program enhancement, with a focus on the Very Small/Small customer segment. Follow-up calls appear to have made a significant amount of customers more likely to implement recommendations from the Audit. This positive effect was the most pronounced for very small customers. Follow-up calls were also appreciated by 97% of customers who received them suggesting that is a very beneficial element to the Program.

In addition to follow-up calls, implementation of new types of follow up programs would also benefit the program. The long term assessment found there would be measurable benefits to reminding customers to use the results of their audit by sending annual follow-up reminders to participants

- Since participants continue to find useful information in their audits for several years after they receive the initial report, it would be worth encouraging them to revisit their audit report with an annual email. For those who completed an online audit, a link to the results would be appropriate, while it may also be possible to provide an extra copy of the results for those who received in-person or phone audits
- In addition, the follow-up could encourage past participants to consider an updated audit if there have been changes to their equipment or their business operations.
- To minimize the amount of customer time required for an update, it may be possible to provide online access to a form with data from the previous audit. This should be fairly easy for audits that were performed online in the first place, and may also be practical for in-person or telephone audits, which typically input customer characteristics into a software package to generate the audit results.

Results of the analysis of long-term audit effects indicate the program would benefit from targeting small customers for more frequent audits – Long-term results clearly show a significant initial increase in adoptions for small customers, but also a rapid subsequent decline. Promotion of more frequent audits and, if necessary, a change in program requirements to allow more frequent on-site audits would be appropriate for all customers, but is particularly important for very small and small customers.

Collaboration with Community Based Organizations (CBOs) can increase audit program participation and ECM installation. CBOs have been used successfully to increase the installation rate of ECMs. SCE is able to provide customers receiving an audit with a list of contractors, but they cannot recommend one over another. This is typically a point in the program where participation falls off and customers do not realize savings from the audit. However, CBOs are able to suggest one of their members to install ECMs recommended through the program, which helps overcome the barriers customers face of finding a qualified contractor and the barriers contractors face in trying to market to small customers.

Direct install programs with audits can increase ECM installations in the small and hard-to-reach markets. The direct install approach proved to be very successful for getting ECMs installed in hard-to-reach markets. SCE’s 2005 Summer Initiative Direct Install Program achieved penetration rates of nearly 90% in the small hard-to-reach commercial customer segment when measures were provided at no cost. Citing additional third party programs of this nature in San Francisco, the East Bay and other locations, this type of approach, though relatively expensive, has proven to be effective in delivering energy efficiency equity to the small customer hard-to-reach market segment and achieving a high level of ECM installations. Utilities should attempt to determine the cost-effectiveness of direct install programs before implementing them to make sure they are delivering energy savings at a reasonable cost.

The IOU's continue to exhibit improvements in the content of tracking systems, though there is still room for improvements in various segments. We recommend a continued monitoring and evaluation of tracking system content, accuracy and accessibility. Further, for the more complex on-site audits, we recommend the development of a comprehensive (electronic) database of audit recommendations and associated ex-ante impact estimates. This would allow for greater evaluation accuracy and the flexibility for more complex analysis characterizing program impacts, and recommendation "realization rates". Better electronic housing of recommendations can be used as the basis to identify spillover, to prompt customers with audit recommended measures over the phone, leading to more cost effective and accurate assessment of installed measures.

The assessment of impacts associated with measures for which efficiency is unknown, such as packaged air conditioners or gas furnace equipment, is difficult without hard data on equipment efficiency levels. Even for very small and small customers, evaluation work relying on self-report measure adoptions should plan for this shortfall in self-reported measure data, with consideration of on-site follow up. If measure recommendations and ex-ante impact estimates were available, these could possibly be used to better prompt customers with relevant survey questions and lead more easily to estimates of measure impacts.

Attachment

SCE Program Energy Impact Reporting for 2004-2005 Programs

Program Name:	2004/2005 Nonresidential Audit							
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	1,541	N/A	1.4	N/A	1,024,257
	2	2005	N/A	4,850	N/A	2.7	N/A	2,048,939
	3	2006	N/A	8,769	N/A	3.6	N/A	2,156,529
	4	2007	N/A	10,195	N/A	4.1	N/A	2,334,574
	5	2008	N/A	10,814	N/A	4.5	N/A	2,432,605
	6	2009	N/A	11,116	N/A	4.5	N/A	2,432,605
	7	2010	N/A	11,116	N/A	4.5	N/A	2,432,605
	8	2011	N/A	11,116	N/A	4.5	N/A	2,432,605
	9	2012	N/A	10,541	N/A	4.5	N/A	2,432,605
	10	2013	N/A	8,947	N/A	3.9	N/A	2,432,605
	11	2014	N/A	8,525	N/A	3.4	N/A	2,432,605
	12	2015	N/A	8,454	N/A	3.3	N/A	2,432,605
	13	2016	N/A	8,341	N/A	3.3	N/A	2,432,605
	14	2017	N/A	8,228	N/A	3.3	N/A	2,432,605
	15	2018	N/A	8,228	N/A	3.3	N/A	2,432,605
	16	2019	N/A	8,176	N/A	3.3	N/A	1,431,093
	17	2020	N/A	6,270	N/A	3.0	N/A	429,748
	18	2021	N/A	3,073	N/A	2.0	N/A	370,562
	19	2022	N/A	1,727	N/A	1.2	N/A	247,221
	20	2023	N/A	481	N/A	0.9	N/A	171,412
	TOTAL	**2004-2023**	N/A	150,509	N/A	65.5	N/A	36,972,993

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

PG&E Program Energy Impact Reporting for 2004-2005 Programs

Program Name:	2004/2005 Nonresidential Audit								
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	364	N/A	0.5	N/A	45,998
	2	2005	N/A	1,765	N/A	1.6	N/A	176,996
	3	2006	N/A	3,394	N/A	2.3	N/A	645,543
	4	2007	N/A	4,459	N/A	2.8	N/A	1,298,810
	5	2008	N/A	4,717	N/A	2.9	N/A	1,299,731
	6	2009	N/A	4,766	N/A	2.9	N/A	1,300,664
	7	2010	N/A	4,766	N/A	2.9	N/A	1,300,664
	8	2011	N/A	4,766	N/A	2.9	N/A	1,300,664
	9	2012	N/A	4,674	N/A	2.9	N/A	1,300,664
	10	2013	N/A	4,438	N/A	2.7	N/A	1,300,664
	11	2014	N/A	4,226	N/A	2.6	N/A	1,300,664
	12	2015	N/A	3,916	N/A	2.5	N/A	1,300,664
	13	2016	N/A	3,805	N/A	2.3	N/A	1,300,664
	14	2017	N/A	3,803	N/A	2.3	N/A	1,300,664
	15	2018	N/A	3,803	N/A	2.3	N/A	1,300,664
	16	2019	N/A	3,745	N/A	2.3	N/A	1,254,612
	17	2020	N/A	3,301	N/A	2.2	N/A	1,189,581
	18	2021	N/A	1,726	N/A	1.5	N/A	1,142,195
	19	2022	N/A	551	N/A	0.5	N/A	1,092,340
	20	2023	N/A	160	N/A	0.1	N/A	1,091,455
	TOTAL	**2004-2023**	N/A	67,146	N/A	42.9	N/A	22,243,904

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

PG&E Local Program, Energy Impact Reporting for 2004-2005 Programs

Program Name:	2004/2005 PG&E Local Program								
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	1	N/A	0.0	N/A	0
	2	2005	N/A	72	N/A	0.0	N/A	-7
	3	2006	N/A	159	N/A	0.1	N/A	4,645
	4	2007	N/A	223	N/A	0.1	N/A	10,100
	5	2008	N/A	296	N/A	0.1	N/A	10,892
	6	2009	N/A	305	N/A	0.1	N/A	10,892
	7	2010	N/A	305	N/A	0.1	N/A	10,892
	8	2011	N/A	305	N/A	0.1	N/A	10,892
	9	2012	N/A	305	N/A	0.1	N/A	10,892
	10	2013	N/A	258	N/A	0.1	N/A	10,892
	11	2014	N/A	211	N/A	0.1	N/A	10,892
	12	2015	N/A	211	N/A	0.1	N/A	10,892
	13	2016	N/A	211	N/A	0.1	N/A	10,892
	14	2017	N/A	211	N/A	0.1	N/A	10,892
	15	2018	N/A	211	N/A	0.1	N/A	10,892
	16	2019	N/A	211	N/A	0.1	N/A	10,892
	17	2020	N/A	210	N/A	0.1	N/A	10,892
	18	2021	N/A	186	N/A	0.1	N/A	10,899
	19	2022	N/A	90	N/A	0.0	N/A	10,116
	20	2023	N/A	25	N/A	0.0	N/A	9,324
	TOTAL	**2004-2023**	N/A	4,007	N/A	1.2	N/A	186,674

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

SDG&E Program Energy Impact Reporting for 2004-2005 Programs

Program Name:	2004/2005 Nonresidential Audit							
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	4	N/A	0.0	N/A	0
	2	2005	N/A	661	N/A	0.4	N/A	72,982
	3	2006	N/A	1,721	N/A	1.1	N/A	249,299
	4	2007	N/A	3,046	N/A	1.2	N/A	269,062
	5	2008	N/A	3,076	N/A	1.2	N/A	269,058
	6	2009	N/A	3,076	N/A	1.2	N/A	269,058
	7	2010	N/A	3,076	N/A	1.2	N/A	269,058
	8	2011	N/A	3,076	N/A	1.2	N/A	269,058
	9	2012	N/A	3,073	N/A	1.2	N/A	269,058
	10	2013	N/A	2,439	N/A	1.2	N/A	269,058
	11	2014	N/A	1,819	N/A	0.9	N/A	269,058
	12	2015	N/A	1,778	N/A	0.8	N/A	269,058
	13	2016	N/A	1,778	N/A	0.8	N/A	269,058
	14	2017	N/A	1,778	N/A	0.8	N/A	248,073
	15	2018	N/A	1,778	N/A	0.8	N/A	185,116
	16	2019	N/A	1,777	N/A	0.8	N/A	185,116
	17	2020	N/A	1,755	N/A	0.8	N/A	144,593
	18	2021	N/A	1,624	N/A	0.8	N/A	79,648
	19	2022	N/A	1,175	N/A	0.7	N/A	62,508
	20	2023	N/A	3	N/A	0.0	N/A	62,767
	TOTAL	**2004-2023**	N/A	38,516	N/A	16.9	N/A	3,980,686

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

SCG Program Energy Impact Reporting for 2004-2005 Programs

Program Name:	2004/2005 Nonresidential Audit							
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	234	N/A	0.2	N/A	89,482
	2	2005	N/A	1,012	N/A	1.4	N/A	217,696
	3	2006	N/A	2,695	N/A	1.7	N/A	414,933
	4	2007	N/A	3,748	N/A	1.8	N/A	593,192
	5	2008	N/A	3,751	N/A	1.8	N/A	593,600
	6	2009	N/A	3,751	N/A	1.8	N/A	593,600
	7	2010	N/A	3,751	N/A	1.8	N/A	593,600
	8	2011	N/A	3,751	N/A	1.8	N/A	593,600
	9	2012	N/A	3,751	N/A	1.8	N/A	593,600
	10	2013	N/A	3,679	N/A	1.8	N/A	593,600
	11	2014	N/A	3,539	N/A	1.7	N/A	593,600
	12	2015	N/A	3,275	N/A	1.6	N/A	591,478
	13	2016	N/A	3,274	N/A	1.5	N/A	591,285
	14	2017	N/A	3,274	N/A	1.5	N/A	591,285
	15	2018	N/A	3,274	N/A	1.5	N/A	591,285
	16	2019	N/A	3,118	N/A	1.5	N/A	590,583
	17	2020	N/A	2,656	N/A	1.4	N/A	529,303
	18	2021	N/A	1,591	N/A	0.6	N/A	273,895
	19	2022	N/A	719	N/A	0.2	N/A	90,121
	20	2023	N/A	2	N/A	0.0	N/A	89,851
	TOTAL	**2004-2023**	N/A	54,844	N/A	27.2	N/A	9,409,588

**Definition of Peak MW as used in this evaluation: These are either consistent with the IOU work papers, or calculated per the current DEER definition, i.e. during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.

Sum Of Energy Impacts for Statewide 2004-2005 Nonresidential Audit Program

Program IDs:	CPUC 1122-04, 1248-04, 1358-04, 1465-04							
Program Name:	2004/2005 Nonresidential Audit							
	Year	**Calendar Year**	**Ex-ante Gross Program-Projected Program MWh Savings**	**Ex-Post Net Evaluation Confirmed Program MWh Savings**	**Ex-Ante Gross Program-Projected Peak Program MW Savings (**)**	**Ex-Post Evaluation Projected Peak MW Savings (**)**	**Ex-Ante Gross Program-Projected Program Therm Savings**	**Ex-Post Net Evaluation Confirmed Program Therm Savings**
	1	2004	N/A	2,144	N/A	2.0	N/A	1,159,737
	2	2005	N/A	8,289	N/A	6.1	N/A	2,516,613
	3	2006	N/A	16,579	N/A	8.8	N/A	3,466,304
	4	2007	N/A	21,449	N/A	9.9	N/A	4,495,639
	5	2008	N/A	22,358	N/A	10.3	N/A	4,594,994
	6	2009	N/A	22,710	N/A	10.3	N/A	4,595,927
	7	2010	N/A	22,710	N/A	10.3	N/A	4,595,927
	8	2011	N/A	22,710	N/A	10.3	N/A	4,595,927
	9	2012	N/A	22,039	N/A	10.3	N/A	4,595,927
	10	2013	N/A	19,503	N/A	9.6	N/A	4,595,927
	11	2014	N/A	18,109	N/A	8.5	N/A	4,595,927
	12	2015	N/A	17,424	N/A	8.2	N/A	4,593,805
	13	2016	N/A	17,198	N/A	8.0	N/A	4,593,612
	14	2017	N/A	17,083	N/A	8.0	N/A	4,572,627
	15	2018	N/A	17,083	N/A	8.0	N/A	4,509,671
	16	2019	N/A	16,816	N/A	8.0	N/A	3,461,404
	17	2020	N/A	13,981	N/A	7.3	N/A	2,293,226
	18	2021	N/A	8,015	N/A	4.9	N/A	1,866,300
	19	2022	N/A	4,172	N/A	2.5	N/A	1,492,190
	20	2023	N/A	645	N/A	1.0	N/A	1,415,486
	TOTAL	**2004-2023**	N/A	311,015	N/A	152.5	N/A	72,607,171

**Definition of Peak MW as used in this evaluation: There are two definitions of Peak used in this evaluation. Much of the gross impact estimates are based on DEER and the IOU work papers. However, where primary engineering research is performed, peak demand reduction is calculated during the three contiguous hottest days between 2 pm to 5 pm, Monday to Friday, in the week with the hottest weekday in June, July, August, or September.