PG&E STATEWIDE MULTI-YEAR BILLING ANALYSIS STUDY: COMMERCIAL LIGHTING TECHNOLOGIES

FINAL REPORT

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Submitted to

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1 EXECUTIVE SUMMARY

1.1 Background

This section is intended to give the reader some general background and structure information regarding the Statewide Multi-Year Billing Analysis (the "Multi-Year Study"). The evaluation covers indoor lighting technologies for Pacific Gas & Electric Co.'s (PG&E's) Commercial Energy Efficiency Incentives (CEEI) Program (the "Lighting Program"). Sub-section 1.2 presents the conclusions and recommendations that resulted from this study. Sub-section 1.3 presents the integrated analysis results of the study.

The objective of this study is to measure the total net load impact of the Lighting Program over a four-year period extending from 1994 through 1997. Moreover, the goal is to determine whether billing analysis is an effective method for measuring net impacts over time. The key elements of this goal are: to determine net impacts as they are affected by the persistence of measures over time, an increasing free-ridership rate, and effects of participant spillover. Another key element is to determine (if possible) the portion of nonparticipant impacts attributable to market transformation versus naturally occurring conservation. The approach for estimating net load impact can be decomposed into five intermediate research tasks.

(1) Estimate gross load impacts for the Lighting Program.

(2) Adjust gross load impacts over time by the persistence of installed lighting measures. The persistence rate is expected to decrease over time due to the failure and removal of installed lighting measures.

(3) Subtract free rider contribution from gross load impacts. Over time, free ridership is expected to increase, as participants reportedly would have installed the lighting measures in subsequent years.

(4) Add participant spillover contribution to the gross load impacts. The gross load impacts of participant spillover is adjusted by the persistence rate of the installed lighting measures.

(5) Estimate total nonparticipant market transformation load impacts. The portion of nonparticipant impacts attributable to the influence of the Lighting Program is estimated and adjusted for persistence over time.

These five research tasks are completed and verified using a variety of analysis techniques, which are summarized in Section 3 and discussed in detail in Section 4. A wealth of data resources are used in support of each analysis method to accomplish the stated objective.

1.2 Conclusions

Through the process of completing this study, certain methodological issues were brought to light. These discoveries and their ramifications are noted for use in future, similar studies. Methodological conclusions are presented for each research task.

Task 1: Estimate gross load impacts for the Lighting Program.

Conclusion: Billing analysis, in combination with engineering analysis, is the most effective method for calculating gross load impacts over time. This study sustains the capability of a billing analysis to measure gross load impacts, whether for first year impacts or impacts over time. Billing analysis yielded robust gross impact estimation results over time. Moreover, the results are consistent with previous years' program evaluations.

Task 2: Adjust for the persistence of installed lighting measures.

Conclusion: Persistence rates of installed lighting measures cannot be accurately identified through a billing analysis. The rate of equipment attrition is too small over a four-year period to detect with billing analysis. In addition, failed equipment is sometimes not replaced, or replaced with equally efficient equipment. As a result, the equipment failure is associated with either no change in energy consumption or a decline in consumption. Furthermore, removals would result in a decline in consumption. All of these cases would provide results contra-indicative of the true event: a decline in program impacts. Self report analysis however, does provide an adequate estimate of persistence over time. It is important that self-reported data be verified, because its accuracy is a principal concern. Therefore, we recommend conducting on-site audits to verify self-reported data whenever possible.

Task 3: Determine rates of free-ridership over time.

Conclusion: We found both self-report and billing analysis to be reliable, effective techniques for estimating free-ridership. However, billing analysis requires a very large sample size in order to get valid results. For example, our sample was too small to yield statistically significant results for most technologies; only fluorescents had a statistically valid result. In addition, the multiple regression analysis steps and sample censoring introduce potential estimation error and bias. Finally, self-report techniques are able to capture the dynamic effects of accelerated adoption, while the billing analysis produces a static result.

Task 4: Identify participant spillover adoptions and load impact.

Conclusion: Self-report data are used to determine whether participants were influenced by the program to make non-rebated high efficiency lighting adoptions. Billing analysis provides an estimate of the load impact derived from all of the non-rebated lighting adoptions. This estimate is an upper bound for participant spillover, and can be used to validate the self-report analysis results.

Task 5: Estimate nonparticipant market transformation load impacts.

Conclusion: Market transformation is estimated by combining estimates of total nonparticipant load impact and nonparticipant natural conservation. In this study, total nonparticipant load impact was captured using self-report adoption rates, combined with ex-post load impacts estimated with billing analysis. This method was both efficient and effective, and we recommend that it continue to be utilized in future studies.

The best method for estimating natural conservation is less clear. Two methods are presented in this study: one using out-of-state samples from territories where there are no programs similar to the Lighting Program, and the second using data gathered in the PG&E service territory.

Using out-of-state samples requires the assumption that the out-of-state territory is representative of the behavior that would have occurred in California in the absence of the program. Every territory is unique, and so results are dependent upon which territory is selected. Nonetheless, we believe this is the best estimation approach. Using California data requires the assumption that lighting adoptions by individuals *unaware* of being influenced by the lighting program are due to natural conservation. This approach underestimates market transformation because it ignores hidden market effects. This approach could be improved with surveys of other market "actors" such as distributors, to determine other ways the program has altered the market from the supply side. Nonetheless, this result is useful in providing a lower bound estimate of market transformation.

1.3 Integrated Results

The results of the five intermediate research tasks (stated above) were combined to identify each of the five components of total market effects: free-ridership, nonparticipant natural conservation, nonparticipant market transformation, participant installations, and participant spillover.

This study utilized multiple approaches to estimate each component of total market effects. With the exception of market transformation, the results of one approach was deemed superior and chosen for each estimate. In the case of market transformation, the analysis results are dependent upon the choice of a control group. Two approaches are presented for market transformation. The first is our "best estimate," which utilizes Georgia as a baseline control group. Georgia was selected from three alternative out-of-state control groups to best represent California based upon a qualitative analysis of firmographic and attitudinal variables. Due to the qualitative basis upon which Georgia was selected, a second approach is also presented. This approach relies upon self-report data collected in the state of California and represents a "lower bound" estimate for market transformation.

Self-report analysis results were chosen over billing analysis results for persistence, free ridership, and total market effects. As stated earlier, the estimate of market transformation effects is dependent upon the selection of a baseline control group. Due to the qualitative selection criteria used to select the baseline control group, two alternative estimates are presented. The first (using Georgia as a baseline) is the 'best estimate', while the second (using California as a baseline) represents a lower bound estimate of true market transformation effects.

1.3.1 Georgia as a Baseline to Measure Market Transformation Effects (MTE)

Exhibit 1.3-1 below presents cumulative total market effects by market effects components, from 1994 through 1997, using Georgia as a baseline for natural conservation. The data reveal tremendous market transformation effects. Total market transformation load impacts are between 78% and 86% of total load impact in each year. This indicates that, in the absense of the program, the total load impact from energy efficient measures would have been between 14% and 22% of what actually occurred. This substantial market transformation is due to program influence on both participants and nonparticipants. For nonparticipants, the program impacts are between 75% and 88% of total nonparticipant load impacts in each year. Overall, free-ridership rates are moderate, rising from 15% in 1994 to 18% in 1997. There is an almost negligable effect of persistence of measures over the period. Four years after installation, there was only a 0.6% failure/removal rate.

Exhibit 1.3-1
Cumulative Program Effects (kWh), 1994-1997
All Measures
Using Georgia as a Baseline

	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	206,204,601	318,204,090	416,112,154	512,532,065
Participant Spillover	1,770,910	2,443,800	3,369,565	3,480,251
Nonparticipant Adoptions	168,258,700	340,342,849	488,174,248	640,281,718
TOTAL	376,234,211	660,990,739	907,655,968	1,156,294,033
Natural Conservation				
Nonparticipant Adoptions	22,064,271	70,352,802	131,268,705	214,529,350
Participant Free Ridership	37,261,558	62,885,246	86,826,502	109,551,289
TOTAL	59,325,828	133,238,048	218,095,207	324,080,639
Market Transformation Effects Ratios				
% of Total Market Effects	86.4%	83.2%	80.6%	78.1%
Nonpart MTE as % of Total NP Effects	88.4%	82.9%	78.8%	74.9%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	15.3%	17.2%	18.2%	18.3%
Annual Persistence Rates	100.0%	99.9%	99.7%	99.4%

1.3.2 California as a Baseline to Measure Market Transformation Effects (MTE)

Exhibit 1.3-2 below depicts cumulative total market effects in the PG&E service territory from 1994 through 1997 using California as a baseline for natural conservation. California data was used as a baseline by invoking non-rebated lighting adoptions *that were not classified as spillover* as a proxy for natural conservation. The cumulative market effects by component over the 1994-1997 period are shown. The data reveal moderate market transformation effects. Total market transformation load impacts are between 39% and 50% of total load impact in each year. This indicates that, in the absence of the program, the total load impact from energy efficient measures would have been between 50% and 61% of what actually occurred. The market transformation impacts are due almost entirely to the program influence on participants. For nonparticipants, the program impacts are between 4% and 7% of total nonparticipant load impacts in each year.

Exhibit 1.3-2
Cumulative Program Effects (kWh), 1994-1997
All Measures
Using California as a Baseline

	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	206,204,601	318,204,090	416,112,154	512,532,065
Participant Spillover	1,770,910	2,443,800	3,369,565	3,480,251
Nonparticipant Adoptions	7,535,924	18,667,564	34,337,425	58,963,259
TOTAL	215,511,434	339,315,454	453,819,145	574,975,574
Natural Conservation				
Nonparticipant Adoptions	182,787,047	392,028,087	585,105,528	795,847,809
Participant Free Ridership	37,261,558	62,885,246	86,826,502	109,551,289
TOTAL	220,048,605	454,913,334	671,932,030	905,399,098
Market Transformation Effects Ratios				
% of Total Market Effects	49.5%	42.7%	40.3%	38.8%
Nonpart MTE as % of Total NP Effects	4.0%	4.5%	5.5%	6.9%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	15.3%	17.2%	18.2%	18.3%
Annual Persistence Rates	100.0%	99.9%	99.7%	99.4%

2 INTRODUCTION

This report summarizes the Statewide Multi-Year Billing Analysis Study (the "Multi-Year Study"). The primary objective of this study is to measure net load impacts of the 1994 Commercial Energy Efficiency Incentives (CEEI) Lighting Technologies Program (the "Lighting Program") beginning in 1994, and for each analysis year through 1997. These technologies are covered by two separate program options, the Retrofit Express (RE) Program and the Customized Incentive (Customized) Program.

This report is divided into 5 primary sections, and an Appendix. The first section, the Executive Summary, provides a summary of key findings and conclusions. Section 2 (the current section) provides greater detail of the contents of the Study. Section 2 also includes a description of the programs that are included in the CEEI Program, followed by an overview of the analysis, including the research tasks and timing.

Section 3 presents brief summaries of the methodology and results for each intermediate research task. Section 3 also presents the integrated analysis results including a description of how the intermediate analysis steps were combined into one comprehensive result. Section 4 contains very detailed explanations of the methodologies and results of the intermediate research tasks. In addition, Section 4 includes a comprehensive overview of the Study approach, and an explanation of the data sources utilized.

Section 5 provides a multitude of comparisons between PG&E and out-of-state survey territories. These comparisons are intended to highlight qualitative market transformation effects from the Lighting Program, as well as examine the comparability of the different samples. Section 6 presents the key methodological findings and conclusions drawn from the Study. The Appendix presents copies of the survey instruments[1], in addition to survey response frequencies and refusal comments.

2.1 PROGRAM DESCRIPTION

The Retrofit Express Program

The RE Program offered fixed rebates to customers who installed specific electric energy-efficient equipment. The program covered the most common energy saving measures and spans lighting, air conditioning, refrigeration, motors, and food service. Customers were required to submit proof of purchase with these applications in order to receive rebates. The program was marketed to small- and medium-sized commercial, industrial, and agricultural customers. The maximum rebate amount, including all measure types, was $300,000 per account. No minimum amount was required to qualify for a rebate.

Lighting end-use rebates were offered in the program for the following technologies:

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[1] For surveys funded by this Study.

Technology	Action
Halogen lamps	Replace existing lamps
Compact fluorescent lamps	Replace incandescent lamps
Compact fluorescent lamps and LEDs	Replace incandescent lamps in exit signs
Electronic ballasts	Replace magnetic ballasts
T-8 and T-10 lamps and electronic ballasts	Replace T-12 lamps and electromagnetic ballasts in various lengths and configurations
High Intensity Discharge (HID) fixtures	Replace incandescent or mercury vapor fixtures
Occupancy sensors, bypass or delay timers, photocells, and time clock controls	Reduce overall lighting consumption

The Customized Incentives Program

The Customized Incentives Program offered financial incentives to customers who undertook large or complex projects that save gas or electricity. These customers were required to submit calculations for projected first-year energy impacts with their applications prior to installation of the project. The maximum incentive amount for the Customized Incentives Program was $500,000 per account, and the minimum qualifying incentive was $2,500 per project. The total incentive payment for kW, kWh, and therm savings was limited to 50 percent of direct project cost for retrofit of existing systems. Since the program also applied to expansion projects, the new systems incentive was limited to 100 percent of the incremental cost to make new processes or added systems energy efficient. Customers were paid 4¢ per kWh and 20¢ per therm for first-year annual energy impacts. A $200 per peak kW incentive for peak demand impacts required that savings be achieved during the hours PG&E experiences high power demand.

As a result of program design, many of the measures installed were similar to or the same as those for the RE Program, but were installed in larger and more complex projects.

2.2 ANALYSIS OVERVIEW

The Statewide Multi-Year Billing Analysis described in this report covers all lighting measures installed at commercial accounts that were included under the RE and Customized Incentives Program for which rebates were *paid* during calendar year 1994. Although the focus of the Study is on the 1994 Lighting Program, 1995-1997 Program data was also used.

Research Tasks

The Research tasks comprising this study were originally stated in the Request for Proposals (RFP), refined during the project initiation meeting, and documented in the analysis research plan. These research tasks are as follows:

- Estimate total net load impact of the 1994 Lighting Program beginning in 1994 through 1997.

- Determine the persistence of gross load impacts, and estimate how net load impacts change over time.

- Identify the number of Free Riders and spillover customers, and their effects on net load impacts.

- Distinguish Market Transformation Effects from naturally occurring conservation within the nonparticipant population.

To accomplish these tasks, analytical models from the 1994 Commercial Retrofit Program Evaluation were used to replicate the calculation of load impacts for the analysis years pertinent to this study. These models and self-reported data from 15 different surveys were used to examine and quantify total net load impacts over the four-year period. The study also identified the persistence of gross load impacts, and distinguished market transformation effects from naturally occurring energy conservation.

Timing

The Multi-Year Billing Study began in December 1997, completed the planning stage in February 1998, executed data collection between March and May, 1998, and completed the analysis and reporting phase in July 1998.

3 EVALUATION RESULTS SUMMARIES

This section presents summaries of the Multi Year Study methodology and results. Section 3.1 presents summaries of the intermediate research tasks, including brief explanations of each methodology and a synopsis of the results. Section 3.2 presents the integrated analysis and results of the Study.

The overall goal of this study is to estimate total Lighting Program net load impacts over a four year period, as they are affected by the persistence of measures over time, an increasing free-ridership rate, and effects of participant spillover. This goal is achieved by disaggregating net load impacts into the following five components: gross load impacts, persistence of gross load impacts, free ridership, spillover effects, and market transformation effects over time. Net load impact estimation is then decomposed into the following five intermediate steps.

(1) Estimate gross load impacts for the Lighting Program.

(2) Adjust gross load impacts over time by the persistence of installed lighting measures over a four-year period. The persistence rate is expected to decrease over time due to the failure and removal of installed lighting measures.

(3) Subtract the Free Rider contribution from gross load impacts. Over time, free ridership is expected to increase as participants reportedly would have installed the lighting measures in subsequent years.

(4) Add the participant spillover contribution to the gross load impacts. Adjust the gross load impacts of participant spillover by the persistence rate of the installed lighting measures.

(5) Estimate total nonparticipant market transformation load impacts. The portion of the nonparticipant impacts attributable to the influence of the Lighting Program are estimated and adjusted for persistence over time.

These five steps are executed and verified using a variety of analysis techniques. Each technique and result is discussed within the sub-sections of *Section 3.1*. More detailed explanations of these techniques and results can be found in *Section 4*. Throughout this section references are made to the pages within *Section 4* that provide greater detail on the subject being discussed.

Section 3.1.1 discusses the estimation of gross load impacts for the Lighting Program. In addition, *Section 3.1.1* presents the persistence analysis and results. *Section 3.1.2* presents the free-ridership analysis. *Section 3.1.3* discusses the calculation of total market effects and the spillover analysis. The total market effects are a key input in the estimation of market transformation effects. *Section 3.1.4* discusses the estimation of nonparticipant market transformation load impacts, incorporating total market effects and naturally occurring conservation.

Section 3.2 presents the integrated analysis and results. *Section 3.2.1* presents an explanation of the methodology used to combine the intermediate research task results into a comprehensive result. Section 3.2.2 presents the final results of the integrated analysis.

3.1 METHODOLOGY AND INTERMEDIATE RESULTS SUMMARIES

Section 3.1 presents summaries of the intermediate research tasks, including brief synopses of the methodologies and results. More detailed explanations of the methodology and intermediate results is presented in *Section 4*. References are made to the sections and pages within *Section 4* that provide greater detail on each analysis discussed below.

3.1.1 Gross Load Impact and Persistence over Time

Gross Load Impact

Gross billing analysis models were used to estimate gross impacts. The results from the models were highly successful. The Gross Model #1 successfully captured close to 100% of the total 1994 evaluation ex post load impact. The model continued to predict constant impacts over the first two post analysis years, but decreases by about 5% in 1997. A more detailed explanation of the gross load impact analyses can be found in *Section 4.2*, pages 4-9 through 4-14.

The gross billing analysis employs two different multivariate regression models to predict post energy usage relative to installed lighting measures. The first model, Baseline Model #1, selects nonparticipants to predict energy usage of participants had they not participated in the Lighting Program. The difference between the predicted and the actual post period energy usage is attributable to the installed lighting measures and the lighting and facility change characteristics associated with each participant.

The second model, Gross Model #1, regresses the participant lighting and facility changes and installed lighting measure impacts against the difference between the predicted and actual post period energy usage to identify the portion of difference that can be attributed to participants' installed lighting measures. Gross load impacts are estimated using the results from Gross Model #1.

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. Exhibit 3.1.1-1 summarizes and compares the ex-post load impact results of the Multi-Year Study with the original ex-post load impacts from the original 1994 evaluation results. For technology segments with statistically insignificant SAE[1] Coefficients, the 1994 ex-post results were applied.

[1] The results of the billing regression analysis are estimated as ratios, termed "SAE coefficients," of realized impacts to the engineering impact estimates.

Exhibit 3.1.1-1
Comparison of Ex-Post Load Impacts
1995 Evaluation vs. 1995-1997 Multi-Year Study Results

			Multi-Year Billing Study Results					
	1995 Evaluation Results		1995 Post-Period		1996 Post-Period		1997 Post-Period	
Program and Technology Group	**Engineering Estimate**	**Ex-Post Load Impact**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**
Retrofit Express Program								
Compact Fluorescent	23,719	14,706	19,545	133%	18,728	127%	13,456	91%
Incandescent to Fluorescent	4,292	3,407	3,455	101%	3,416	100%	3,369	99%
Efficient Ballast	4,929	3,795	3,967	105%	3,922	103%	3,869	102%
T8 Lamps and Electronic Ballasts	107,428	87,775	86,469	99%	85,487	97%	84,321	96%
Optical Reflectors w/ Fluor. Delamp	91,536	76,961	73,677	96%	72,841	95%	71,847	93%
High Intensity Discharge	29,458	34,557	34,557	100%	34,557	100%	34,557	100%
Halogen	5,265	6,128	6,128	100%	6,128	100%	6,128	100%
Exit Signs	4,482	4,482	4,482	100%	4,482	100%	4,482	100%
Controls	11,136	11,136	11,136	100%	11,136	100%	11,136	100%
Other	17	17	17	100%	17	100%	17	100%
Retrofit Express Indoor Total	282,264	242,965	243,435	100%	240,714	99%	233,182	96%
Customized Incentives Program								
Compact Fluorescent	435	684	641	94%	696	102%	557	81%
Standard Fluorescent	16,151	25,356	23,765	94%	25,801	102%	20,655	81%
High Intensity Discharge	1,152	1,808	1,695	94%	1,840	102%	1,473	81%
Exit Signs	28	45	42	94%	45	102%	36	81%
Controls	2,485	3,901	3,656	94%	3,970	102%	3,178	81%
Other	1,865	2,929	2,745	94%	2,980	102%	2,386	81%
Customized Incentives Indoor Total	22,117	34,723	32,544	94%	35,332	102%	28,284	81%
Indoor Lighting Total	304,380	277,688	275,979	99%	276,047	99%	261,466	94%

Persistence over Time

Gross Billing Analysis

Persistence rates can be interpreted in Exhibit 3.1.1-1 as the difference between the current parameter estimate relative to previous year's parameter estimate. However, the t-statistics for the estimated parameters are insignificant in certain technology segments because of inadequate sample size. Further, the rate of equipment attrition is too small over a four-year period to detect with billing analysis. Failed equipment is sometimes not replaced, or replaced with equally efficient equipment. Equipment removal would result in a decline in consumption. All of these cases would produce billing model results contra-indicative of the true event: a decline in program effects. Consequently, the method of inferring persistence rates from Gross Model #1 results is not recommended. Self-report analysis, however, does provide an adequate estimate of persistence over time. Finally, the Gross Model #1 results are useful for verifying the self-report analysis method explained below.

A more detailed account of the Gross Model #1 persistence analysis can be found in *Sections 4.2.1* and *4.2.6* on pages 4-12 and 4-14.

Self Report

The 1994 Program participants were re-contacted to gather information regarding the failure and/or replacement behavior of installed lighting measures. The re-contact surveys specifically asked participants about installed lighting failures and/or replacement behavior including time of failure and/or replacement and number of failures and/or replacements.

Out of 984 participant installations, there were only 104 participants that reported removals. When the results of the 104 reported removals were applied to the entire 1994 participant population, the persistence rates reflect population persistence rates. Exhibit 3.1.1-2 illustrates the persistence findings as applied to the entire 1994 participant population. More detail regarding the self report persistence analysis can be found in *Section 4.2.7* on page 4-14.

Exhibit 3.1.1-2
Population Persistence Estimates
Self Report

STRATA	1995	1996	1997	1998
Compact Fluorescent	99.96%	99.85%	97.72%	95.48%
Elec. Ballast-Office	99.74%	99.70%	99.55%	99.20%
Elec. Ballast-Retail	99.99%	99.87%	99.69%	99.10%
Elec. Ballast-School	99.97%	99.97%	99.92%	99.59%
Elec. Ballast-Others	99.79%	99.78%	99.65%	99.18%
Delamp Fluorescent	99.99%	99.99%	99.99%	99.99%
High Intensity Discharge	99.79%	98.33%	98.22%	97.76%
Controls	100.00%	99.98%	99.98%	99.40%
Others	100.00%	100.00%	100.00%	98.06%
TOTALS	99.90%	99.66%	99.43%	98.88%

Weighted by ex-post energy load impact.

3.1.2 Free-Ridership

"Free-riders" are program participants who would have installed the rebated lighting technology in the absence of the program. The energy savings associated with free-riders must be excluded from the net load impact estimate. The objective of this analysis step was to identify the energy savings associated with free-rider adoptions for each year, 1994-1997. Two methods were used to estimate free-ridership, net billing analysis and self report analysis. These two methodologies and corresponding results are summarized below. Readers who desire a highly detailed explanation of the free-ridership analysis methodology and results should refer to *Section 4.3* on page 4-16.

Net Billing Model Free-Ridership

Methodology

One method used to estimate free-ridership was to conduct a net billing analysis. The objective of the net billing analysis was to estimate SAE coefficients that could be applied to gross engineering estimates to calculate net load impact. The net billing analysis model is similar to the gross billing analysis model in that the SAE Model incorporates both participants and nonparticipants into one model.

A disadvantage of combining both participants and nonparticipants into one model of net energy savings is that the resulting sample is not randomly determined. In particular, participants self-select into the program and therefore are unlikely to be randomly distributed. One solution to this problem is to include an Inverse Mills Ratio in the model to correct for self-selection bias. In addition, a second Inverse Mills Ratio is interacted with a measure of energy savings, which allows the amount of net savings to vary with participation. The rationale for the second term is that those customers who have potentially large savings are more likely to participate in the program.

To calculate the Inverse Mills Ratios, a probit model of program participation is estimated. Once the probit model is estimated, the parameters of the participation model are used to calculate an Inverse Mills Ratio for both participants and nonparticipants. This Mills Ratio is included in a net savings regression that combines both participants and nonparticipants into one model. The net billing analysis provides load impacts for program measures over time, taking into account self selection and free ridership among Lighting Program participants. More detail regarding the Net Billing analysis, including a discussion of the probit model of participation, may be found in *Section 4.3.2*, pages 4-17 through 4-25.

Results

Exhibit 3.1.2-1 summarizes the Net Billing Model #1 results. The exhibit highlights the finding that only the "Fluorescents" and "Customized Incentives" lighting end uses are statistically significant (at the 95% confidence level). The parameter estimates shown in the exhibit represent net participation within that technology (having accounted for self-selection). From these estimates, we can now "back out" an estimate of free ridership, by taking the product of these coefficients with their Mills Ratio and dividing by the SAE Coefficients from Gross Model #1. Exhibit 3.1.2-2 summarizes the resulting estimate of the free ridership rate of three most significant lighting technologies.

Exhibit 3.1.2-1
Net Billing Model #1 Results

		1995 Post Period			1996 Post Period			1997 Post Period		
Parameter Descriptions	**Units**	**Parameter Estimate**	**t-Statistic**	**Sample Size**	**Parameter Estimate**	**t-Statistic**	**Sample Size**	**Parameter Estimate**	**t-Statistic**	**Sample Size**
Mills Ratio	Unitless	-1215	-0.429	894	916	0.224	846	-1568	-0.486	815
SAE Coefficients										
Lighting End Use										
Fluorescents	Mills * kWh	-0.78	-9.90	154	-0.75	-7.50	153	-0.76	-9.27	149
HIDs	Mills * kWh	-0.15	-0.43	23	-0.07	-0.14	23	0.14	0.37	23
Compact Fluorescents	Mills * kWh	-0.23	-0.73	74	-0.43	-0.97	76	-0.31	-0.88	74
Other Lighting	Mills * kWh	-0.14	-0.75	25	-0.22	-0.84	25	-0.01	-0.07	25
Customized Lighting	Mills * kWh	-1.63	-4.24	5	-1.80	-3.25	4	-1.48	-3.43	4
Outdoor Lighting	Mills * kWh	-0.26	-0.98	46	-0.16	-0.42	47	0.05	0.18	47
Other End Uses										
Other Impacts	kWh	-0.15	-0.34	29	-0.67	-1.01	38	-0.60	-1.33	46
Other Site Changes										
Lighting Additions	kWh	0.05	3.46	58	-0.02	-0.88	72	-0.02	-1.67	83
Lighting Replacements	kWh	-0.03	-0.90	43	-0.03	-0.55	49	-0.02	-0.72	71
Lighting Removals	kWh	0.11	0.27	3	0.29	0.48	2	-0.10	-0.08	2
HVAC Replacements	kWh	-0.09	-0.59	3	-0.13	-0.60	3	-0.24	-1.36	4
Other Equip Replacements	kWh	-0.10	-3.03	24	-0.08	-3.86	41	-0.08	-4.88	56
Add Employees	# Emp	323.77	4.25	147	281.93	4.44	154	297.58	5.64	128
Reduce Employees	# Emp	-745.48	-1.82	80	-145.47	-0.43	87	-140.61	-0.53	67
Other Equip Additions	kWh	0.02	2.05	206	0.05	4.69	269	0.07	7.73	312
Total Sample Size				894			846			815

Exhibit 3.1.2-2
Free-Ridership Rates by Technology
Net Billing Model #1 Results

Parameter Descriptions	Gross Model # 1 Parameter Estimate	Net Model #1 Parameter Estimate	From Probit Mean Mills	Resulting Free-Ridership
1995				
Fluorescents	0.80	0.78	0.85	0.17
Compact Fluorescents	0.82	0.23	0.83	0.77
Customized Lighting	1.47	1.63	0.83	0.08
1996				
Fluorescents	0.80	0.75	0.87	0.19
Compact Fluorescents	0.79	0.43	0.86	0.53
Customized Lighting	1.60	1.80	0.90	-0.01
1997				
Fluorescents	0.78	0.76	0.87	0.15
Compact Fluorescents	0.57	0.31	0.86	0.53
Customized Lighting	1.28	1.48	0.90	-0.04

Self-Report Free-Ridership Analysis

Methodology

The self-report approach used survey data from the 1994 participant survey to estimate free-ridership over the period 1994-1998. If the survey respondent indicated they would have installed the rebated technology in the absence of the program they became a candidate for free-ridership. The next step was to determine when they would have installed the technology. If the respondent would have installed the technology in 1994, then they were considered a free-rider in all five years, 1994-1998. If they would have waited one year, then they were considered a net participant in 1994 and a free-rider for the following years. If the respondent would have waited two years, then they were classified as a net participant in 1994 and 1995, and a free-rider in years 1996-1998, etc. More information regarding the self-report estimation of free-ridership, including the scoring method, data sources, and results can be found in *Section 4.3.3*, pages 4-25 through 4-30.

Results

Exhibit 3.1.2-3 below presents self-reported estimates of free ridership by technology group for the 1994 Lighting Program participants. The results are weighted by avoided cost. Overall, free-ridership is moderate in 1994 at 15.3%, rising to 19.7% by 1998.

Exhibit 3.1.2-3
Weighted Self-Report Estimates of Free Ridership, 1994-1998
For Lighting Technology Groups in the 1994 CEEI Program

Technology Group	*FREE RIDERSHIP*				
	1994	**1995**	**1996**	**1997**	**1998**
Customized Incentive Program	79.3%	79.3%	79.3%	79.3%	79.3%
Halogen	52.3%	52.3%	52.3%	52.3%	52.3%
Compact Fluorescent Lamps	7.2%	9.2%	9.7%	10.2%	14.0%
Incandescent to Fluorescent Fixtures	30.9%	30.9%	30.9%	30.9%	30.9%
Exit Signs	8.3%	8.3%	8.3%	8.3%	8.3%
Efficient Ballast Changeouts	55.7%	64.8%	64.8%	64.8%	66.8%
T-8 Lamps and Electronic Ballasts	10.2%	12.8%	13.7%	13.8%	15.8%
Optical Reflectors w/ Fluorescent Delamp	3.6%	4.8%	7.2%	7.2%	7.2%
High Intensity Discharge	25.8%	26.0%	26.0%	26.2%	26.2%
Controls	4.9%	7.7%	7.7%	7.7%	17.7%
	9.7%	11.9%	13.4%	13.4%	14.6%
	15.3%	17.2%	18.2%	18.3%	19.7%

The technology group with the lowest rates of free ridership was Optical Reflectors with Fluorescent Delamping. The rate for this group was estimated to be 3.6% in 1994, rising to 7.2% by 1998. The second lowest rate in 1994 was Controls, 4.9% followed closely by Compact Fluorescent and Exit Signs at 7.2% and 8.3% respectively. However, by 1998 the rate of free-ridership in the Controls category rises to 17.7%, surpassing the Compact Fluorescent rate which rises to 14.0%, and the Exit Signs rate, which stays constant at 8.4%.

The Highest rates of free ridership were found within the Customized Incentive Program; free-ridership is a consistent 79.3% throughout 1994 to 1998. Efficient Ballast Changeouts and Halogen lighting categories also had significant levels of free-ridership, 52.3% and 55.7% respectively. However, free ridership rises within the Efficient Ballasts group to 66.8% by 1998, while the rate for Halogens stays constant. Free-ridership rates are somewhat lower for fluorescent technologies than all technologies combined; roughly 5% lower in each year.

Free-Ridership Analysis: Net Billing Model versus Self-Report

Some differences between the bill analysis and self-report free-ridership results are worthwhile highlighting. First, there were three estimation steps, and consequently three sources of estimation error in the billing analysis (Gross, Net and Mills). Second, large customers were censored from the bill analysis. In contrast, the self-report analysis used all available data. Third, there was a significantly smaller sample size in the billing analysis. The number of re-contacted respondents, as well as the required censoring limited the bill analysis sample size.

For fluorescent technologies, the results from the two different approaches are relatively comparable. The bill analysis results do not indicate a trend in free-ridership, with the rate increasing from 1995 to 1996 and then decreasing in 1997. The self-report results increase each year, from 9.7% in 1994 to 14.6% in 1998. A longer discussion of the comparison of net biling model and self report analysis results can be found in *Section 4.3.3*, pages 4-31 and 4-32.

3.1.3 Market Effects Analysis

"Total market effects" are the energy savings from all high efficiency lighting adoptions that occurred in the PG&E service territory over the four-year period. The market effects analysis measures the energy savings, adoption rates and fixtures installed over the 1994-1997 period. The total market effects analysis provides the foundation for determining market transformation effects. Market transformation effects are all of the load impacts resulting from the influence of the Lighting Program. Total market effects can be divided into two components: market transformation effects and naturally occurring conservation. Thus, total market effects combined with a proxy for naturally occurring conservation to determine the extent to which the existence of the Lighting Program has had any effect in transforming the lighting market. Alternatively, this analysis will show whether the efficiency baseline is increasing due to naturally occurring conservation.

Results are presented for rebated adoptions, nonrebated adoptions, and spillover adoptions. Each of these components was estimated two ways: using gross and net billing models, as well as self report analysis. The two methodologies and results are summarized below. The market effects analysis is also discussed in greater detail in *Section 4.4*, pages 4-32 through 4-51.

Net and Gross Billing Model #2

One method of estimating total market effects is through a billing analysis. The analysis uses the same models developed in calculating gross load impact (see *Section 3.1.1* above). The only difference between Model #1 and Model #2 is the exclusion of lighting replacements in the $Chg_{i,k}$ variable. This modification causes the effects of lighting market movement to be captured by business type intercepts and the pre-usage parameter estimate in Baseline Model #2. The results are used to predict participant post-period usage and to calculate SAE

Coefficients in the gross and net models. The difference between the SAE Coefficients from Net Billing Model #2 and the SAE Coefficients from Net Billing Model #1 can be attributable to total market effects (accounting for self-report and self-selection). The results of the Net Billing Model #2 were almost identical to the Net Billing Model #1 on a year by year basis. A relationship of lighting replacement and total market effects could not be established through a this approach because the parameter estimate for the "lighting replacements" variable that was included in the Model #1 specification was not statistically significant; its removal from the Model #2 specification had little impact.

Although the light replacement parameter estimate was statistically insignificant, the value was the correct sign and was of a reasonable order of magnitude. This result lead to a revised approach. Specifically, total market effects were estimated with the results of Baseline and Gross Model #1. The "Lighting Replacements" parameter estimate from Baseline Model #1 and the actual post-period energy usage of the nonparticipant were used to establish a "nonparticipant lighting adoption" impact. This impact is a measure of how much a nonparticpant's lighting replacement would decrease post-period energy usage. Likewise for participants, impacts attributable to lighting replacements can be calculated the "Lighting Replacements" parameter estimate from Gross Model #1 and the actual post-period energy usage. The sample participant and nonparticipant lighting adoption impacts for each post-period year are leveraged to the entire MDSS population and commercial population. Exhibit 3.1.3-1 presents the results of this analysis.

Exhibit 3.1.3-1
Total Non-Rebated Market Effects
Annual kWh Savings

Technology Group	1994 - 1995 Baseline and Gross Model #1 Parameter Estimate	1994 - 1995 Adoption Ratio	1994 - 1995 Annual kWh Savings	1994 - 1996 Baseline and Gross Model #1 Parameter Estimate	1994 - 1996 Adoption Ratio	1994 - 1996 Annual kWh Savings	1994 - 1997 Baseline and Gross Model #1 Parameter Estimate	1994 - 1997 Adoption Ratio	1994 - 1997 Annual kWh Savings
Participants									
Fluorescents	0.03	0.02	2,285,631	0.01	0.05	2,020,841	0.02	0.09	2,239,363
Other High Efficiency	0.03	0.05	990,216	0.01	0.05	480,519	0.02	0.07	470,437
Total	-	-	3,275,846	-	-	2,501,360	-	-	2,709,800
Nonparticipants									
Fluorescents	0.05	0.06	257,337,991	0.02	0.08	75,437,874	0.02	0.11	89,853,971
Other High Efficiency	0.05	0.06	127,433,636	0.02	0.09	42,050,143	0.02	0.11	41,978,965
Total	-	-	384,771,628	-	-	117,488,016	-	-	131,832,935
Total	-	-	388,047,474	-	-	119,989,377	-	-	134,542,735

Exhibit 3.1.3-1 summarizes the kWh savings of non-rebated adoptions for participants and nonparticipants. Non-fluorescent technologies are grouped together to create a comparable group to the fluorescents. The adoption ratio is the proportion of customers who made adoptions to the total customer sample in the models. For example, only 2% of the participants and 6% of the nonparticipants reportedly made a adoption between 1993-1995. The annual kWh savings is a cumulative value from pre-period year to post-period year.

Exhibit 3.1.3-2 below provides another viewpoint of the results discussed above. Since each subsequent post-period overlaps the previous post-period, mean annual kWh savings are calculated. The exhibit examines the mean savings by technology for participants and nonparticpants over time. Not surprisingly, particpant savings are small compared to nonparticpant savings. This is because the size of the commercial nonparticpant population, more than 400,000 customers, is so much larger than the participant population, about 5000 customers. These results are used to validate the self report analysis of total market effects.

Exhibit 3.1.3-2
Total Non-Rebated Market Effects
Mean Annual kWh Savings

	Fluorescents			Other High Efficiency			Fluorescents and Other High Efficiency		
Year	Participant	Nonparticipant	Total	Participant	Nonparticipant	Total	Participant	Nonparticipant	Total
94	2,181,945	140,876,612	143,058,557	647,057	70,487,581	71,134,639	2,829,002	211,364,193	214,193,195
95	2,181,945	140,876,612	143,058,557	647,057	70,487,581	71,134,639	2,829,002	211,364,193	214,193,195
96	2,130,102	82,645,922	84,776,024	475,478	42,014,554	42,490,032	2,605,580	124,660,476	127,266,056
97	2,239,363	89,853,971	92,093,334	470,437	41,978,965	42,449,402	2,709,800	131,832,935	134,542,735

An expanded discussion of the market effects analysis using the Gross and Net Model #2 Billing Analysis can be found in *Section 4.4.1*, pages 4-32 through 4-35.

Self-Report Market Effects Analysis

Methodology

Adoptions were examined for nine different measure categories. These include four fluorescent lighting measure categories: standard fluorescents, T-8 lamps and ballasts, electronic ballasts, and efficient lamp conversions (e.g. energy savers). In addition, we examined five other high efficiency lighting technolgies: halogen, compact fluorescents, exit signs, HIDs and controls. An expanded discussion of the Self Report Market Effects analysis can be found in *Section 4.2.2*, pages 4-35 through 4-42.

Participant adoptions were analyzed using the MDSS and CIS databases, together with the results of Gross Model #1 Billing Analysis. No estimation methods were used in this analysis to calculate the number of adoptions or fixtures for participant adoptions. The kWh were adjusted by the Gross Model #1 Billing Analysis results to provide an estimate of ex-post load impacts.

Twelve surveys were used in the self-report market effects analysis. These surveys were:

- the 1994 participant and nonparticipant surveys
- the 1995 and 1996 participant, nonparticipant and canvass surveys
- and the new re-contacted and previously uncontacted surveys.

For each survey the number of adoptions for each measure category was calculated. Next, the number of fixtures installed and kWh savings associated with these adoptions were calculated. The third step was to distribute the kWh savings over the period covered by the survey. An examination of the distribution of lighting adoptions by year was used to distribute kWh savings to specific years. The final step was to combine the results of this analysis for the 12 surveys

Results

Exhibit 3.1.3-3 below shows rebated and nonrebated commercial lighting installations in PG&E's service territory over the period 1994 through 1997. The table shown below is the combined result of the self-report market effects analysis.

For fluorescent lighting rebated adoptions, 1994 was by far the greatest year. 1994 produced the highest adoption rate, the greatest number of installed fixtures, and over twice the energy savings of both 1996 and 1997. From 1994 through 1997, there is a steady decline in adoption rates, fixtures and energy savings associated with rebated fluorescent lighting adoptions.

Adoptions of electronic ballasts and efficient lamp conversions have dropped as a share of fluorescent lighting adoptions. In 1994 electronic ballasts and efficient lamp conversions comprised 34% of fluorescent lighting adoptions. In 1997, the share falls to 22%. Conversely, T-8 adoptions have become more common among rebated fluorescent lighting adopters, rising from 66% to 78% of fluorescent lighting adoptions.

There are several notable trends within the other nonrebated high efficiency lighting technologies. Adoption rates for halogen, exit signs, and HIDs have risen over the four year period. At the same time, the number of fixtures associated with these adoptions has declined, reflecting smaller average project sizes for these three measures. Compact fluorescent adoption rates decline modestly over the period, as does the total number of fixtures installed. Controls remain relatively uncommon, but have experienced an increase over the four-year period in both adoption rates and fixtures.

Exhibit 3.1.3-3
Commercial Lighting Installations by Rebate, 1994-1997

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
PG&E Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	1.55%	900,859	84,280,182	1.32%	603,518	65,522,990	1.19%	512,067	61,264,225	0.84%	559,628	51,614,563
Electronic Ballasts	0.17%	52,471	3,967,130	0.04%	10,411	959,932	0.04%	7,042	556,529	0.02%	6,284	179,643
Efficient Lamp Conversions	0.61%	590,326	79,321,124	0.29%	197,436	34,894,658	0.24%	159,856	31,411,171	0.22%	198,986	30,310,502
Total Fluorescents	2.33%	1,543,657	167,568,436	1.66%	811,365	101,377,580	1.47%	678,965	93,231,924	1.08%	764,898	82,104,709
Other High Efficiency												
Halogen	0.10%	21,446	6,176,408	0.06%	8,876	829,302	0.05%	9,578	1,325,524	0.04%	11,199	1,666,589
Compact Flourescents	0.75%	124,491	19,545,229	0.48%	70,162	12,179,480	0.38%	46,231	10,119,829	0.47%	61,880	21,140,790
Exit Signs	0.19%	15,856	4,482,343	0.16%	9,496	2,522,894	0.16%	10,304	2,863,122	0.18%	13,989	4,278,110
HID	0.19%	15,156	34,557,487	0.09%	7,609	16,318,498	0.07%	5,672	12,408,503	0.11%	8,236	11,521,370
Controls	0.33%	23,543	11,136,255	0.15%	8,936	4,842,039	0.11%	7,092	3,741,003	0.11%	6,788	3,236,730
PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	2.20%	986,403	-	1.71%	716,534	-	1.34%	240,487	-	1.53%	47,345	-
T-8 Lamp & Ballasts	2.06%	534,303	58,920,147	2.15%	537,296	60,424,019	2.11%	674,973	74,329,994	2.38%	782,326	85,813,289
Electronic Ballasts	0.30%	11,688	1,207,986	0.27%	19,750	1,739,294	0.24%	26,265	1,985,778	0.33%	28,828	2,179,545
Efficient Lamp Conversions	0.43%	71,457	6,794,755	0.33%	50,155	4,879,654	0.20%	33,139	2,915,870	0.04%	1,787	250,848
Total Fluorescents	4.99%	1,603,851	66,922,888	4.46%	1,323,736	67,042,967	3.88%	974,864	79,231,642	4.27%	860,286	88,243,682
Other High Efficiency												
Halogen	0.30%	39,948	11,504,949	0.37%	31,857	9,174,716	0.40%	34,777	10,015,854	0.46%	22,949	6,609,267
Compact Flourescents	0.49%	344,296	64,482,126	0.46%	334,981	60,844,410	0.29%	127,815	20,017,747	0.27%	122,865	19,548,600
Exit Signs	0.14%	8,688	2,449,427	0.19%	15,302	1,863,748	0.13%	9,921	130,385	0.16%	12,330	140,323
HID	0.58%	42,484	46,253,368	0.76%	49,904	81,242,712	0.68%	45,540	99,374,976	0.81%	48,168	119,987,454
Controls	0.00%	967	481,122	0.07%	1,741	877,018	0.08%	1,790	902,464	0.11%	1,875	949,475

Self-Report Spillover Analysis

The following is a summary of the results of our examination of spillover lighting adoptions in the PG&E service territory over the 1994-1997 period. A spillover adoption is defined as a high efficiency adoption that is attributable to the influence of the CEEI program. The objective of this analysis is to identify the spillover adoption rates for each measure and to quantify the load impact resulting from spillover adoptions. The Self Report Spillover Analysis is discussed in greater detail in *Section 4.4.3*, pages 4-42 through 4-45.

All twelve surveys used to derive total market effects were also utilized in the self-reported spillover analysis. Survey data were examined to determine whether each adoption met the spillover criteria. Specifically, an adoption was considered to be spillover if the adopter's knowledge of, awareness of, or participation in the CEEI program encouraged them to install high efficiency equipment outside the program. Respondents must have indicated that they were directly influenced by the Lighting Program to install high efficiency equipment, and that they did not receive a rebate for the installation.

Exhibit 3.1.3-4 below presents the results of the self-reported spillover analysis.

Exhibit 3.1.3-4
Nonparticipant and Participant Self-Reported Spillover

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
PG&E Nonparticipant Spillover Non-Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	0.08%	24,626	2,661,980	0.11%	32,292	3,624,212	0.16%	57,382	6,187,550	0.26%	91,197	9,952,295
Electronic Ballasts	0.00%	162	15,602	0.00%	430	35,064	0.03%	2,179	164,768	0.04%	2,891	218,565
Efficient Lamp Conversions	0.01%	2,756	267,086	0.01%	1,819	177,746	0.01%	1,791	173,290	0.00%	74	10,440
Total Fluorescents	0.10%	27,544	2,944,669	0.12%	34,541	3,837,022	0.20%	61,353	6,525,608	0.30%	94,162	10,181,300
Other High Efficiency												
Halogen	0.02%	3,047	877,395	0.02%	1,880	541,384	0.03%	2,470	711,479	0.03%	1,387	399,331
Compact Flourescents	0.01%	3,969	734,002	0.01%	5,580	966,251	0.02%	7,909	1,250,663	0.03%	10,113	1,596,121
Exit Signs	0.01%	124	34,432	0.01%	334	25,560	0.01%	688	7,950	0.01%	863	10,799
HID	0.02%	1,880	2,945,425	0.05%	6,259	5,699,442	0.04%	12,789	7,171,737	0.09%	16,885	12,389,146
Controls	0.00%	-	-	0.01%	138	69,707	0.00%	62	31,601	0.01%	215	108,727

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
Participant Spillover PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	0.52%	9,321	1,010,629	0.88%	6,619	712,684	1.40%	10,027	1,078,682	1.79%	4,611	486,358
Electronic Ballasts	0.09%	2,501	193,048	0.18%	1,541	119,004	0.28%	2,258	170,739	0.40%	600	45,395
Efficient Lamp Conversions	0.09%	172	12,986	0.06%	100	7,730	0.07%	139	11,078	0.02%	16	1,706
Total Fluorescents	0.700%	11,995	1,216,662	1.126%	8,260	839,417	1.749%	12,425	1,260,499	2.208%	5,228	533,459
Other High Efficiency												
Halogen	0.09%	98	28,210	0.07%	89	25,621	0.08%	97	27,957	0.06%	80	23,002
Compact Flourescents	0.14%	989	148,395	0.14%	584	88,221	0.17%	821	122,498	0.17%	145	23,009
Exit Signs	0.04%	87	25,618	0.05%	79	21,783	0.08%	98	27,121	0.09%	88	22,724
HID	0.07%	183	57,812	0.12%	145	79,472	0.21%	227	124,903	0.26%	139	128,249
Controls	0.12%	591	294,213	0.04%	210	104,609	0.05%	230	114,416	0.00%	-	-

Market Effects Analysis: Billing Model versus Self-Report

Both the bill analysis and the self-report analysis faced difficulties and challenges in estimating total market effects. The self-report analysis suffered primarily from incomplete or inaccurate data. Specifically, there was a general inability of respondents to recall measure installed more than a couple years in the past. Often respondents were unsure of the technology installed, the number of fixtures, and the date of installation. Of course the billing analysis also faced challenges of inaccurate or incomplete data. Further, lighting changes often correspond with other facility changes, which makes it very hard to isolate the effects of the lighting change. The sample size for adopters was very limited. The number re-contacted respondents limited the billing analysis sample size. Further, large customers had to be censored from the analysis because of their disproportionate influence on the results. As a result of these problems, the billing analysis did not result in a significant lighting replacement parameter.

Although the self-report analysis had some challenges, it also had the advantage of a very large sample size. Twelve different surveys were used to compile the self-report market effects analysis. The magnitude and diversity of the data used for this analysis compensate somewhat for the challenges of missing and/or inaccurate data. A more detailed comparison of Billing versus Self Report market effects analyses, including a discussion of methodological challenges, can be found in *Sections 4.4.4* and *4.4.5*, pages 4-45 through 4-51.

3.1.4 Market Transformation Effects Analysis

The objective of the market transformation effects analysis was to estimate the percentage of the total market effects that are attributable to the influence of the Lighting Program. This influence could be direct, such as in the case of spillover adoptions, or indirect, such as adoptions resulting from hidden market effects. 'Hidden market effects' include items such as the influence of vendor stocking practices, or easier access to information about high efficiency lighting equipment. Market Transformation Effects Analysis is presented in more detail in *Section 4.5*, pages, 4-51 through 4-65.

Market Transformation Effects Analysis Methodology

We identified market transformation by measuring and taking the difference of total market effects, and naturally occurring conservation. 'Naturally occurring conservation' consists of those high efficiency adoptions that would have occurred in the PG&E service territory in the absence of the Lighting Program. Total market effects were measured with survey instruments and statistical inference. The results of our total market effects analysis are presented above, in *Section 3.1.3.* Natural conservation is somewhat more complicated to measure than total market effects because there is no group of PG&E customers who existed in the absence of the Program. In order to estimate natural conservation we used a baseline control group as a proxy for the market that would have existed in the absence of the DSM programs.

We explored two alternative types of customers as baseline control groups. The first type was made up of customers in out-of-state areas unaffected by DSM or other similar programs. While the energy conservation from these customers is clearly natural conservation, they are not a perfect baseline group. Out of state groups are made up of different population members than the PG&E service territory, with unique circumstances and demographics. As an alternative baseline, we used the nonparticipants within the PG&E service territory that did not claim to have been influenced by the program. This group consists of all nonparticipants except those classified as spillover adopters. Of course this is not a perfect baseline either because it ignores all hidden market effects, clearly understating the influence of the program.

Using Georgia as a Baseline to Measure Market Transformation Effects (MTE)

We analyzed three surveys taken in 1997 in out-of-state territories where there was no DSM program. These surveys were conducted on behalf of Southern California Edison (SCE) in three states: Georgia, New York and Louisiana. A detailed analysis of the SCE surveys, and the decision to used Georgia as a baseline to measure MTE is presented in *Sections 4.5.3* and *4.5.4* pages 4-52 through 4-58. For each survey the adoption rate, fixtures installed, and energy savings were calculated by technology. The surveys covered only fluorescent lighting technologies. Fixtures installed and energy savings were normalized to correspond to the population size of the PG&E service territory for comparison purposes.

It was discovered that there had been a DSM program in New York that ended in the early 1990s. However, rebates were still being made in New York as late as 1994. Due to the prior existence of a DSM program in New York, the New York market would not serve as the ideal out-of-state baseline group. The Georgia survey seemed most appropriate for several reasons. First, the Georgia survey contained 778 responses- substantially more than the 500 responses in the Louisiana survey. In addition, Louisiana appeared excessively low in terms of fixture installations and annual energy savings relative to both Georgia and New York. Thus, we felt that Georgia would make a better baseline group than Louisiana because the Louisiana data appeared disproportionate in the key area of high efficiency adoptions. Furthermore, in terms of average facility size and number of employees, Georgia, Louisiana, and New York are all fairly comparable. Finally, a comparison of attitudes and awareness about energy related issues revealed all three states to be fairly comparable. Georgia was a moderate or "middle" choice from most perspectives. Exhibit 3.1.4-1 below shows the adoption rates, fixtures and load impact results from the analysis of Georgia survey data.

Exhibit 3.1.4-1
Georgia SCE Survey Analysis
Lighting Adoptions, 1995-1997

	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
GEORGIA									
Technology Group									
Fluorescents									
Standard Flourescents	3.41%	164,539	-	4.35%	209,787	-	5.04%	242,695	-
T-8 Lamp & Ballasts	1.22%	181,358	19,188,612	1.56%	231,231	24,465,480	1.80%	267,503	28,303,203
Electronic Ballasts	0.17%	74,329	136,456	0.22%	2,301	173,981	0.26%	2,662	201,273
Efficient Lamp Conversions	1.13%	972,810	15,410,553	1.45%	1,240,333	19,648,455	1.67%	1,434,895	22,730,566
Total Fluorescents	5.94%	1,393,036	34,735,621	7.58%	1,683,652	44,287,917	8.77%	1,947,754	51,235,041

Using California as a Baseline to Measure Market Transformation Effects

Data from PG&E service territory were used as an alternative baseline to estimate MTE. Specifically, we assumed that all adoptions for which the respondent claimed not to have been influenced by the program were due to natural conservation. That is, all non-rebated adoptions that could not be classified as spillover adoptions were treated as natural conservation adoptions. This approach markedly understates market transformation by ignoring all 'hidden market effects,' or the indirect influence of the program. However, using California as a baseline remains an interesting exercise, because the results represent a lower bound for the estimation of MTE. A detailed discussion of using California as a baseline is presented in *Section 4.5.5*, pages 4-61 through 4-64.

Annual Market Transformation Effects Ratio- Georgia Baseline

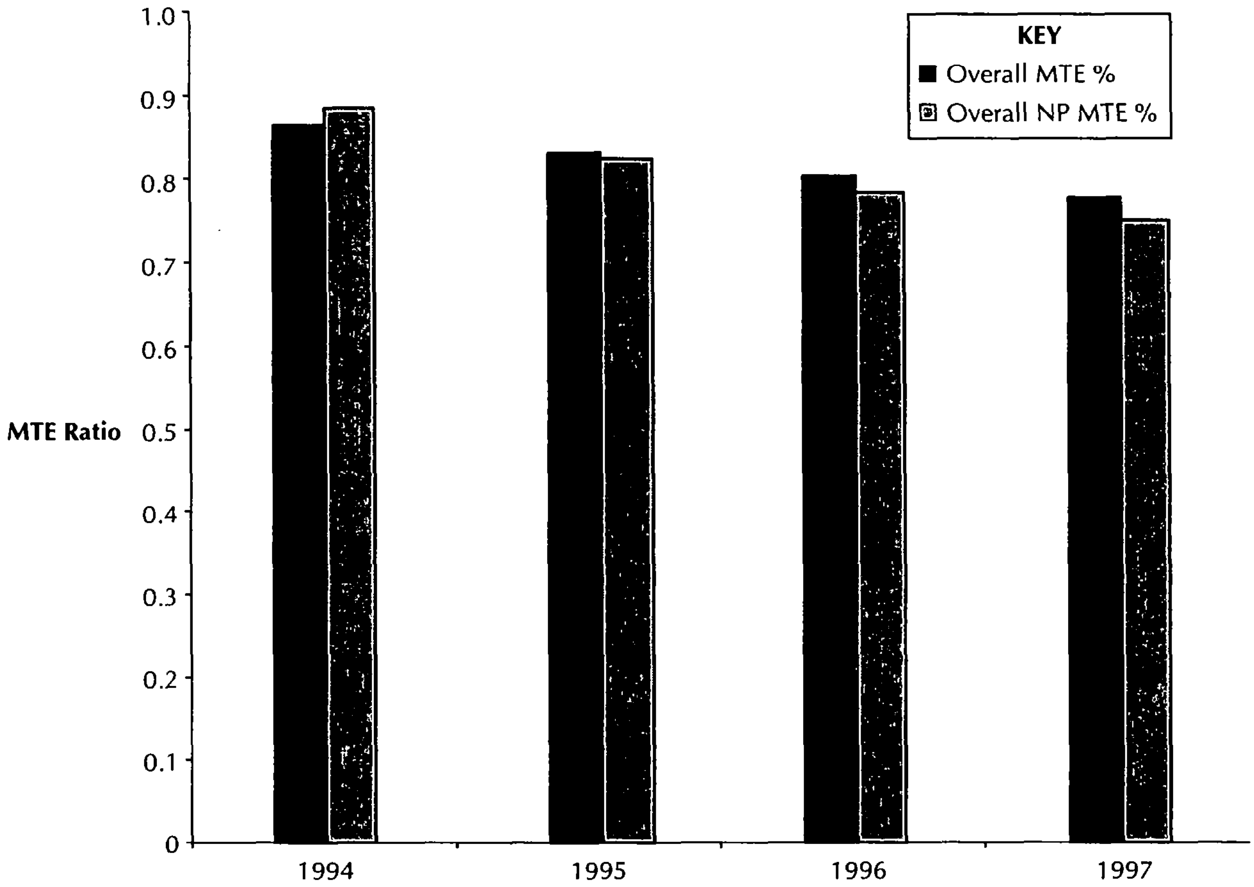
Using Georgia as a proxy for natural conservation enabled us to identify market transformation effects within the PG&E service territory from 1994 through 1997. All energy savings from high efficiency lighting adoptions in the PG&E service territory in excess of natural conservation is market transformation. The percentage of total energy savings that is market transformation is referred to as the "Market Transformation Effects Ratio" (MTE ratio). Exhibit 3.1.4-2 below presents the MTE ratio annually for the total population, as well as for nonparticipants only. For those who desire a more detailed explanation of the annual market transformation effects, using Georgia as a baseline, please see pages 4-59 through 4-61.

The MTE ratio for nonparticipants is the portion of nonparticipant load impact that can be attributed to the Lighting Program. The portion attributable to the program is the total nonparticipant load impact minus the nonparticipant portion of natural conservation.

Nonparticipant natural conservation can be identified by subtracting free-ridership (participant natural conservation) from total natural conservation. In sum, total nonparticipant load impact minus the nonparticipant portion of natural conservation, divided by total nonparticipant load impact yields the nonparticipant MTE ratio.

The MTE ratio for the whole population is fairly comparable to the MTE ratio for the nonparticipant population. Both ratios are declining over time. This is due to a faster rate of growth in natural conservation than in overall total market effects. The MTE ratio for the whole population is 86% in 1994, and drops to 78% in 1997. The Nonparticipant MTE ratio is 88% in 1994, and drops more significantly over the period, reaching 74% in 1997.

Exhibit 3.1.4-2
PG&E's Annual Market Transformation Effects Ratio
All Measures
Georgia Baseline

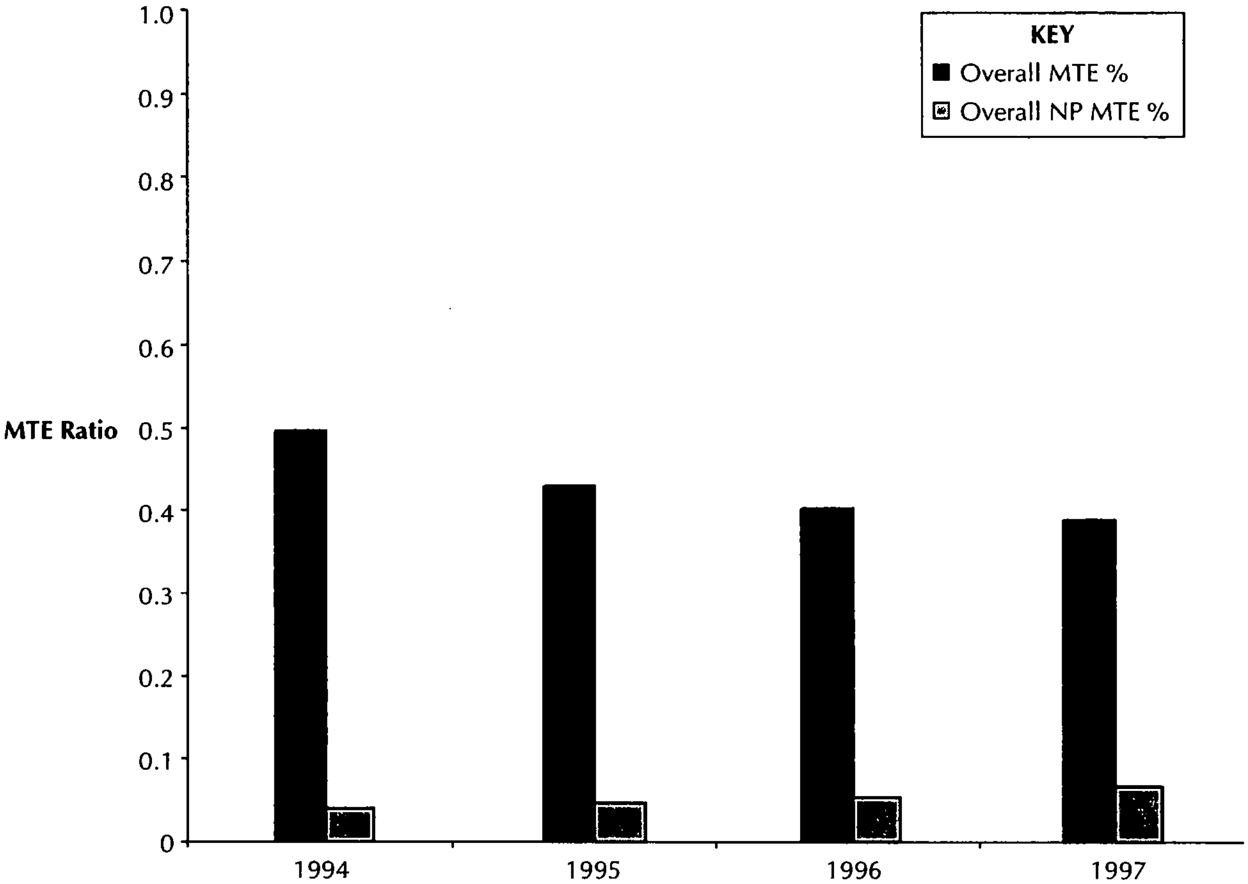


Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

Annual Market Transformation Effects Ratio- California Baseline

Exhibit 3.1.4-3 below presents the MTE ratio annually for the total population, as well as for nonparticipants only, using California as a baseline to measure MTE. Market transformation expressed as a percentage of total market effects is the overall MTE ratio for the population. The nonparticipant market transformation effect consists of the nonparticipant spillover adoptions. Thus, the nonparticipant MTE ratio is the ratio of nonparticipant spillover to total non-rebated load impact (excluding participant spillover).

Exhibit 3.1.4-3
PG&E's Annual Market Transformation Effects Ratio
All Measures
Using California As a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

Using California non-rebated, non-spillover adoptions as a proxy for natural conservation resulted in modest estimates of annual market transformation effects ratios from 1994 through 1997. The MTE ratio for the whole population is highest in 1994, 49%. It falls notably over the period, reaching 39% by 1997. The drop-off is due primarily to a slower growth rate in rebated load impacts relative to natural conservation over the period.

Market Transformation Effects Analysis: California versus Georgia Baseline

There is a remarkable difference in market transformation effects analysis results between using California as a baseline and using Georgia as a baseline. Using Georgia as a baseline indicates that over two thirds of all nonparticipant adoptions are due to market transformation. Moreover, over three-fourths of all high efficiency adoptions are attributable to the program. In contrast, using California as a baseline would indicate that less than 10% of the nonparticipant adoptions are attributable to market transformation, and less than 50% of all high efficiency adoptions are due to the program. The difference between the two results can be explained by the 'hidden market effects' that are included using Georgia as a baseline, but ignored in the California baseline scenario. A somewhat more detailed comparison of results: California versus Georgia baseline, can be found in *Section 4.5.6*, pages 4-64 through 4-65.

3.2 INTEGRATED ANALYSIS

This section presents the integration of the intermediate results presented in Sections 3 and 4 into a comprehensive result. This section will tie all of the intermediate results together to address the primary objective of the study: to measure the total net load impact of the Lighting Program over a four year period extending from 1994 through 1997.

By combining the results of the analyses presented in Sections 3 and 4 of this report we were able to separate total market effects into five components: free-ridership, nonparticipant natural conservation, nonparticipant market transformation, rebated installations, and participant spillover. We combined estimates of gross impact, persistence, free-ridership, total market effects, spillover adoptions, and market transformation ratios to arrive at an integrated solution.

3.2.1 Methodology

Cumulative net load impact for all program years was calculated based on the following equation:

$$\sum_{p=1994}^{t} \text{Net\_Energy}_{p,t} = \sum_{i=1994}^{t} \text{Gross\_Save}_i * \text{Persist}_{t-i+1} * (1 - \text{FR}_{t-i+1})$$
$$+ \sum_{p=1994}^{t} \sum_{i=p}^{t} \text{P\_Spill}_{p,i} * \text{Persist}_{t-i+1} + \sum_{i=1994}^{t} \text{Nonparts}_t * \text{Persist}_{t-i+1} * \text{MTE}_i$$

Where,

$\text{Net\_Energy}_{p,t}$	=	Total net load impact for program year p in t^{th} year after installation;
Gross_Save_p	=	Mean ex-post gross lighting load impact for program year p participants;
$Persist_t$	=	Rate of persistence in t^{th} year after installation;
FR_t	=	Free ridership rate in t^{th} year after installation;
$P\_Spill_{p,t}$	=	Participant spillover load impact for program year p in t^{th} year after installation
$Nonparts_t$	=	Gross lighting load impacts for all non-rebated high efficiency lighting adoptions in year t;

MTE_t = Decrease in baseline energy usage in year t due to market transformation effects, as a percentage of nonparticipant load impacts.

Basically, the three terms on the right side of the equation can be interpreted as follows. The first term is the gross load impact for each program year adjusted for persistence and free-ridership, and summed over all program years. Next, each year's program participant's spillover adoptions are adjusted for persistence and summed over all program years. Finally, nonparticipant adoptions are adjusted by natural conservation and persistence rates, and then summed over all program years. These three terms together make up Lighting Program cumulative net load impact for the years 1994 through 1997.

This study utilized multiple approaches to estimate total market effects, spillover, persistence, free-ridership, and market transformation. With the exception of market transformation, one approach was chosen for each estimate. Integrated results are presented for two different approaches to the market transformation estimate: California as baseline, and Georgia as baseline.

Self-report analysis results were chosen over billing analysis results for persistence, free-ridership, and total market effects. In the case of persistence, self reported data were used because the billing analysis was unable to distinguish the effects of the small amount of equipment attrition over the four year period. Also, failed equipment is sometimes not replaced, or replaced with equally efficient equipment. Equipment removals would result in a decline in energy consumption. All of these cases would produce results contra-indicative of the true event: a decline in program load impacts. That is, although equipment failures translate into a decline in Lighting Program load impacts, a billing analysis will likely detect either no change or a decline in energy consumption. Self-report analysis, however, does provide an adequate estimate of persistence over time.

We preferred the self-reported rates for free-ridership to the net billing analysis results for several reasons. First, there were three estimation steps, and consequently three sources of estimation error in the billing analysis (Gross, Net and Mills). Second, large customers were censored from the billing analysis, biasing the estimate downward. Third, there was a significantly smaller sample size in the billing analysis. The number of re-contacted respondents limited the billing analysis sample size. Finally, the billing analysis produces a static result, while the self-report analysis results captures the dynamic effects of accelerated adoption.

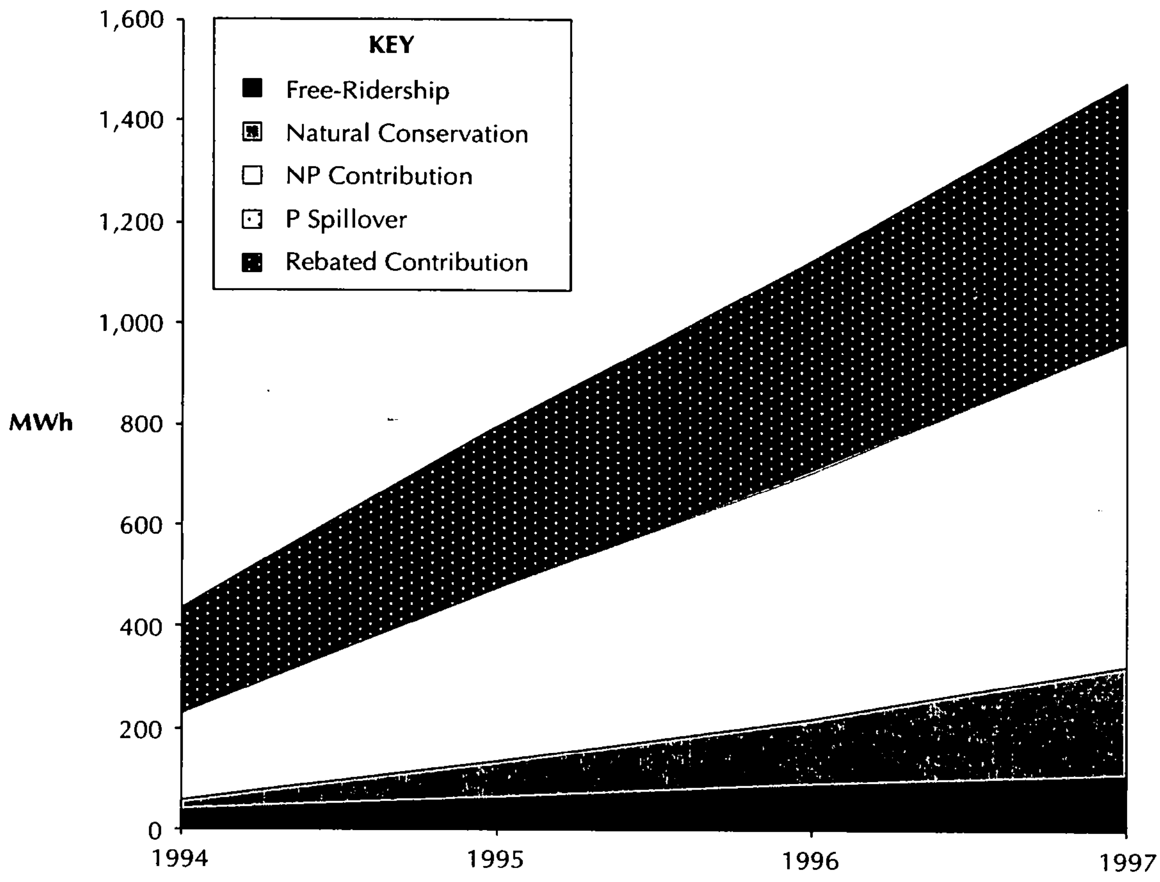
For total market effects, the self-report analysis results were selected instead of the billing analysis results. The billing analysis resulted in a statistically insignificant estimate of the effect of a lighting change on energy consumption. This estimate is the foundation from which total market effects are calculated using the billing analysis. In addition, the self-report analysis was able to incorporate data from twelve surveys consisting of over 9,000 observations. In contrast, the number of re-contacted respondents limited the sample size of the billing analysis to about 1,200 observations.

As a baseline group for estimating market transformation, both Georgia and California were candidates. Although using California as a baseline understates market transformation, it is interesting as a "lower bound" estimate. Integrated results are presented below for both baseline groups.

3.2.2 *Integrated Analysis Using Georgia as a Baseline to Estimate MTE*

Exhibit 3.2.2-1 below depicts cumulative total market effects in the PG&E service territory from 1994 through 1997 using Georgia as a baseline for natural conservation. Recall, using Georgia as a baseline means that lighting adoption rates in Georgia were used as a proxy for natural conservation.

Exhibit 3.2.2-1
PG&E's Cumulative Market Effects
All Measures
By Market Effect Components
Georgia Baseline



Note: Based on MDSS, self reports, and 1994 Ex-Post kWh savings algorithms.

Please note participant natural conservation is captured in free-ridership. The cumulative market effects of each component over the 1994-1997 period are shown in Exhibit 3.2.2.1. The graph reveals that the nonparticipant market transformation contribution and rebated installations together make up most of the cumulative load impact over the period. Participant spillover is too small to be visible on the chart. Net load impacts include the nonparticipant market transformation, rebated contribution and participant spillover components. Net load impacts are between 78% and 86% of total load impacts over the period.

Exhibit 3.2.2-2 below presents the data that is portrayed in Exhibit 3.2.2-1, except in tabular form. The exhibit also includes subtotals for market transformation and natural conservation. In addition, market transformation effects ratios are displayed, both for the total population and for the nonparticipant population. Recall, the market tranformation effects ratios are the percentage of total load impact that can be attributed to the program. Finally, rates of free-ridership and persistence are presented; these are applied relative to initial adoption date or program participation year.

Exhibit 3.2.2-2
Cumulative Program Effects, 1994-1997
All Measures
Using Georgia as a Baseline

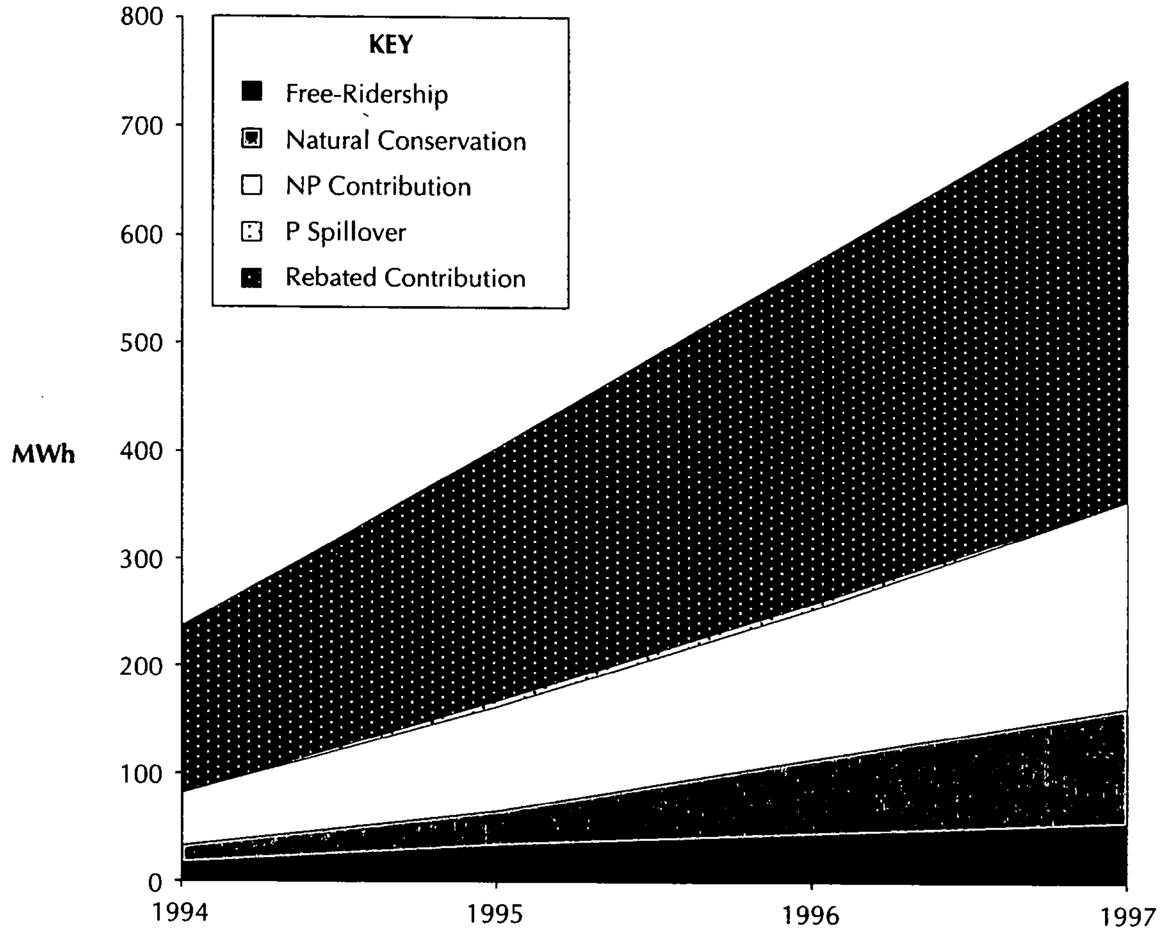
	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	206,204,601	318,204,090	416,112,154	512,532,065
Participant Spillover	1,770,910	2,443,800	3,369,565	3,480,251
Nonparticipant Adoptions	168,258,700	340,342,849	488,174,248	640,281,718
TOTAL	376,234,211	660,990,739	907,655,968	1,156,294,033
Natural Conservation				
Nonparticipant Adoptions	22,064,271	70,352,802	131,268,705	214,529,350
Participant Free Ridership	37,261,558	62,885,246	86,826,502	109,551,289
TOTAL	59,325,828	133,238,048	218,095,207	324,080,639
Market Transformation Effects Ratios				
% of Total Market Effects	86.4%	83.2%	80.6%	78.1%
Nonpart MTE as % of Total NP Effects	88.4%	82.9%	78.8%	74.9%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	15.3%	17.2%	18.2%	18.3%
Annual Persistence Rates	100.0%	99.9%	99.7%	99.4%

The exhibit above displays the results of every analysis presented in Sections 3 and 4 of this report. The data reveal substantial market transformation effects. Market transformation load impacts are near 80% of total load impact in each year, both on an overall basis, and for nonparticipants only. Net load impacts were 376 MWh in 1994, and rise to 1,156 MWh in 1997. In contrast, natural conservation (using Georgia as a baseline), had a load impact of 59 MWh in 1994, and 324 MWh in 1997. Free-ridership rates are between 15% and 18%, and persistence rates are almost 100%.

Exhibit 3.2.2-3 below shows PG&E's cumulative market effects for all fluorescent technologies, broken down into five components. The graph reveals that the rebated contribution is the largest component of total load impact. Nonparticipants contribute about 30% of the net load impacts and between 30% and 40% of total load impacts. Similar to the "All Measures" data shown in Exhibits 3.2.2-1 and 3.2.2-2, the net load impact for fluorescent technologies is roughly 80% of total load impact in each year. For nonparticipants, the market transformation component is between 64% and 76% of total load impact. Again, participant spillover effects are too small to be visible in the exhibit.

Exhibit 3.2.2-3
PG&E's Cumulative Market Effects
All Fluorescent Technologies
By Market Effect Components
Georgia Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

Exhibit 3.2.2-4 below is a tabular version of Exhibit 3.2.2-3. The data reflect cumulative market effects for all fluorescent technologies by market effects component, using Georgia as a baseline. Free-ridership rates for fluorescent technologies are relatively moderate, ranging from about 10% to 13%. Persistence rates are nearly 100%.

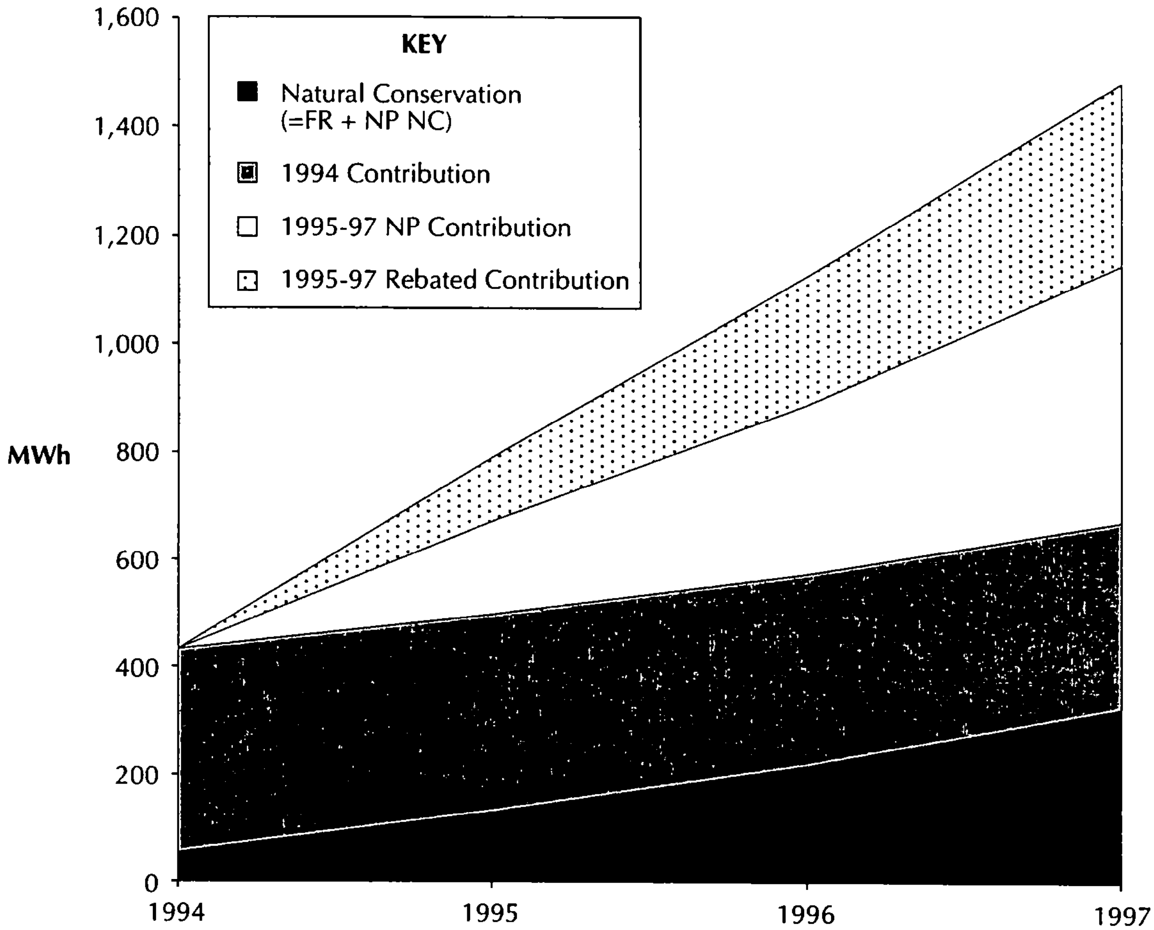
Exhibit 3.2.2-4
Cumulative Program Effects, 1994-1997
Fluorescent Measures
Using Georgia as a Baseline

	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	151,364,221	238,912,429	317,988,806	387,696,513
Participant Spillover	1,216,662	1,741,678	2,466,732	3,281,485
Nonparticipant Adoptions	49,971,349	95,374,984	143,356,196	191,225,531
TOTAL	202,552,233	336,029,090	463,811,735	582,203,529
Natural Conservation				
Nonparticipant Adoptions	15,734,877	36,849,194	67,374,567	106,934,162
Participant Free Ridership	16,204,214	29,792,710	43,479,256	54,998,955
TOTAL	31,939,092	66,641,904	110,853,823	161,933,118
Market Transformation Effects Ratios				
% of Total Market Effects	86.4%	83.5%	80.7%	78.2%
Nonpart MTE as % of Total NP Effects	76.1%	72.1%	68.0%	64.1%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	9.7%	11.9%	13.4%	13.4%
Annual Persistence Rates	100.0%	99.9%	99.9%	99.8%

Exhibit 3.2.2-5 below highlights the contribution of the 1994 program to the total cumulative program load impacts. The Exhibit shows cumulative market effects for all measures, with the net load impact divided into the 1994 program contribution and the 1995-1997 contribution. The 1994 program contribution includes the 1994 participant adoptions, adjusted each year for persistence and free-ridership. It also includes all spillover adoptions by the 1994 participants. Finally, it includes the 1994 nonparticipant contribution (1994 nonparticipant market transformation impact) adjusted for persistence. The exhibit illustrates that the 1994 program year contribution remains substantial throughout the 1994-1997 period.

Exhibit 3.2.2-5
PG&E's Cumulative Market Effects
All Measures
1994 Program Contribution vs. Cumulative
Georgia Baseline

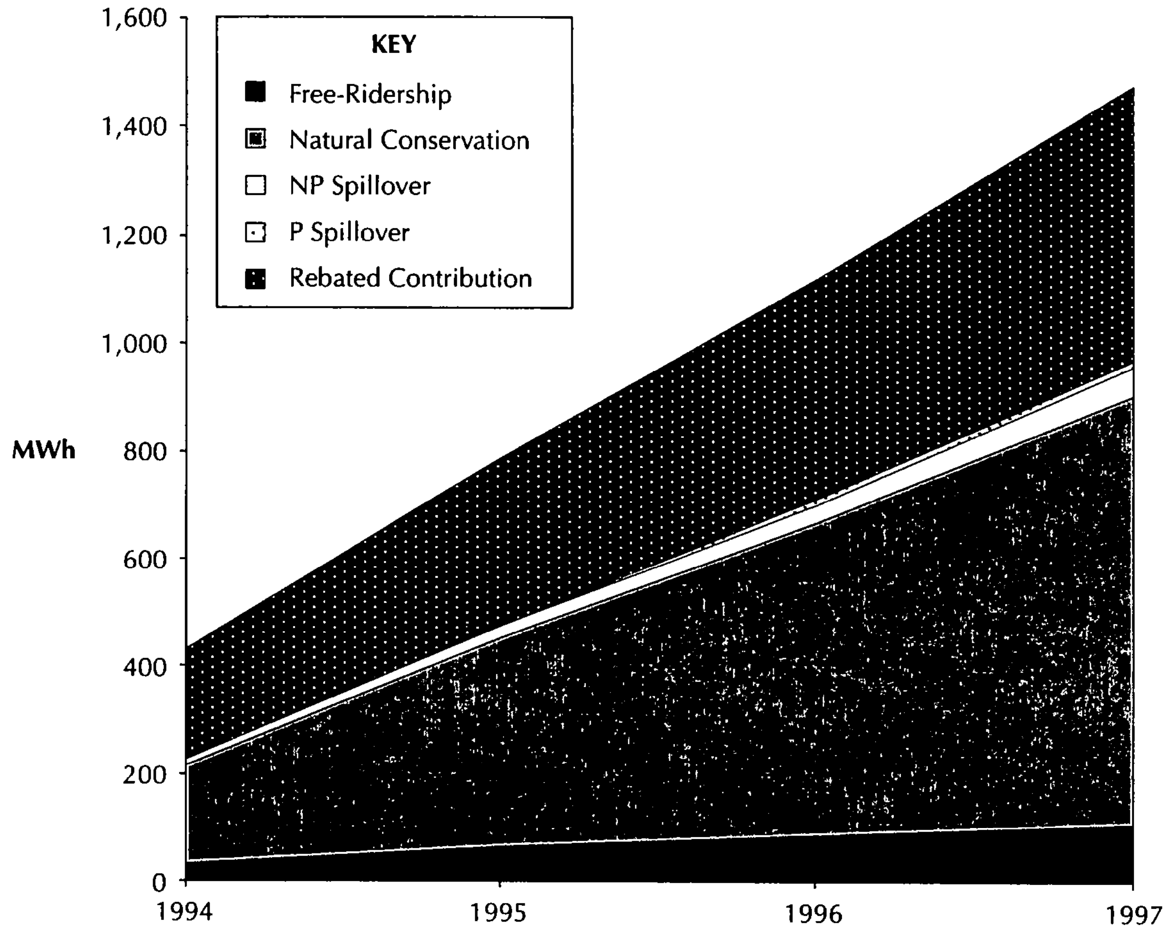


Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

3.2.3 *Integrated Analysis Using California as a Baseline to Estimate MTE*

Exhibit 3.2.3-1 below depicts cumulative total market effects in the PG&E service territory from 1994 through 1997 using California as a baseline for natural conservation. Five components of total market effects are detailed in the exhibit: free-ridership, nonparticipant natural conservation, nonparticipant market transformation (NP contribution), rebated installations, and participant spillover. The cumulative market effects of each component over the 1994-1997 period are shown. Recall, using California as a baseline means that non-rebated lighting adoptions *that were not classified as spillover* are used as a proxy for natural conservation.

Exhibit 3.2.3-1
PG&E's Cumulative Market Effects
All Measures
By Market Effect Components
Using California As a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

With California as the baseline, natural conservation makes up the largest component of total load impact, followed by rebated adoptions. Nonparticipant market transformation (also nonparticipant spillover) adoptions are quite moderate, and participant spillover is barely visible. Net load impacts include the nonparticipant market transformation, rebated contribution and participant spillover components. The Lighting Program influence is responsible for about half of the total load impact, and about 5% of the total nonparticipant load impact in each year.

Exhibit 3.2.3-2 shown below is a tabular representation of the data that are displayed in Exhibit 3.2.3-1. The table is an integrated representation of the results of every analyses presented in Sections 3 and 4 of this report. Subtotals are shown for market transformation and natural conservation. In addition, market transformation effects ratios are displayed, both for the total population and for the nonparticipant population. Recall, the market tranformation effects ratios are the percentage of total load impact that can be attributed to the program. Finally, rates of free-ridership and persistence are presented; these are applied relative to initial adoption date or program participation year.

Exhibit 3.2.3-2
Cumulative Program Effects, 1994-1997
All Measures
Using California as a Baseline

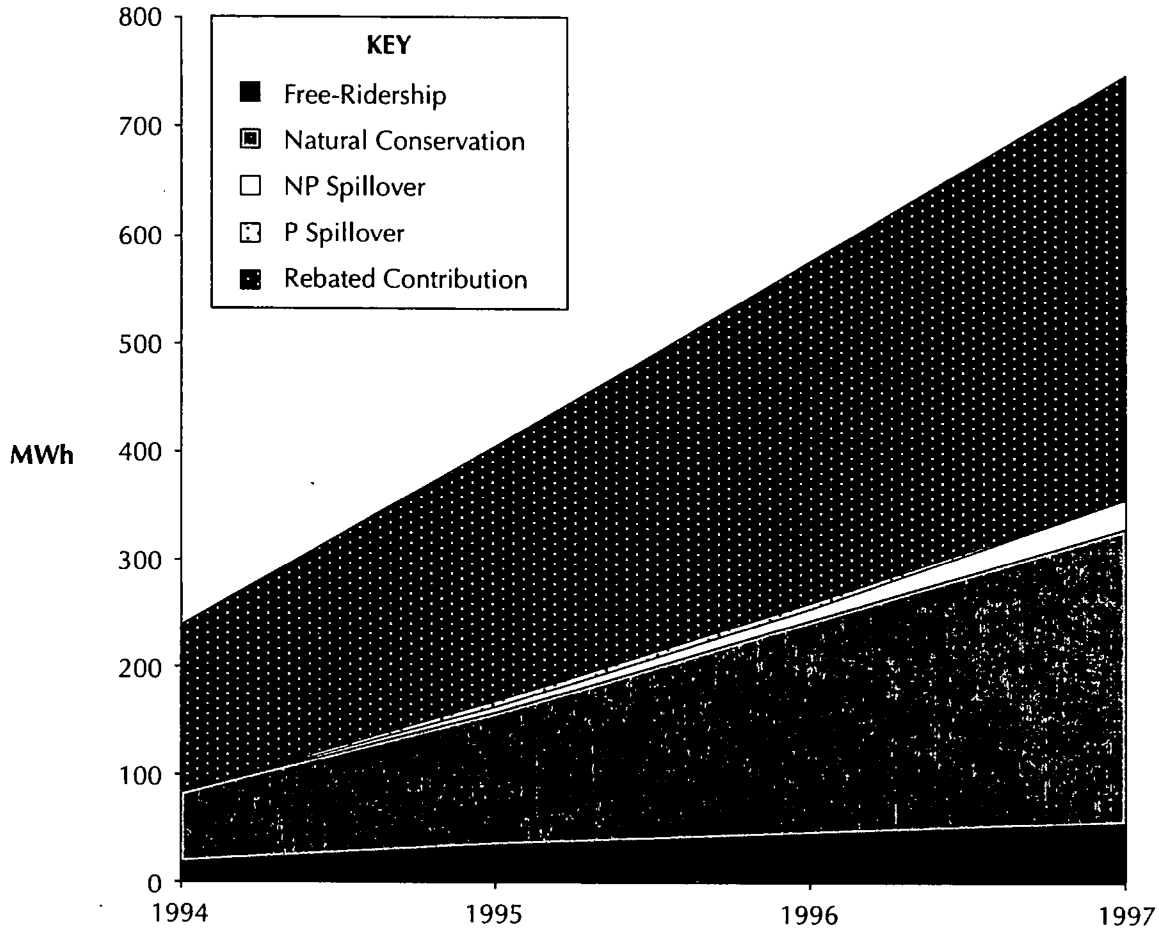
	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	206,204,601	318,204,090	416,112,154	512,532,065
Participant Spillover	1,770,910	2,443,800	3,369,565	3,480,251
Nonparticipant Adoptions	7,535,924	18,667,564	34,337,425	58,963,259
TOTAL	215,511,434	339,315,454	453,819,145	574,975,574
Natural Conservation				
Nonparticipant Adoptions	182,787,047	392,028,087	585,105,528	795,847,809
Participant Free Ridership	37,261,558	62,885,246	86,826,502	109,551,289
TOTAL	220,048,605	454,913,334	671,932,030	905,399,098
Market Transformation Effects Ratios				
% of Total Market Effects	49.5%	42.7%	40.3%	38.8%
Nonpart MTE as % of Total NP Effects	4.0%	4.5%	5.5%	6.9%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	15.3%	17.2%	18.2%	18.3%
Annual Persistence Rates	100.0%	99.9%	99.7%	99.4%

Total load impacts grow from 436 MWh in 1994, to 1,480 MWh in 1997. Nonparticipant adoptions account for between 43% and 58% of total load impacts. Program influence is reponsible for between roughly 40% to 50% of total load impacts. For nonparticipants only, program influence is responsible for only about 4% to 7%. This is due to the use of nonparticipant spillover as the measure of nonparticipant market transformation effects. As stated earlier, this approach ignores all the hidden market effects of the program. Free-ridership rates vary between 15% and 18%, and persistence is nearly 100%.

Exhibit 3.2.3-3 below shows PG&E's cumulative market effects for all fluorescent technologies, broken down into five components, using California as a baseline. The Exhibit reveals that for fluorescent technologies, the rebated contribution is by far the largest contributor to total load impact.

Exhibit 3.2.3-3
PG&E's Cumulative Market Effects
All Fluorescent Technologies
By Market Effect Components
Using California As a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

Exhibit 3.2.3-4 below displays the data shown in Exhibit 3.2.3-3 in tabular form. Market tranformation effects for the total population are somewhat larger among fluorescent technologies than for all technologies combined. Net load impacts are between 56% and 66% of total load impacts. Bear in mind, these estimates represent a lower bound for the true market transformation because they ignore hidden market effects. Total load impact for fluorescent technologies grows from 234 MWh in 1994 to 744 MWh in 1997. Net load impact grows from 156 MWh in 1994 to 414 MWh in 1997. In this scenario the nonparticipant portion of net load impact is minimal, at about 2% to 6%.

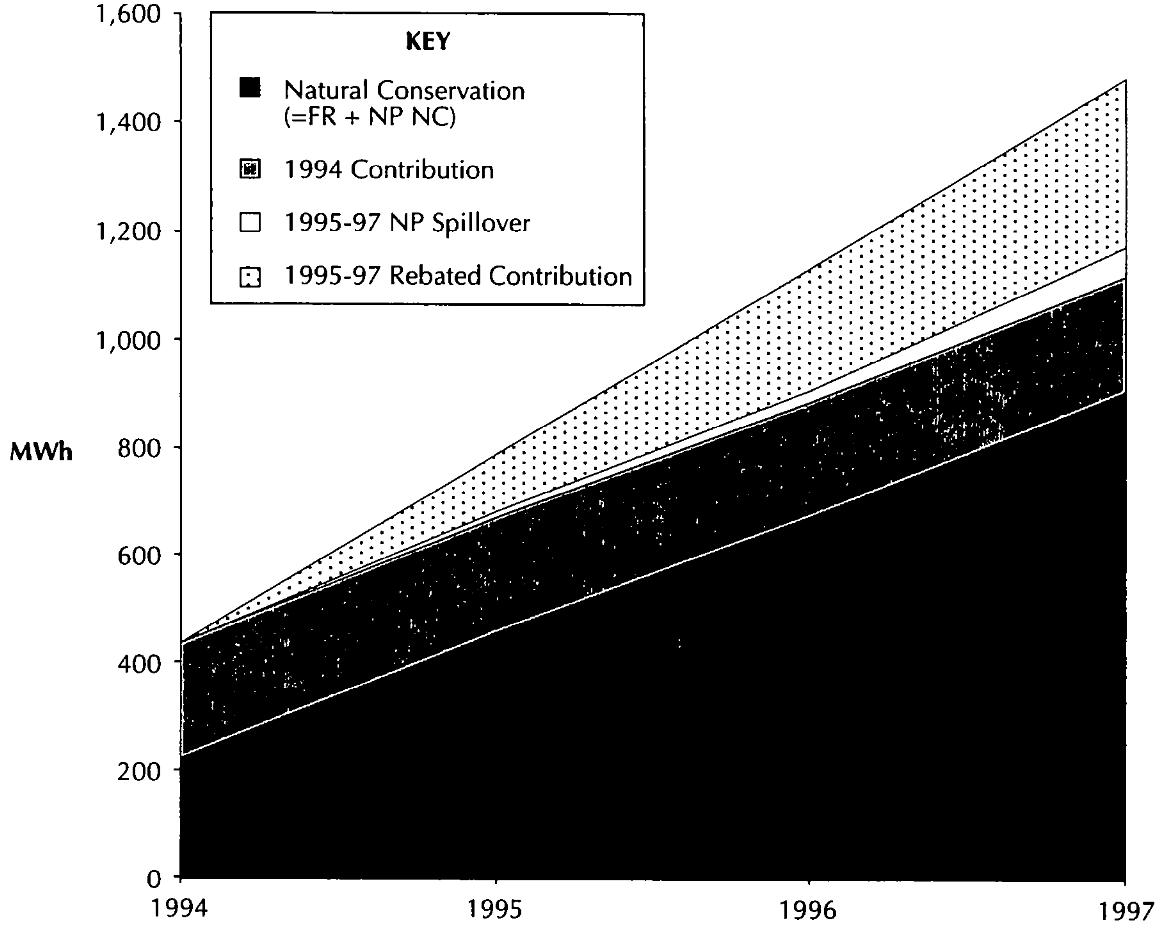
Exhibit 3.2.3-4
Cumulative Program Effects, 1994-1997
Fluorescent Measures
Using California as a Baseline

	1994	1995	1996	1997
Market Transformation				
Participant Rebated Adoptions	151,364,221	238,912,429	317,988,806	387,696,513
Participant Spillover	1,216,662	1,741,678	2,466,732	3,281,485
Nonparticipant Adoptions	2,944,669	6,778,667	13,299,639	23,470,920
TOTAL	155,525,553	247,432,773	333,755,177	414,448,918
Natural Conservation				
Nonparticipant Adoptions	62,761,557	125,445,510	197,431,125	274,688,773
Participant Free Ridership	16,204,214	29,792,710	43,479,256	54,998,955
TOTAL	78,965,771	155,238,221	240,910,381	329,687,729
Market Transformation Effects Ratios				
% of Total Market Effects	66.3%	61.4%	58.1%	55.7%
Nonpart MTE as % of Total NP Effects	4.5%	5.1%	6.3%	7.9%

	1st Year	2nd Year	3rd Year	4th Year
Annual Free Ridership Rates	9.7%	11.9%	13.4%	13.4%
Annual Persistence Rates	100.0%	99.9%	99.9%	99.8%

Exhibit 3.2.3-5 below highlights the contribution of the 1994 program to the total cumulative program load impacts over the 1994-1997 period. The exhibit shows PG&E's cumulative market effects for all measures, with the net load impact separated into the 1994 program contribution and the 1995-1997 contributions. The 1994 program contribution includes the 1994 participant adoptions, adjusted each year for persistence and free-ridership. It also contains all spillover adoptions by the 1994 participants. Finally, it includes the 1994 nonparticipant contribution (1994 nonparticipant spillover adoption impact) adjusted for persistence. The Exhibit illustrates that the 1994 program year contribution remains a substantial portion of total program impacts throughout the 1994-1997 period.

Exhibit 3.2.3-5
PG&E's Cumulative Market Effects
All Measures
1994 Program Contribution vs. Cumulative
Using California as a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

4 DETAILED METHODOLOGY AND INTERMEDIATE RESULTS

This section of the report presents a detailed discussion of the analytical methods and intermediate results of the Multi-Year Study. Section 4.1 presents an overview of the approach, and then explains how the results of the research tasks are integrated into the net load impact calculation. In addition, a summary of all the data sources are presented here. Sections 4.2 through 4.5 present detailed reviews of the analysis steps required to complete each research task, as well as the results. Each review includes an overview of the objective, followed by an explanation of the analytical method(s) and results. These sections conclude with a comparison of the different methods used to meet each research task objective.

4.1 OVERVIEW OF THE APPROACH

Section 4.1 presents an overview of the analysis approach used in the Multi-Year Study. Basically, the approach is to disaggregate net load impacts into the following five components: gross load impacts, the persistence of gross load impacts, free ridership, spillover effects, and market transformation effects over time. Net load impact estimation is then decomposed into five intermediate tasks. Each of these tasks is introduced and described in Section 4.1.1. The integration of these tasks into the calculation of the net load impact is presented in Section 4.1.2. Finally, data sources and uses are described in Section 4.1.3.

4.1.1 Analysis Elements

This section describes in further detail the five research tasks used to estimate the net load impacts for the Multi-Year Study. The approach used to accomplish each research task and the data requirements to support it are discussed. The result of each research task is translated into a quantifiable term in the net energy impact equation.

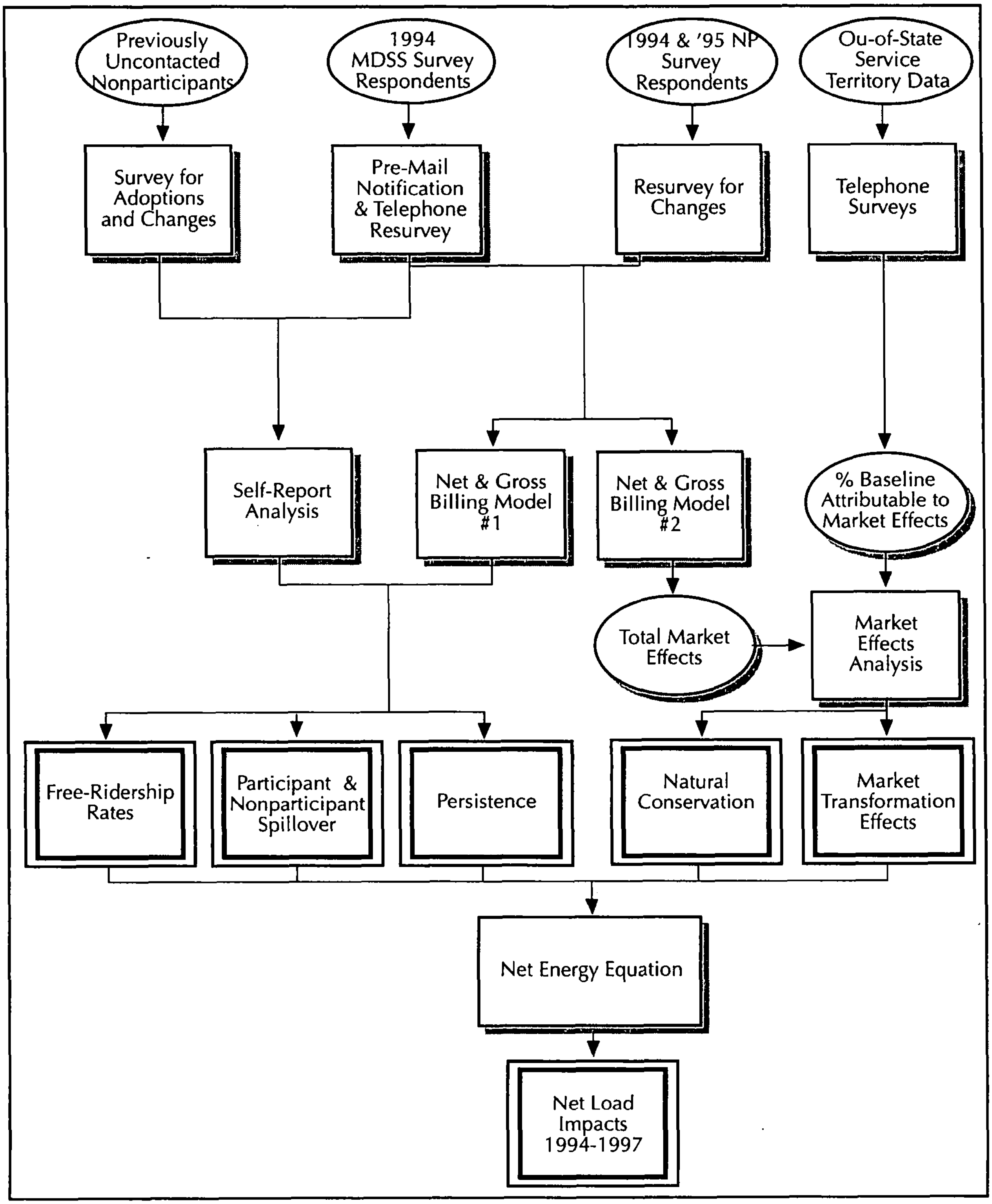
The analysis approach illustrated in Exhibit 4.1.1-1 consists of four primary analysis segments: the gross billing analyses, the net billing analyses, the self-report analyses, and the market transformation effects analyses. These four segments are used to estimate and verify each of the five intermediate research tasks described below. This integrated approach reduces a complicated problem into manageable components, while incorporating the comparative advantages of each method.

Task 1: Estimate Gross Load Impact

Gross load impacts are estimated for post analysis periods by using the gross billing analysis. The gross billing analysis employs two different multivariate regression models to predict post energy usage relative to installed lighting measures. The first model, baseline model #1, selects nonparticipants to predict energy usage of participants had they not participated in the Lighting Program. The difference between the predicted and the actual post period energy usage is attributable to the installed lighting measures and the lighting and facility change characteristics associated with each participant.

The second model, gross model #1, regresses the participant lighting and facility changes and installed lighting measure impacts against the difference between the predicted and actual post

Exhibit 4.1.1-1
Overall Impact Analysis Approach



period energy usage to identify the portion of difference that can be attributed to participants' installed lighting measures. Gross load impacts are estimated using the results from gross model #1. This is discussed in greater detail in *Section 4.2*.

Task 2: Adjust for Persistence

Persistence rates are estimated in the self report analysis, and verified using the gross billing analysis (gross model #1). The 1994 Program participants were re-contacted and re-surveyed to gather information regarding the failure and/or replacement behavior of installed lighting measures. Additional customers initially surveyed for the 1994 and 1995 first year program evaluations were re-contacted to support the analyses. The details surrounding the persistence estimates from the self report analysis and the gross billing analysis are discussed in *Section 4.2*.

Task 3: Subtract Free Ridership

Free ridership is estimated using two analysis techniques: a self-report analysis (from data already gathered as part of the 1994 Evaluation) and a net billing analysis (Net Model #1). Estimates of free ridership were shown to increase over time, because participants are more likely to have installed measures in the absence of the Program. (That is, one component of free ridership is *accelerated* adoption. As time progresses from the base installation year, acceleration rates drop off). The gross load impacts associated with free riders are adjusted by the persistence rates of installed measures over time. These two methods are described in the self-report and net billing sections (*Section 4.3*).

Task 4: Add Participant Spillover

Participant spillover estimates are calculated using existing data from the 1994-1996 participant surveys, and additional data gathered from re-surveying the 1994 Lighting Program participants. Lighting Program participants were re-surveyed to determine if additional high efficiency technology adoptions have been made since they were last surveyed, and whether these adoptions were influenced by their participation in the Lighting Program. The participant spillover impacts are then adjusted by the persistence rates of installed measures over time. The approach for estimating participant spillover is described in the market effects analysis section (*Section 4.4*).

Task 5: Add Nonparticipant Market Transformation Effects

Nonparticipant load impacts influenced by the Lighting Program are included and adjusted by the persistence rates of installed measures. Nonparticipant load impacts include all non-rebated high efficiency lighting adoptions within the analysis period. Nonparticipant market transformation effects are estimated as a function of the total nonparticipant load impacts. This function is estimated using two different approaches. The first assumes that only nonparticipants who claimed they were influenced by the program count towards market transformation. The second approach uses an out-of-state control group to estimate what the nonparticipant load impacts would have been in the absence of the program and attributes the difference to market transformation.

Both approaches utilize twelve different surveys conducted in PG&E's service territory over the past four years. The second approach also utilizes three out-of-state surveys. The approach is further described in the market effects sections (*Section 4.4 and 4.5*).

These five tasks are accomplished and verified using a variety of analysis techniques that are discussed in the following sections. A wealth of data resources are used in support of each analysis method to accomplish the stated objective. A description of required data is presented below, followed by individual analysis methodologies.

4.1.2 Net Load Impact Equations

Our approach is based on a decomposition of net load impact, such that net load impact can be specified as a combination of the intermediate research task results. The post-period year savings of net load impact that is attributable to the 1994 Program can be calculated using the following model, referenced as Annual Net Load Impact Equation, or Equation 1 throughout our discussion:

ANNUAL NET LOAD IMPACT EQUATION
[EQUATION #1]

$$\text{Net\_Energy}_{1994,t} = \text{Gross\_Save}_{1994} * \text{Persist}_{t\text{-}1993} * (1 - \text{FR}_{t\text{-}1993})$$

$$+ \sum_{i=1994}^{t} \text{P\_Spill}_{1994,i} * \text{Persist}_{t\text{-}i+1} + \text{Nonparts}_t * \text{Persist}_{t\text{-}1993} * \text{MTE}_i$$

Where,

$\text{Net\_Energy}_{1994,t}$	=	Total net load impact in year t;
Gross_Save_{1994}	=	Mean ex-post gross lighting load impact for the 1994 participants;
$Persist_t$	=	Rate of persistence in t^{th} year after installation;
FR_t	=	Free ridership rate in t^{th} year after installation;
$P\_Spill_{1994,t}$	=	Participant spillover load impact in year *t;*
$Nonparts_t$	=	Gross lighting load impacts for all non-rebated high efficiency lighting adoptions in year *t;*
MTE_t	=	Decrease in baseline energy usage in year *t* due to market transformation effects, as a percentage of nonparticipant load impacts.

The first component of the Equation 1 is the gross load impact contribution made by 1994 Lighting Program participants. The persistence rate, ($Persist_t$), adjusts the load impacts for decreases in measure retention over time. In addition, the participant gross load impact must be adjusted by free ridership (FR_t).

The second component of Equation 1 is the spillover load impact ($P\_Spill_{1994,t}$). Spillover impacts are adjusted by the persistence rate ($Persist_t$). Cumulative spillover load impacts are adoptions made by the 1994 participants in all years subsequent to participation.

The third component of Equation 1 is the load impact contributed by nonparticipants. The nonparticipant net load impact is due to the Market Transformation Effects of the Program influencing customers to install measures. In our equation, this is represented by the MTE_t term, which is expressed as a percentage of the gross nonparticipant load impacts. Because market transformation effects are expressed as a *rate* of the gross load impacts, this value will also change due to the movement in the market's naturally occurring baseline efficiency. In addition, the overall market transformation effects will be reduced over time due to persistence effects.

CUMULATIVE NET LOAD IMPACT EQUATION [EQUATION #2]

The cumulative effects of all programs up to year *t* can be calculated by aggregating Equation 1 over all program years from 1994 to year *t*. The resulting model is known is the Cumulative Net Load Impact Equation or Equation 2.

$$\sum_{p=1994}^{t} \text{Net\_Energy}_{p,t} = \sum_{i=1994}^{t} \text{Gross\_Save}_i * \text{Persist}_{t-i+1} * (1 - \text{FR}_{t-i+1})$$
$$+ \sum_{p=1994}^{t} \sum_{i=p}^{t} \text{P\_Spill}_{p,i} * \text{Persist}_{t-i+1} + \sum_{i=1994}^{t} \text{Nonparts}_t * \text{Persist}_{t-i+1} * \text{MTE}_i$$

Where,

$\text{Net\_Energy}_{p,t}$	=	Total net load impact for program year p in t^{th} year after installation;
Gross_Save_p	=	Mean ex-post gross lighting load impact for program year p participants;
$Persist_t$	=	Rate of persistence in t^{th} year after installation;
FR_t	=	Free ridership rate in t^{th} year after installation;
$P\_Spill_{p,t}$	=	Participant spillover load impact for program year p in t^{th} year after installation;
$Nonparts_t$	=	Gross lighting load impacts for all non-rebated high efficiency lighting adoptions in year t;

MTE_t = Decrease in baseline energy usage in year t due to market transformation effects, as a percentage of nonparticipant load impacts.

4.1.3 Data Sources

The Multi-Year Study used data supplied by PG&E as well as out-of-state service territory study results. Prior years' commercial lighting evaluation surveys were supplemented with new data to identify 1994 program participants' impacts and nonparticipant behavior from 1994 through 1997.

1994 Program Survey Data

- To support PG&E's 1994 Commercial Lighting Evaluation, 480 participants and 458 nonparticipants were surveyed. QC re-used these two survey samples as our reference database that, in turn, assisted all subsequent analysis components. The customers in the two samples were re-surveyed to obtain changes at their facility (in particular lighting replacements) that have occurred since 1994. In addition, participants were re-surveyed to gather information on the removal or failure of any of the rebated measures installed in 1994.

1995 Program Survey Data

- Similar to the 1994 data, we utilized survey samples from the PG&E 1995 Commercial Lighting Evaluation. The surveys included a participant, nonparticipant and canvass (a survey more limited in scope used to canvass a large portion of the population to identify lighting replacers) sample. The nonparticipant sample was re-surveyed to measure changes at their facility since 1995. No rebate participants from the 1995 study were contacted.

1996 Program Survey Data

Survey samples from the 1996 Commercial Lighting Evaluation were used in support of the market transformation analysis and spillover estimates. QC did not re-survey any of the participants, nonparticipants or canvass samples from these evaluations, because all necessary change information had recently been gathered.

Additional Survey Data

As discussed above, the 1994 participant and nonparticipant sample along with the 1995 nonparticipant sample were re-surveyed to collect lighting and facility changes since they were last surveyed. The lighting and facility change information is used to explain energy usage behavior. A group of previously uncontacted nonparticipants were surveyed to supplement the nonparticipant comparison group for the billing analysis. Exhibit 4.1.3-1 summarizes the data collection results.

Exhibit 4.1.3-1
Data Collection Results

Analysis Year	Data Source	Original Sample Size	Re-Surveyed Sample
1994	Participant Sample	480	300
1994	Nonparticipant Sample	457	240
1995	Nonparticipant Sample	451	239
-	Uncontacted Nonparticipant Sample	-	352

Relevant facets of the data collection include:

- Of the 480 original participants in the 1994 evaluation telephone sample, 300 were resurveyed to identify changes in equipment, and facility since 1995 when last contacted. The re-surveyed data are used to estimate gross load impacts, persistence rates, and participant spillover impacts.

- 240 nonparticipants from the 1994 nonparticipant sample were re-surveyed to identify changes since 1995. These customers, combined with nonparticipants from other evaluation samples, served as a control group to the participant population in the gross and net billing models described in later sections. The re-surveyed data are used in support of gross load impact estimates, nonparticipant spillover rates, and total market effects.

- 239 nonparticipants from the 1995 Commercial Lighting Evaluation sample were re-surveyed as well, to identify changes made at their facilities since 1996. The 1995 nonparticipant sample was combined with the 1994 nonparticipant sample and the previously uncontacted nonparticipants, to comprise the gross billing model control group. The re-surveyed data are used in support of gross load impacts estimates, nonparticipants spillover rates, and total market effects.

- An additional 352 new previously uncontacted commercial customers were surveyed to better represent PG&E's commercial population. Previous evaluation efforts have designed the nonparticipant sample around business segments and usage strata where rebate participation has historically been concentrated. While this met the needs of these studies, it is not representative of PG&E's commercial population. The sample points originally allocated to re-survey the 1995 canvass survey participants, was better spent re-distributing the nonparticipant sample. The new surveyed data are used in support of gross load impact estimates, nonparticipant spillover rates, and total market effects.

Existing Non-Survey Data

The Multi-Year Study incorporated a variety of available data; in particular PG&E's historical commercial billing data, program participation data (Marketing Decision Support System

[MDSS]), statewide and out of service territory market study results, and other program-related documentation. The available data are described in the following bullets:

- *Program Participant Tracking System.* The participant tracking system data, maintained in PG&E's MDSS, contains vital project and technical information about measures rebated. It also provides expected impact estimates based on engineering algorithms.

- *Program Marketing Data.* PG&E program marketing data contain a detailed description of the installation and rebate program procedures.

- *PG&E Billing Data.* The PG&E non-residential billing database contains monthly energy-consumption information for all non-residential customers in the PG&E service territory. It also contains demographic information on all customers. Existing billing data from January 1993 through December 1997 were available for use in support of the sample design and data collection activities.

- *Market Transformation Effects Data.* Results from the 1997 statewide and 1997 SCE Market Transformation Effects studies were used to separate market transformation effects from naturally occurring conservation within the nonparticipant population.

Exhibit 4.1.3-2 summarizes the data requirements for this study. The Exhibit illustrates the different uses of the all data and how each data source supports the analysis methods to accomplish the five intermediate research tasks.

The following sections will discuss in detail the analysis methods for accomplishing the five intermediate tasks and how data are utilized in the analysis methods. Each section includes a thorough summary of results derived from the billing and self-report analyses. Results derived from each method are compared for validation purposes, as well as to identify the most effective methodologies.

Exhibit 4.1.3-2
Evaluation Methods

Objectives	Methods	Available Surveys				Resurveys			Additional Sources			
		1994 Part	1994/ 1995 Nonparts	1995/ 1996 Parts	1995 Canvass, 1996 Nonpart/ Canvass	1994 Part	1994/ 1995 Nonparts	Un-Contacted Nonparts	1993-1997 CIS	1993-1997 MDSS	1997 SCE Market Transformation Results	1997 Statewide Market Transformation Results
(1) Gross Savings	Gross Billing Analysis	•	•			•	•	•	•	•		
(2) Persistence	Self Report Analysis					•				•		
	Gross Billing Analysis	•	•			•	•	•	•	•		
(3) Free Ridership	Self Report Analysis	•								•		
	Net Billing Analysis	•	•			•	•	•	•	•		
(4) Part Spillover	Self Report Analysis	•		•		•				•		
(5) Market Transformation Effects	Gross Billing Analysis	•	•			•	•	•	•	•		
	Net Billing Analysis	•	•			•	•	•	•	•		
	Baseline Energy Usage Estimates	•	•	•	•	•	•	•	•	•	•	•
	Self Report Nonpart Spillover Analysis		•		•		•	•		•		

4.2 ESTIMATE GROSS LOAD IMPACT AND PERSISTENCE OVER TIME

This section discusses the detailed analytical approaches used to estimate gross load impacts of the 1994 Commercial Lighting Program and the persistence of impacts over time. A statistical billing analysis was employed to measure gross load impacts and the persistence rates of the 1994 installed lighting measures over a four year analysis period. In addition, a self report analysis of persistence rates supplemented the billing model results. The billing models will first be presented followed by persistence results from the self report analysis. This section concludes with a comparative analysis on the effectiveness and validity of each method and its results.

4.2.1 Overview of the Billing Analysis

The objective of the billing analysis is to determine the 1994 Commercial Lighting Program gross load impacts and the persistence rates of installed lighting measures over a period of four years. A statistical analysis is employed to model the differences of customers' energy usage between pre- and post-analysis 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 program participation. This statistically adjusted engineering (SAE) analysis is consistent with the requirements of the Load Impact Regression Model (LIRM) defined in the California Public Utilities Commission's (CPUC's) Measurement and Evaluation Protocols (the Protocols).

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 in the billing analysis are relative to the results of the evaluation-based engineering estimates, not the PG&E Program ex ante estimates. This distinction is important, as the SAE coefficients are then used to estimate gross ex post program impacts, which in turn are used to calculate realization rates relative to the ex ante estimates.

4.2.2 Model Specification

The billing regression analysis for the Multi-Year Study incorporated 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, termed Baseline Model #1, is initially estimated using only the comparison (1994 nonparticipant, 1995 nonparticipants and previously uncontacted nonparticipants) group sample. This model estimates a relationship that is then used to forecast what the post-period year energy usage for participants (as a function of the 1993 pre-analysis year usage) would have been in the absence of the program. The difference between the predicted post usage and the actual post usage provides an estimate of change in usage attributable to the Program and other changes at the facility. Lighting measure impacts installed as part of the 1994 Program and facility changes since the installation are regressed against the difference between predicted and actual post energy usage. This model, termed Gross Model #1, is the second stage in the gross billing analysis.

The Gross Model #1 identifies the portion of the difference between predicted and actual post energy usage that can be attributed to the 1994 Program lighting measures. The parameter estimate generated from Gross Model #1 for each lighting technology is referred to as the SAE Coefficient. The SAE Coefficient is the proportion of the load impact (for a particular lighting technology) that directly contributes to a participant's observed decrease in energy usage from pre-installation to post-period year. Gross load impacts are the total gross energy savings (for a particular lighting technology) of the entire 1994 Program participant population.

The SAE coefficients calculated by Gross Model #1 is compared across post-period years (1995 – 1997). The decrease of the SAE Coefficient relative to the previous year is theoretically attributable to lighting persistence. Since all facility changes are accounted for one year to the next, the SAE Coefficient should remain constant and stable over time. But lighting failures and replacements would cause energy usage to increase thereby decreasing the total impacts of the original installed lighting measures resulting in a smaller SAE Coefficient than the previous year. This effect is the persistence rate of lighting measures.

4.2.3 Baseline Model #1

The Baseline Model #1 explains post-analysis period energy usage as a function of the pre-analysis period energy usage and customer self-reports of factors that could affect energy usage. In order to isolate the program impact from the energy usage changes, only the comparison group is used to fit this model. The Baseline Model #1 has the following functional form:

$$kWh_{post,i} = \sum_j \alpha_j + \beta\, kWh_{pre,i} + \sum_k \eta_k Chg_{i,k} + \varepsilon$$

Where,

$kWh_{post,i}$ and $kWh_{pre,i}$ are customer i's annualized energy usage for the post- and pre-analysis periods, respectively;

$Chg_{i,k}$ are the customer self-reported change variables from the survey data, including adding, replacing, or removing equipment associated with major end uses, and changes in number of employees and square footage;

α_j is the indicator variable (0/1) for the jth business type, which equals 1 if the customer is in that business type and 0 otherwise;

β , and η are the estimated slopes on their respective independent variables; and,

ε is the random error term of the model.

Exhibit 4.2.3-1 summarizes the Baseline Model #1 results for post analysis period 1995, 1996 and 1997 using 744, 727 and 702 nonparticipant customers respectively. The highlighted box in Exhibit 4.2.3-1 attempts to identify a trend in nonparticipant lighting replacement. The model identified positive correlations between energy usage and change variables such that variables of addition in nature tended to result in an increase in energy usage whereas variables of removal or reduction in nature tended to result in a reduction in energy usage. The final functional relation for post period year 1995, for example is estimated as follows. Recall that this is an estimate of 1995 usage in the absence of both program and non-program changes made at the facility.

$$\begin{aligned} k\hat{W}h_{1995} = &-1213{*}OFFICE - 5778{*}RETAIL + 735{*}SCHOOL + 1067{*}GROCERY \\ &- 2235{*}RESTAURANT - 4088{*}HOSPITAL - 2986{*}HOTEL + 3957{*}WAREHOUSE \\ &+ 3930{*}PSERVICE + 4975{*}CSERVICE - 123{*}MISC + 0.10{*}LGTADD - 0.05{*}LGTREP \\ &+ 0.12{*}LGTREM - 0.11{*}HVACREP - 0.12{*}OEREP + 261{*}ADDEMP - 793{*}REDEMP \\ &+ 0.04{*}OEADD + 1.00{*}\,kWh_{1993} \end{aligned}$$

Exhibit 4.2.3-1
Baseline Model #1 Results

Descriptions	Units	1995 Post Period			1996 Post Period			1997 Post Period		
		Parameter Estimate	t-Statistic	Sample Size	Parameter Estimate	t-Statistic	Sample Size	Parameter Estimate	t-Statistic	Sample Size
Pre-Usage - 1993	kWh	1.00	174.55	744	1.03	113.41	727	1.02	132.93	702
Business Type Intercepts										
Office	(0,1)	-1,213	-0.30	116	-2,016	-0.35	113	-3,036	-0.69	107
Retail	(0,1)	-5,778	-1.33	103	-6,567	-1.09	105	-5,372	-1.19	103
School	(0,1)	7,356	0.81	23	11,771	0.94	23	14,860	1.54	22
Grocery	(0,1)	1,067	0.17	51	-16,316	-1.82	50	-8,244	-1.18	46
Restaurant	(0,1)	-2,235	-0.37	52	-4,238	-0.50	52	-3,968	-0.63	52
Hospital	(0,1)	-4,088	-0.61	42	-5,084	-0.54	42	-10,164	-1.45	42
Hotel/Motel	(0,1)	-2,986	-0.31	21	13,437	1.00	21	1,555	0.15	20
Warehouse	(0,1)	3,957	0.58	41	5,646	0.58	39	6,069	0.79	35
Personal Service	(0,1)	3,930	0.72	63	4,771	0.62	61	6,655	1.16	61
Community Service	(0,1)	4,975	1.26	121	3,127	0.56	117	2,212	0.52	115
Miscellaneous	(0,1)	-123	-0.03	111	7,806	1.25	104	3,466	0.73	99
Other Site Changes										
Lighting Additions	kWh	0.10	5.23	48	0.02	0.88	63	-0.01	-0.54	75
Lighting Replacements	kWh	-0.05	-1.34	39	-0.02	-0.32	44	-0.02	-0.58	63
Lighting Removals	kWh	0.12	0.30	3	0.28	0.52	2	-0.16	-0.13	1
HVAC Replacements	kWh	-0.11	-0.74	3	-0.10	-0.47	3	-0.25	-1.60	4
Other Equip Replacements	kWh	-0.12	-3.85	20	-0.07	-3.24	40	-0.11	-6.94	52
Add Employees	# Emp	261	3.35	113	96	1.44	122	305	6.07	100
Reduce Employees	# Emp	-793	-1.60	68	-367	-0.92	79	-285	-0.93	60
Other Equip Additions	kWh	0.04	4.25	153	0.03	2.38	221	0.09	7.42	253
Total Sample Size				744			727			702

For each customer in the analysis dataset, a post-period predicted usage value was calculated using the parameters of the Baseline Model #1 estimated for the pre- to post-analysis period. They both take the same functional form with different segment-level intercept series (α_j) and slopes (β).

$$\begin{aligned} k\hat{W}h_{post,i} &= F_{pre}(Bu\sin essType, kWh_{pre}) \\ &= \sum_j \alpha_j + \beta\, kWh_{pre,i} \end{aligned}$$

4.2.4 *Gross Model #1*

Using the predicted post-period usage values estimated in the Baseline Model #1, a simultaneous equation model is specified to estimate the SAE coefficients on load impact. The SAE simultaneous system is described as follows:

$$\begin{aligned} \Delta Usage_i &= kWh_{post,i} - k\hat{W}h_{post,i} \\ &= kWh_{post,i} - F_{pre}(Bu\sin essType, kWh_{pre}) \\ &= \sum_m \beta_m^{'} Eng_{i,m} + \sum_k \eta_k^{'} Chg_{i,k} + \mu_i \end{aligned}$$

The difference between predicted and actual usage in the post period was used as the dependent variable in Gross Model #1. Change variables were used to explain the deviation in actual usage from the predicted usage. As discussed above, the predicted usage was estimated using only the comparison group to forecast the post period usage as a function of pre period usage. This usage prediction explains what would have happened in the absence of the Lighting Program and any changes made at the facility outside of the Lighting Program.

Exhibit 4.2.4-1 presents the Gross Model #1 results with SAE Coefficients for seven technology segments. The three highlighted boxes in the top section illustrate statistically significant results of Fluorescent, Compact Fluorescent, and Customized Lighting technology segments across the analysis years. The parameter estimate for post-period year, referred to as the SAE Coefficient, can be interpreted as the percentage of true load impacts attributed to that technology segment, for that year.

Exhibit 4.2.4-1
Gross Model #1 Results

Parameter Descriptions	Units	1995 Post Period			1996 Post Period			1997 Post Period		
		Parameter Estimate	t-Statistic	Sample Size	Parameter Estimate	t-Statistic	Sample Size	Parameter Estimate	t-Statistic	Sample Size
SAE Coefficients										
Lighting End Use										
Fluorescents	kWh	-0.80	-11.79	154	-0.80	-9.15	153	-0.78	-10.70	149
HIDs	kWh	-0.02	-0.10	23	0.01	0.02	23	0.23	0.88	23
Compact Fluorescents	kWh	-0.82	-2.17	74	-0.79	-1.48	76	-0.57	-1.35	74
Other Lighting	kWh	-0.23	-0.57	25	-0.39	-0.66	25	0.13	0.28	25
Customized Lighting	kWh	-1.47	-4.54	5	-1.60	-3.30	4	-1.28	-3.36	4
Outdoor Lighting	kWh	-0.58	-1.40	46	-0.42	-0.71	47	-0.10	-0.22	47
Other End Uses										
Other Impacts	kWh	0.51	1.36	29	1.63	2.94	38	-0.04	-0.09	46
Other Site Changes										
Lighting Additions	kWh	0.07	4.61	58	0.00	0.13	72	-0.01	-0.82	83
Lighting Replacements	kWh	-0.03	-0.81	43	-0.01	-0.30	49	-0.02	-0.53	71
Lighting Removals	kWh	0.11	0.28	3	0.29	0.50	2	-0.12	-0.09	2
HVAC Replacements	kWh	-0.09	-0.60	3	-0.14	-0.63	3	-0.23	-1.33	4
Other Equip Replacements	kWh	-0.10	-3.16	24	-0.09	-4.24	41	-0.08	-5.12	56
Add Employees	# Emp	326	4.35	147	295	4.72	154	313	5.97	128
Reduce Employees	# Emp	-932	-2.37	80	-401	-1.23	87	-276	-1.06	67
Other Equip Additions	kWh	0.02	2.35	206	0.04	4.33	269	0.06	7.52	312
Total Sample Size				894			846			815

4.2.5 Comparison of Gross Impact Results

Exhibit 4.2.5-1 summarizes the ex-post load impact results of the Multi-Year Study with the original ex-post load impacts from the original 1994 evaluation results. For technology segments with statistically insignificant SAE Coefficients, the 1994 ex-post results were applied. Technology segments with a higher ex-post load impact than the original evaluation impacts are likely due to differences in the sample size and sample characteristics. The Gross Model #1 captured close to 100% of the total 1994 evaluation ex-post load impact. Total ex-post load impact remains relatively constant over the first two post-analysis years but decreases by about 5% in 1997.

Exhibit 4.2.5-1
Comparison of Ex-Post Load Impacts
1995 Evaluation vs. 1995-1997 Multi-Year Study Results

	1995 Evaluation Results		Multi-Year Billing Study Results					
			1995 Post-Period		1996 Post-Period		1997 Post-Period	
Program and Technology Group	**Engineering Estimate**	**Ex-Post Load Impact**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**	**Ex-Post Load Impact**	**Ratio of MYBS:'95 Eval**
Retrofit Express Program								
Compact Fluorescent	23,719	14,706	19,545	133%	18,728	127%	13,456	91%
Incandescent to Fluorescent	4,292	3,407	3,455	101%	3,416	100%	3,369	99%
Efficient Ballast	4,929	3,795	3,967	105%	3,922	103%	3,869	102%
T8 Lamps and Electronic Ballasts	107,428	87,775	86,469	99%	85,487	97%	84,321	96%
Optical Reflectors w/ Fluor. Delamp	91,536	76,961	73,677	96%	72,841	95%	71,847	93%
High Intensity Discharge	29,458	34,557	34,557	100%	34,557	100%	34,557	100%
Halogen	5,265	6,128	6,128	100%	6,128	100%	6,128	100%
Exit Signs	4,482	4,482	4,482	100%	4,482	100%	4,482	100%
Controls	11,136	11,136	11,136	100%	11,136	100%	11,136	100%
Other	17	17	17	100%	17	100%	17	100%
Retrofit Express Indoor Total	282,264	242,965	243,435	100%	240,714	99%	233,182	96%
Customized Incentives Program								
Compact Fluorescent	435	684	641	94%	696	102%	557	81%
Standard Fluorescent	16,151	25,356	23,765	94%	25,801	102%	20,655	81%
High Intensity Discharge	1,152	1,808	1,695	94%	1,840	102%	1,473	81%
Exit Signs	28	45	42	94%	45	102%	36	81%
Controls	2,485	3,901	3,656	94%	3,970	102%	3,178	81%
Other	1,865	2,929	2,745	94%	2,980	102%	2,386	81%
Customized Incentives Indoor Total	22,117	34,723	32,544	94%	35,332	102%	28,284	81%
Indoor Lighting Total	304,380	277,688	275,979	99%	276,047	99%	261,466	94%

4.2.6 Gross Billing Model Persistence Results

It is difficult to conclude whether the decrease in load impacts (as shown in Exhibit 4.2.5-1) across years is due to persistence over time or other unobserved effects. From the last row in Exhibit 4.2.5-1, the difference between total ex-post load impacts from one year to the next shows a very high persistence rate. However, when looking at each parameter estimate separately as in Exhibit 4.2.4-1, the persistence rates (the difference between the parameter estimate relative to previous year's parameter estimate) show that the billing model produced some invalid and insignificant results in certain technology segments because of inadequate sample size. The appropriateness of using the Gross Model #1 results to estimate persistence is discussed in more detail in *Section 4.2.8,* Comparison of Persistence Results.

4.2.7 Self Report Persistence Rates

The self report analysis may be a more appropriate tool for measuring participant persistence across years because the analysis employs survey data gathered directly from the participants themselves. The survey specifically asked participants about installed lighting failures and/or replacement behavior including time of failure and/or replacement and number of failure and/or replacements. The participants were pre-screened in the survey to ascertain their knowledge of the installed lighting measures.

Participants were analyzed by technology and building type. Segment level results are provided for technologies/business type groups (strata) with sufficient sample size. The number of failures/replacements reportedly to have failed or removed is compared to the actual number of units installed (taken from the variable pnumpurl in the MDSS). The persistence rate is a ratio of the number of lighting technology (not failed or replaced) to the total number of units installed as part of the 1994 Lighting Program.

Exhibit 4.2.7-1
Persistence Among Customers Reporting Removal or Failure
Self Report

STRATA	1995	1996	1997	1998
Compact Fluorescent	99.78%	99.13%	86.76%	73.68%
Elec. Ballast-Office	97.74%	97.36%	96.07%	93.02%
Elec. Ballast-Retail	99.97%	99.36%	98.45%	95.56%
Elec. Ballast-School	99.93%	99.92%	99.79%	98.92%
Elec. Ballast-Others	98.84%	98.80%	98.06%	95.47%
Delamp Fluorescent	98.93%	98.93%	98.21%	97.39%
High Intensity Discharge	98.34%	86.91%	86.02%	82.42%
Controls	100.00%	98.94%	98.94%	63.32%
Others	100.00%	100.00%	100.00%	0.00%

104 Customer-Installations reported some removal or failure.

984 Customer-installations surveyed.

Of the 300 customers re-surveyed, 984 different customer-technologies were installed. Among the 984 installations, 104 customer-technologies reported some failure or removal. Exhibit 4.2.7-1 summarizes the persistence rates of these 104 customer-technologies reporting failure or removal over time. There are nine strata segments covering all the responded lighting failures or removals. The value shown is the percentage of lighting technology that have not failed or been removed since the 1994 installation year. There were few responses within the 'High Intensity Discharge', 'Controls', and 'Others' strata resulting in a dramatic decrease in persistence rate in subsequent years. Of the participants who responded, about 86% of compact fluorescent measures installed in 1994 survived in 1997 and 73% of the 1994 measures survived in 1998. The remaining strata groups showed a persistence rate above 90% into post period year 1998.

The values shown in Exhibit 4.2.7-1 should be viewed in light of the fact that only 104 participant installation out of 984 reported removals. When the results of the 104 reported removals were applied to the entire 1994 participant population, the persistence rates are more reflective of the true population persistence among strata and across years. Persistence results of the 104 reported removals were adjusted to the entire participant population by the ex-post energy load impact. Exhibit 4.2.7-2 illustrates the persistence findings as applied to the entire 1994 participant population.

Exhibit 4.2.7-2
Population Persistence Estimates
Self Report

STRATA	1995	1996	1997	1998
Compact Fluorescent	99.96%	99.85%	97.72%	95.48%
Elec. Ballast-Office	99.74%	99.70%	99.55%	99.20%
Elec. Ballast-Retail	99.99%	99.87%	99.69%	99.10%
Elec. Ballast-School	99.97%	99.97%	99.92%	99.59%
Elec. Ballast-Others	99.79%	99.78%	99.65%	99.18%
Delamp Fluorescent	99.99%	99.99%	99.99%	99.99%
High Intensity Discharge	99.79%	98.33%	98.22%	97.76%
Controls	100.00%	99.98%	99.98%	99.40%
Others	100.00%	100.00%	100.00%	98.06%
TOTALS	99.90%	99.66%	99.43%	98.88%

Weighted by ex-post energy load impact.

4.2.8 Comparison of Persistence Results

Overall, both approached indicate that there is a significant level of persistence savings. Regardless of the approach, persistence rates of all measures installed under the 1994 Lighting Program were greater than 95% over the analysis period.

The self report analysis method of estimating persistence rates produced results that are more consistent and stable over time. Persistence results from the billing analysis were statistically insignificant for many technologies. In addition, there are two behavioral effects associated with persistence that may invalidate the use of billing analysis to estimate persistence. First, if failures or removals are not replaced, post-period usage will decrease, not increase as theoretically required. Similarly, if failures or removals are replaced with equivalent or higher efficiency lighting, post-period usage will not increase. One other interesting note is the effects of persistence of controls on fluorescent technologies. Quite frequently, controls are installed in tandem with fluorescent technologies. Therefore, in a billing analysis the persistence effects of controls are likely to be captured as a reduction in fluorescent energy savings. In other words, if controls are no longer used, the fluorescent lights will be used more frequently indicating an increase in fluorescent energy usage and a decrease in savings.

4.3 FREE RIDERSHIP

4.3.1 Objective Overview

As stated earlier, the primary objective of this study is to identify the net load impact resulting from the 1994 Lighting Program, for the period 1994-1997. Net impacts are defined as the energy savings associated with customers who engaged in retrofit activities as a result of the program. "Free-riders" are program participants who would have installed the rebated lighting technology in the absence of the program. The energy savings associated with free-riders must be excluded from the net load impact estimate. The objective of this analysis step was to identify the energy savings associated with free-rider adoptions for each year, 1994-1997. Two methods were used to estimate free-ridership, net billing analysis and self report analysis. These two methodologies and corresponding results are presented below.

4.3.2 Net Billing Model #1

Overview

One method used to estimate free-ridership was to conduct a net billing analysis. The objective of the net billing analysis was to estimate SAE coefficients that could be applied to gross engineering estimates to calculate net load impact. The Net Model is similar to the Gross Model in that both incorporate participants and nonparticipants into one model.

A disadvantage of combining both participants and nonparticipants into one model of net energy savings is that the resulting sample is not randomly determined. In particular, participants self-select into the program and therefore are unlikely to be randomly distributed. As a result, there are certain unobserved characteristics that influence the decision to participate. If these characteristics are not accounted for in the model, the net savings model could produce biased coefficient estimates.

One solution to this problem is to include an Inverse Mills Ratio in the model to correct for self-selection bias. This method was developed by Heckman (1976, 1979[1]) and is used by others (Goldberg and Train, 1996[2]) to address the problem of self-selection into energy retrofit programs. This assumes that the unobserved factors that are influencing participation are distributed normally. Including an Inverse Mills Ratio in the model as an explanatory variable can approximate the influence of these unobserved factors on participation. This corrects for the self-selection bias in the net savings regression as the unobserved factors affecting participation are now controlled for in the model. As a result, standard regression techniques should produce unbiased coefficient estimates.

Goldberg and Train (1996) develop the technique of including a second Inverse Mills Ratio in the savings regression to account for the possibility that participation is correlated with the size of energy savings. The second Mills Ratio is interacted with a measure of energy savings, which allows the amount of net savings to vary with participation. The rationale for the second term is that those customers who have potentially large savings are more likely to participate in the program. Consequently, the unobserved factors that are influencing participation are also affecting the amount of savings.

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[1] Heckman, J. 'The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models.", Annals of Economic and Social Measurement, Vol. 5, pp. 475-492, 1976.

Heckman, J. "Sample Selection Bias as a Specification Error." Econometrica, Vol. 47, pp. 153-161, 1979.

[2] Goldberg, Miriam and Kenneth Train. 'Net Savings Estimation: An analysis of Regression and Discrete Choice Approaches', prepared for the CADMAC Subcommittee on Base Efficiency by Xenergy, Inc. Madison, WI, March 1996.

To calculate the Inverse Mills Ratios, a probit model of program participation is estimated. Once the probit model is estimated, the parameters of the participation model are used to calculate an Inverse Mills Ratio for both participants and nonparticipants. This Inverse Mills Ratio is included in a net savings regression that combines both participants and nonparticipants into one model. If the Inverse Mills Ratio controls for those unobserved factors that determine participation (i.e. the self-selection bias), and the other model assumptions are met, then the net savings model will produce unbiased estimates of net savings.

A description of the methods used for this application is given in the following sections. The following sections describe the data and variables used for the probit participation model and give the estimation results. Finally, a description of how the Inverse Mills Ratio is used in the Net Billing Model is discussed, concluding with the estimation results from the Net Billing Model.

Probit Model of Participation

The first stage of calculating the Inverse Mills Ratio is to develop a probit model of Lighting Program participation. The probit model is a discrete choice model with a dependent variable of either zero or one indicating whether or not an event occurred. In this application, individuals receive a value of one if they participated in the Lighting Program and a zero otherwise. The sample includes 300 Lighting Program participants and 831 nonparticipants. The information used in the model was obtained from the telephone surveys, as well as billing data. All of the 1,131 survey respondents were used to estimate the participation probit for the Lighting Program.

Using the probit specification, the decision to participate in the Lighting Program is given by:

$$\text{PARTICIPATION} = \alpha + \eta' W + \beta' X + \gamma' Y + \vartheta' Z + \varepsilon$$

A description of the explanatory variables is given in Exhibit 4.3.2-1. The dependent variable PARTICIPATION has a value of one if the customer participated in the 1994 Lighting Program and a zero if they did not participate. The independent variables used are those characteristics that are likely to influence program participation. The first set of variables (W) used in the participation probit describe the customers "barriers to entry" into the market for high efficiency lighting equipment. That is, the customer's attitudes or perceptions of high efficiency lighting equipment. The second set of variables (X) describe the customer's business activity and consist of indicator variables for various building types. The third group of variables (Y) reflect the building characteristics. These include characteristics such as square footage, primary lighting equipment, and age of the building. The fourth group of variables (Z) contain organizational characteristics such as whether or not the organization has assigned responsibility for energy control to a manager or department. Another example of an organizational characteristic is whether the organization owns or leases the facility. Finally, the error term (ε) is assumed to be normally distributed for the probit specification.

Exhibit 4.3.2-1
Variables Used in Lighting Probit Model

Variable Name	Units	Variable Type*	Description
PUR_DK	0,1	W	Do not know whether the purchasing department would accommodate a high efficiency lighting equipment purchase.
PUR_NO	0,1	W	The purchasing department discourages the purchase of high efficiency lighting equipment
PUR_YES	0,1	W	The purchasing department supports the purchase of high efficiency lighting equipment
COST_LO	0,1	W	The initial investment for high efficiency lighting is not high
COST_HI	0,1	W	The initial investment for high efficiency lighting is too high
GOOD_PER	0,1	W	High efficiency lighting does not have performance problems
BAD_PERF	0,1	W	High efficiency lighting has performance problems
NOHASS	0,1	W	Not more hassle to acquire high efficiency lighting than standard
HASSLE	0,1	W	Much more of a hassle to acquire high efficiency lighting than standard
UNACCES	0,1	W	Difficult to find high efficiency lighting equipment in the area
ACCESS	0,1	W	Easy to find high efficiency lighting equipment in the area
UNFAM	0,1	W	Unfamiliar with high efficiency lighting technologies
FAM	0,1	W	Familiar with high efficiency lighting technologies
EMP_LG	0,1	Z	Fifty or more employees
EMP_SM	0,1	Z	Ten or fewer employees
HID	0,1	Y	HIDs were the primary type of lighting in 1994
INCAN	0,1	Y	Incandescents were the primary type of lighting in 1994
KNW_FL	0,1	Y	Fluorescent lighting was the primary type of lighting at the facility in 1994, and respondent knew the type of fluorescent
OTH_FL	0,1	Y	Fluorescent lighting was the primary type of lighting at the facility in 1994, and respondent did not know the type of fluorescent
LT_POLCY	0,1	Z	Standard policy regarding lighting equipment selection
LT_MGR	0,1	Z	Assigned responsibility for controlling energy use to individual or group
CT_REP	0,1	Z	Have regular contact with PG&E representative
CON_INFO	0,1	Z	Lighting Contractor provided information about the program
LT_CON	0,1	Z	Have a regular lighting contractor
OWN	0,1	Z	Own building
AGE3	0,1	Y	Facility built after 1988
CHG_EMP	0,1	Z	Increased number of employees by more than 10%
CHG_SQFT	0,1	Y	Increased square footage of facility by more than 10%
SQ_LARGE	0,1	Y	Facility is over 10,000 square feet
WAREHSE	0,1	X	Warehouse
HOTEL	0,1	X	Hotel/Motel
HEALTH	0,1	X	Healthcare facility
RESTAUR	0,1	X	Restaurant
GROCERY	0,1	X	Grocery
SCHOOL	0,1	X	K-12 School
UNIV	0,1	X	College/University
RETAIL	0,1	X	Retail
OFFICE	0,1	X	Office

* W=Barriers to Entry
X=Business Activity
Y=Building Characteristics
Z=Organizational Characteristics

Probit Estimation Results

The estimation results for the lighting probit are given in Exhibit 4.3.2-2. In general, the estimation results conform to our expectations. For example, we expected size to have a positive impact on participation. One reason for this is that larger customers gain more substantial rewards quickly from high efficiency measures. In addition, larger businesses tend to have more capital available for investment in new equipment. The results of the probit model were very supportive of this "size effect" hypothesis. The model produced positive coefficient estimates on the variables indicating the size of the facility was over 10,000 square feet (SQ_LARGE), as well as the variable indicating the number of employees was greater than 50 (EMP_LG). Similarly, the variable indicating fewer than 10 employees (EMP_SM) had a negative coefficient.

All of the estimated coefficients for the business type variables were positive. However, the largest coefficients were estimated for schools (SCHOOL), universities (UNIV), retail (RETAIL), and healthcare (HEALTH) businesses. Of these business types, schools, universities and healthcare facilities are typically very large buildings. This finding is also in support of the "size effect" hypothesis.

Overall, the organizational characteristics had appreciable predictive power and conformed to expectations. Specifically, the assignment of responsibility for controlling energy usage to a manager or department was a good predictor of participation. The presence of a lighting contractor who provided information about the lighting program had a strong effect on the likelihood of participation. Contact with a PG&E representative proved to be a significant predictor of participation. Contrary to expectations, the existence of a policy regarding the selection of lighting equipment lowered the probability of participation. This is most likely due to policies that do not accommodate high efficiency equipment.

We expected that customers who owned their facility would be more likely to participate. Owners have a longer-term interest in their facility than customers who are leasing. Their long-term interest in the property makes them more apt to make investments in high efficiency equipment that offers benefits over a long-term time horizon. This hypothesis was supported by a positive estimated coefficient on the variable indicating ownership of the facility (OWN).

Customers in the process of remodeling are likely to be in the market for new lighting equipment as part of their remodeling project. Therefore, we expected these customers to have a greater probability of participation. Further, the act of remodeling a space by itself indicates a long-term interest in the facility, which would also indicate these customers were more likely participants. This expectation was born out by the probit model results. The variable indicating there was a change in the square footage of the facility had a positive coefficient estimate.

The age of a building also had a significant impact on participation. Specifically, buildings built before 1988 were more likely to participate. This finding matched our expectation that newer buildings that were subject to more efficient building codes, would not yet be in the market for lighting upgrades.

Exhibit 4.3.2-2
Probit Estimation Results

Variable Name	Units	Variable Type	Coefficient Estimate	Standard Error	Significance Level
PUR_YES	0,1	W	0.005	0.12	0.970
PUR_DK	0,1	W	-0.15	0.18	0.400
PUR_NO	0,1	W	-0.51	0.19	0.009
COST_LO	0,1	W	0.23	0.11	0.041
COST_HI	0,1	W	0.11	0.20	0.596
GOOD_PER	0,1	W	0.16	0.11	0.147
BAD_PERF	0,1	W	-0.76	0.17	0.000
NOHASS	0,1	W	0.06	0.12	0.595
HASSLE	0,1	W	0.05	0.19	0.777
UNACCES	0,1	W	-0.10	0.19	0.598
ACCESS	0,1	W	0.001	0.12	0.990
UNFAM	0,1	W	-0.31	0.12	0.013
FAM	0,1	W	0.13	0.12	0.265
EMP_LG	0,1	Z	0.10	0.14	0.479
EMP_SM	0,1	Z	-0.14	0.11	0.208
HID	0,1	Y	0.51	0.32	0.115
INCAN	0,1	Y	-0.33	0.13	0.014
KNW_FL	0,1	Y	0.09	0.15	0.555
OTH_FL	0,1	Y	-0.10	0.11	0.374
LT_POLCY	0,1	Z	-0.76	0.11	0.000
LT_MGR	0,1	Z	0.32	0.10	0.002
CT_REP	0,1	Z	0.30	0.10	0.004
CON_INFO	0,1	Z	0.90	0.20	0.000
LT_CON	0,1	Z	-0.19	0.12	0.137
OWN	0,1	Z	0.18	0.10	0.081
AGE3	0,1	Y	-0.57	0.19	0.002
CHG_EMP	0,1	Z	-0.03	0.15	0.816
CHG_SQFT	0,1	Y	0.61	0.23	0.007
SQ_LARGE	0,1	Y	0.16	0.12	0.189
WAREHSE	0,1	X	0.24	0.20	0.243
HOTEL	0,1	X	0.17	0.29	0.574
HEALTH	0,1	X	0.48	0.21	0.020
RESTAUR	0,1	X	0.42	0.22	0.057
GROCERY	0,1	X	0.16	0.23	0.489
SCHOOL	0,1	X	0.77	0.22	0.000
UNIV	0,1	X	0.61	0.62	0.330
RETAIL	0,1	X	0.55	0.15	0.002
OFFICE	0,1	X	0.41	0.14	0.003

The "barrier to entry" variables generally conformed to expectations. Specifically, the degree of support from the organization's purchasing department was a good predictor of participation. As expected, respondents with a low level of confidence in the performance of high efficiency equipment were significantly less likely to participant. Familiarity and ease of access were both good predictors of participation.

Among the "barrier to entry" characteristics, there were a couple of anomalous results. The perception that high efficiency equipment costs "too much" did not lower the probability of participation. In addition, the perception that high efficiency equipment is more of a hassle to obtain did not lower the probability of participation. However, neither of these coefficients was very large and both were statistically insignificant.

Calculation of Inverse Mills Ratio

Once the probit model is estimated, the coefficient estimates are used to calculate the Inverse Mills Ratio for use in the net savings regression. The product of all of the independent variables and respective coefficient estimates are used in the following calculation:

$$\text{Mills Ratio} = \phi(Q) \big/ \Phi(Q) \text{ (for participants)}$$

$$= -\phi(Q) \big/ \Phi(-Q) \text{ (for nonparticipants)}$$

Where,

$$Q = \alpha + \eta' W + \beta' X + \gamma' Y + \vartheta' Z$$

The function ϕ is the standard normal probability density function and Φ is the standard normal cumulative density function. Again, this Inverse Mills Ratio is used to control for unobserved factors that may influence both program participation and the amount of energy savings achieved for measures done within the program. In the following sections, the Inverse Mills Ratio is included in the net billing regression as an additional explanatory variable to correct for the problem of self-selection into the program.

Net Billing Model #1 Specification

The net billing analysis takes advantage of the statistical billing models and results developed in the gross billing analysis to estimate free-ridership rates. Baseline Model #1 is applied in the same manner as the gross billing analysis, but Gross Model #1 is modified to include the Inverse Mills Ratios to correct for self-selection bias. The net billing analysis provides load impacts for program measures over time, taking into account self-selection and free-ridership among Lighting Program participants. The resulting Net Billing Model #1 has the following functional form:

$$
\begin{aligned}
\Delta Usage_i &= kWh_{post,i} - k\hat{W}h_{post,i} \\
&= kWh_{post,i} - F_{pre}\left(Bu\sin essType, kWh_{pre}\right) \\
&= \hat{\delta} M_i + \sum_m \hat{\beta}_m M_i \hat{Eng}_{i,m} + \sum_k \hat{\eta}_k Chg_{i,k} + \mu_i
\end{aligned}
$$

Where,

M_i = is the Inverse Mills Ratio for customer i, to correct for self selection bias; and,

$\hat{Eng}_{i,m}$ = is the gross engineering load impact estimates, for the ith customer, and technology group m.

$Chg_{i,k}$ are the customer self-reported change variables from the survey data, including adding, replacing, or removing equipment associated with major end uses, changes in number of employees and square footage;

In the analysis, both participants and nonparticipants have a value for the first Inverse Mills Ratio term (M_i). The second Inverse Mills Ratio term ($M_i \hat{Eng}_{i,m}$) is interacted with the engineering estimate; because nonparticipants did not participate in any Programs, this value is zero for nonparticipants. The resulting SAE coefficients on these second Inverse Mills Ratio terms ($\hat{\beta}_m$) reflect the net load impact for participants that can be attributed to free ridership. Exhibit 4.3.2-3 summarizes the Net Billing Model #1 results.

Exhibit 4.3.2-3
Net Billing Model #1 Results

		1995 Post Period			1996 Post Period			1997 Post Period		
Parameter Descriptions	**Units**	**Parameter Estimate**	**t-Statistic**	**Sample Size**	**Parameter Estimate**	**t-Statistic**	**Sample Size**	**Parameter Estimate**	**t-Statistic**	**Sample Size**
Mills Ratio	Unitless	-1215	-0.429	894	916	0.224	846	-1568	-0.486	815
SAE Coefficients										
Lighting End Use										
Fluorescents	Mills • kWh	-0.78	-9.90	154	-0.75	-7.50	153	-0.76	-9.27	149
HIDs	Mills • kWh	-0.15	-0.43	23	-0.07	-0.14	23	0.14	0.37	23
Compact Fluorescents	Mills • kWh	-0.23	-0.73	74	-0.43	-0.97	76	-0.31	-0.88	74
Other Lighting	Mills • kWh	-0.14	-0.75	25	-0.22	-0.84	25	-0.01	-0.07	25
Customized Lighting	Mills • kWh	-1.63	-4.24	5	-1.80	-3.25	4	-1.48	-3.43	4
Outdoor Lighting	Mills • kWh	-0.26	-0.98	46	-0.16	-0.42	47	0.05	0.18	47
Other End Uses										
Other Impacts	kWh	-0.15	-0.34	29	-0.67	-1.01	38	-0.60	-1.33	46
Other Site Changes										
Lighting Additions	kWh	0.05	3.46	58	-0.02	-0.88	72	-0.02	-1.67	83
Lighting Replacements	kWh	-0.03	-0.90	43	-0.03	-0.55	49	-0.02	-0.72	71
Lighting Removals	kWh	0.11	0.27	3	0.29	0.48	2	-0.10	-0.08	2
HVAC Replacements	kWh	-0.09	-0.59	3	-0.13	-0.60	3	-0.24	-1.36	4
Other Equip Replacements	kWh	-0.10	-3.03	24	-0.08	-3.86	41	-0.08	-4.88	56
Add Employees	# Emp	323.77	4.25	147	281.93	4.44	154	297.58	5.64	128
Reduce Employees	# Emp	-745.48	-1.82	80	-145.47	-0.43	87	-140.61	-0.53	67
Other Equip Additions	kWh	0.02	2.05	206	0.05	4.69	269	0.07	7.73	312
Total Sample Size				894			846			815

Net Billing Model #1 Results

Exhibit 4.3.2-3 highlights the finding that only the "Fluorescents" and "Customized Incentives" lighting end uses are statistically significant. The parameter estimates shown in the Exhibit represent net participation within that technology (having accounted for self-selection). From these estimates, we can now "back out" an estimate of free-ridership, by taking the product of these coefficients with their Inverse Mills Ratio and dividing by the SAE Coefficients from Gross Model #1. This equation has the following functional form:

$$(1 - FR_m) = \frac{\hat{\beta}_m}{\beta'_m} * \overline{Mills_m}$$

Where,

$(1 - FR_m)$ = is the net ratio of load impact for technology group m, or one minus the free ridership rate;

$\hat{\beta}_m$ = is the SAE coefficient from Net Billing Model #1 for technology group m;

β'_m = is the SAE coefficient from Gross Billing Model #1 for technology group m; and,

$\overline{Mills_m}$ = is the mean Inverse Mills Ratio for all participants installing a measure in technology group m.

Exhibit 4.3.2-4 summarizes the resulting estimate of the free-ridership rate for the most statistically significant lighting technologies.

The only statistically significant result produced by the Net Billing Model #1 was for the "Fluorescent" group. As shown in Exhibit 4.3.2-4, free-ridership rates for the "Fluorescent" technology were 0.17, 0.18, and 0.15 for 1995, 1996, and 1997 respectively. These values represent the portion of the load impacts (within the lighting technology) attributable to customers who would have installed the same high efficiency lighting measures in the absence of the program. The other technology groups had either statistically insignificant results or insufficient sample sizes to produce reliable results. The free-ridership for "Fluorescents" and other technologies should be assessed in conjunction with results from the self report analysis. A comparison of free-ridership results will be discussed in *Section 4.3.4*.

Exhibit 4.3.2-4
Free-Ridership Rates by Technology
Net Billing Model #1 Results

Parameter Descriptions	Gross Model # 1 Parameter Estimate	Net Model #1 Parameter Estimate	From Probit Mean Mills	Resulting Free-Ridership
1995				
Fluorescents	0.80	0.78	0.85	0.17
Compact Fluorescents	0.82	0.23	0.83	0.77
Customized Lighting	1.47	1.63	0.83	0.08
1996				
Fluorescents	0.80	0.75	0.87	0.19
Compact Fluorescents	0.79	0.43	0.86	0.53
Customized Lighting	1.60	1.80	0.90	-0.01
1997				
Fluorescents	0.78	0.76	0.87	0.15
Compact Fluorescents	0.57	0.31	0.86	0.53
Customized Lighting	1.28	1.48	0.90	-0.04

4.3.3 Self Report Estimates of Free Ridership

The following discussion explains the methods employed to calculate "self-report" estimates of free ridership amongst the 1994 Commercial Lighting Program participants. Definitions used for free ridership and net participation among the participant population are presented. Specific scoring algorithms and questions used to identify free-riders in the participant survey are also discussed.

The best self-report information is collected soon after participation while the decision maker is better able to recall the reasons for participating. For this reason, only the original 1994 participant survey is used for this analysis.

Overview of Methodology

Participants involved in the 1994 Commercial Lighting Program can be classified into four basic categories depending on the actions they would have taken in the absence of the Program:

1. In the absence of the Program, the participant would not have installed any new equipment

2. In the absence of the Program, the participant would have installed standard efficiency equipment

3. In the absence of the Program, the participant would have installed high efficiency equipment, but not as soon (more than one year later)

4. In the absence of the Program, the participant would have installed high efficiency equipment at the same time (within the year)

Customers who fall into the first two categories are considered net program participants. Customers who fall into the third category are considered "accelerated adopters". Accelerated adopters are considered net program participants during the period prior to their planned purchase date, and free riders in subsequent periods. Customers who fall into the fourth category are considered free-riders for all periods. The self-report estimates of free ridership are based on these four categories. Data used to calculate the self-report free ridership estimates were collected as part of the 1994 Lighting Evaluation participant telephone survey. The survey gathered information on the participants' likely lighting retrofit behavior with regards to the 1994 Commercial Lighting Program.

The questions used to classify responses directly reflect the definitions of net participation and free ridership presented above. Respondents were asked what they would have done in the absence of the Program. They were asked whether or not they would have adopted high efficiency equipment, and when they would have installed that equipment. Generally, the answers to both of these questions allow the responses to be classified based on the categories described above. Specific scoring algorithms and the exact text of the corresponding questions are presented next.

Raw results from the self-report free ridership estimates are weighted by the avoided cost associated with a given respondent. Results of the weighted self-report free ridership estimates are then calculated for each technology group. Results are presented at the technology group level, allowing differences in free ridership rates by technology to be examined.

Scoring Method and Scoring Algorithms

Responses are scored based on the following questions:

FR020	*Before you knew about the Lighting Program, which of the following statements best describes your company's plan to install lighting fixtures?* 1 = We haven't even considered purchasing new lighting equipment. 2 = We were interested in installing lighting equipment, but haven't yet decided on energy efficient lighting. 3 = We have already decided to install high efficiency lighting, but probably not within the year. 4 = We have already decided to install high efficiency lighting within the year. 8 = (Refused) 9 = (Don't Know)
SR020	If you had not replaced this equipment under the program, how long would you have waited to replace it? 1 = Number of Years 2 = Would not have replaced. 8 = (Refused) 9 = (Don't Know)

A response is counted towards **net participation** (consistent with categories 1 and 2) if:

FR020 = 1

-OR-

FR020 = 2

-OR-

FR020 = 3 and SR020 = 2

Under the first condition, respondents indicate that, before they knew about the Program, they had no plans to install any new equipment. Under the second condition, the respondents indicate that they were interested in installing lighting equipment and were considering both standard and high efficiency equipment. In this case the respondents clearly state they had not decided to purchase high efficiency equipment prior to their knowledge of the program, indicating non-free ridership. Under the third condition, the respondents initially indicate they would have installed high efficiency equipment in the absence of the program. However, when asked how long they would have waited to install the equipment, these respondents state they would not have replaced.

A response is considered an accelerated adoption and counted towards **net participation** (consistent with category 3) if:

FR020 = 3

and

SR020 = Number of Years > Analysis Year

Under this condition, the respondents indicate they had plans to install high efficiency equipment prior to learning of the program, but were not planning to do this installation within one year. In addition, the respondent states that these plans were to install the equipment during a year *subsequent* to the analysis year. Thus, in the absence of the program, the equipment would not have been installed during the analysis year. For this reason, the respondent is considered a net participant for the analysis year. For example, if the customer states they had plans to install high efficiency equipment in two years, they are considered an "accelerated adopter" (and thus are counted as a net participant) for the first two years, and scored as a free rider in the third year and beyond.

A response is counted towards **free ridership** (consistent with category 4) if:

FR020 = 4

-OR-

FR020 = 3

and

SR020 = Number of Years < Analysis Year

Under the first condition the respondents indicate that they had already decided to install high efficiency equipment within the year, prior to any knowledge of the program. Under the second condition, the respondents indicate that they had plans to install high efficiency equipment, but not within the year. In addition, their plans were to install this equipment in a year *prior* to the analysis year. Because the equipment would have been installed during the analysis year in the absence of the program, the participant is considered a free rider for the analysis year.

Accelerated Adoption

As discussed above, question FR020 will be used in conjunction with the response from SR020 (Number of Years) to identify free riders for 1994 through 1998. For respondents who indicate (in FR020) they had already decided to install high efficiency equipment, but not within one year, free-ridership is determined by comparing the year the participant was planning to do this installation (as indicated in SR020) with the analysis year in question. Exhibit 4.3.3-1 illustrates the scoring matrix used for our multi-year free ridership analysis. The shaded area indecates the year an accelerated adopter would be scored as a free-rider.

Exhibit 4.3.3-1
Self-Report Free Ridership

	FREE RIDERS				
SR020	1994	1995	1996	1997	1998
<1 year					
1 year					
2 years					
3 years					
4 years					
5 years					

Exhibit 4.3.3-1 shows that respondents may cross over from a net participant to a free rider, depending upon the number of years they were planning to wait before installing the high efficiency equipment in question. For the number of years indicated in SR020, the installation of the equipment is a direct result of the program. Thus during this period, the participant is considered a non-free rider. This is the "accelerated adoption" of technology as a direct result of

the Lighting Program. In the years following the period indicated in SR020, the participant would have adopted the technology in the absence of the program and therefore is considered a free rider during this period.

Data Sources

Data used in deriving the self-report estimates of free ridership included responses from 480 completed telephone surveys of CEEI program participants. The responses included 452 indoor lighting end use adopters. The surveys were conducted between July and September of 1995 as part of a comprehensive telephone survey of CEEI program participants.

Results

Exhibit 4.3.3-2 below presents self reported estimates of free ridership by technology group. The results are weighted by avoided cost. Overall, free-ridership is moderate in 1994 at 15.3%, rising to 19.7% by 1998.

The technology group with the lowest rates of free ridership was Optical Reflectors with Fluorescent Delamping. The rate for this group was estimated to be 3.6% in 1994, rising to 7.2% by 1998. The second lowest rate in 1994 was Controls, 4.9% followed closely by Compact Fluorescent and Exit Signs at 7.2% and 8.3% respectively. However, by 1998 the rate of free-ridership in the Controls category rises to 17.7%, surpassing the Compact Fluorescent rate which rises to 14.0%, and the Exit Signs rate which stays constant at 8.4%.

Exhibit 4.3.3-2
Weighted Self-Report Estimates of Free Ridership, 1994-1998
For Lighting Technology Groups in the 1994 CEEI Program

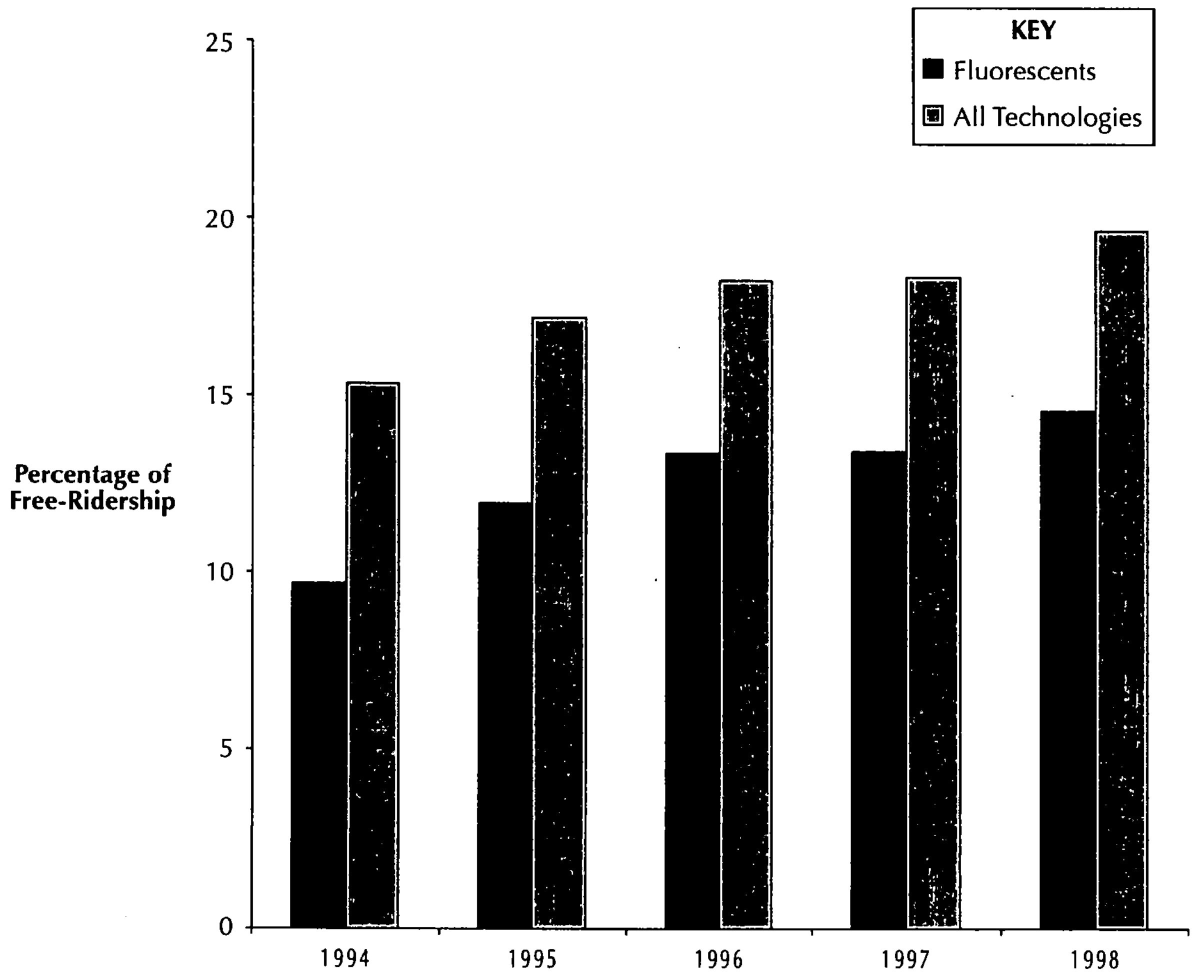
Technology Group	FREE RIDERSHIP				
	1994	**1995**	**1996**	**1997**	**1998**
Customized Incentive Program	79.3%	79.3%	79.3%	79.3%	79.3%
Halogen	52.3%	52.3%	52.3%	52.3%	52.3%
Compact Fluorescent Lamps	7.2%	9.2%	9.7%	10.2%	14.0%
Incandescent to Fluorescent Fixtures	30.9%	30.9%	30.9%	30.9%	30.9%
Exit Signs	8.3%	8.3%	8.3%	8.3%	8.3%
Efficient Ballast Changeouts	55.7%	64.8%	64.8%	64.8%	66.8%
T-8 Lamps and Electronic Ballasts	10.2%	12.8%	13.7%	13.8%	15.8%
Optical Reflectors w/ Fluorescent Delamp	3.6%	4.8%	7.2%	7.2%	7.2%
High Intensity Discharge	25.8%	26.0%	26.0%	26.2%	26.2%
Controls	4.9%	7.7%	7.7%	7.7%	17.7%
Fluorescents Total	9.7%	11.9%	13.4%	13.4%	14.6%
Overall	15.3%	17.2%	18.2%	18.3%	19.7%

Higher rates of free ridership were found within the Customized Incentive Program, Efficient Ballast and Halogen lighting categories. The Customized Incentive Program has by far the highest rate, 79.3%, and it stays constant throughout the 1994 through 1998 periods. The

Halogen and Efficient Ballasts categories have similar rates of free ridership in 1994, 52.3% and 55.7% respectively. However, free ridership rises within the Efficient Ballasts group to 66.8% by 1998, while the rate for Halogens stays constant.

Free-ridership rates are somewhat lower for fluorescent technologies than all technologies combined. Free-ridership rates for fluorescent technologies are roughly 5% lower in each year. This difference is illustrated in Exhbit 4.3.3-3 below, depicting annual free-ridership rates for all technologies versus fluorescents.

Exhibit 4.3.3-3
Annual Free-Ridership Rates
All Technologies vs. Fluorescents
Self Report

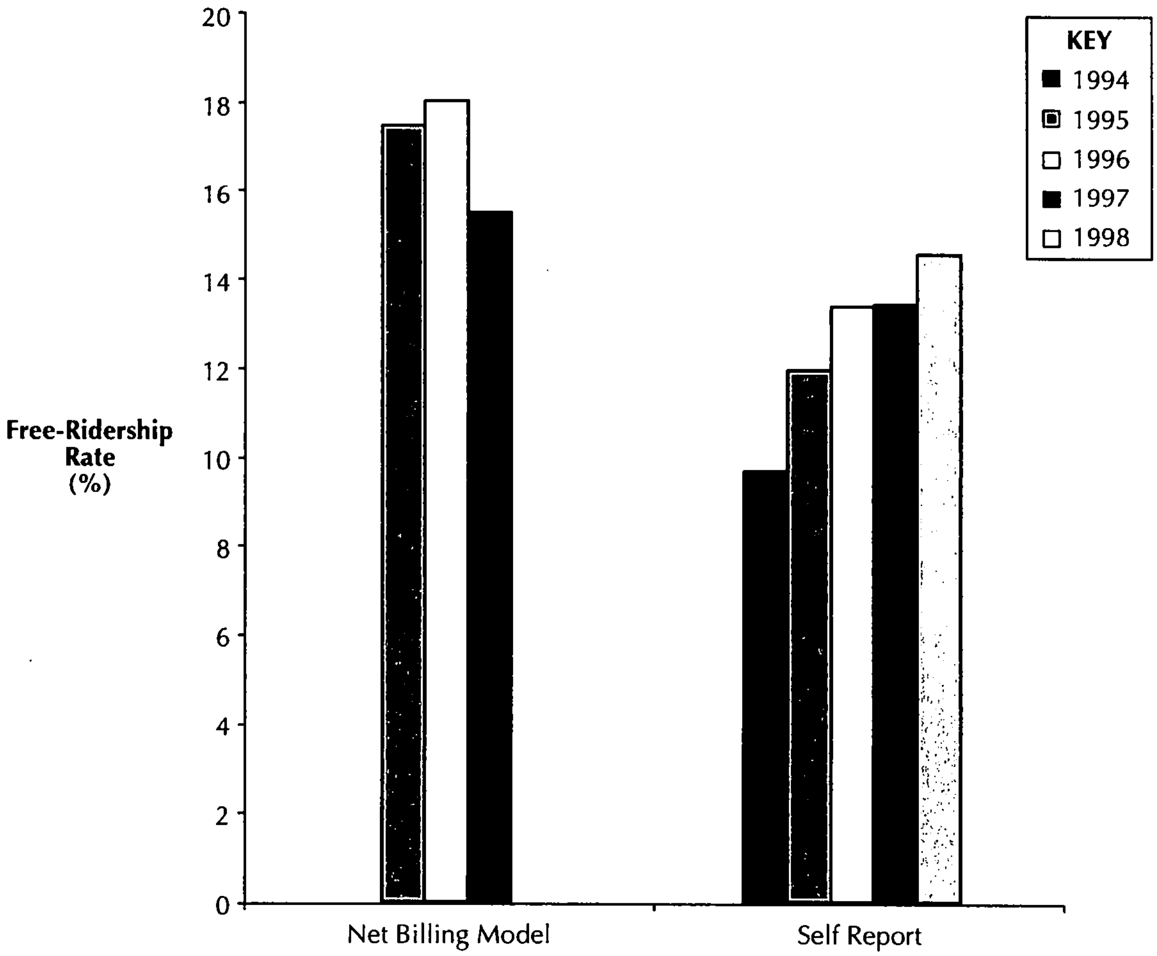


Note: Weighted by avoided cost.

4.3.4 Comparison of Net Billing Model and Self Report Analysis Results

The billing model provided free-ridership estimates for the period 1995 through 1997, while the self-report method produced results for the years 1994 through 1998. For fluorescent technologies, the results from the two different approaches are relatively comparable, although results from the billing model are somewhat higher. Exhibit 4.3.4-1 below is a comparison of net billing model and self-reported free-ridership rates for fluorescent technologies. The bill analysis results do not indicate a trend in free-ridership, with the rate increasing from 1995 to 1996 and then decreasing in 1997. The self-report results increase each year, from 9.7% in 1994 to 14.6% in 1998.

Exhibit 4.3.4-1
Comparison of Net Billing Model
and Self-Reported Free-Ridership
Fluorescents Only



Some differences between the bill analysis and self-report analysis free-ridership results are worth highlighting. First, there were three estimation steps, and consequently three sources of estimation error in the billing analysis (Gross, Net and Mills). The self-report analysis involved one primary estimation step, which was examining the survey data and extrapolating to the population level. Second, large customers were censored from the bill analysis. This censoring would bias the free-ridership estimate downward because larger customers have higher rates of free-ridership. In contrast, the self-report analysis used all available data. Third, there was a significantly smaller sample size in the billing analysis. The number of re-contacted respondents, as well as the required censoring limited the bill analysis sample size. Theoretically, free-ridership should increase over time, as accelerated adopters are shifted into the free-ridership category. This phenomenon is apparent in the self-report results, but not in the bill analysis results. The bill analysis is a static analysis that is not designed to pick up dynamic changes over time. The self-report analysis results capture the dynamic effects of accelerated adoption, which is more desirable in a time series analysis such as this study is performing.

4.4 MARKET EFFECTS ANALYSIS

Objective Overview

The objective of this analysis step was to estimate annual total market effects over the 1994-1997 period. "Total market effects" are the energy savings from all high efficiency lighting adoptions that occurred in the PG&E service territory over the four-year period. The estimate of total market effects provides a foundation for the identification of market transformation effects (presented in Section 4.5), as well as the integrated analysis (presented in Section 4.6). Total market effects can be separated into two components: market transformation effects, and naturally occurring conservation. Our estimate of total market effects is combined with estimated natural conservation to arrive at market transformation effects, as discussed in Section 4.5. The integrated analysis combines rates of persistence, free-ridership, and spillover, with our estimates of natural conservation and total market effects to provide a holistic view of Lighting Program impacts over time.

The market effects analysis measures the energy savings, adoption rates and fixtures installed over the 1994-1997 period. Results are presented for rebated adoptions, nonrebated adoptions, and spillover adoptions. Each of these components was estimated two ways: using gross and net billing models, as well as self report analysis. The two methodologies and results are presented below.

4.4.1 Gross and Net Model #2 Billing Analysis

Initial Approach

One method of estimating total market effects is through a billing analysis. The analysis uses the same models developed in calculating gross load impact in *Section 4.1*. The only difference with the modified models, referred to as Baseline Model #2, Gross Model #2, and Net Model #2, is the exclusion of lighting replacements in the $Chg_{i,k}$ variable. This modification causes the effects of lighting market movement to be captured by business type intercepts and the pre-usage parameter estimate in Baseline Model #2. The results are used to predict participant post-period usage and to calculate SAE Coefficients in the gross and net models. The difference between the SAE Coefficients from Net Billing Model #2 and the SAE Coefficients from Net Billing Model #1 can be attributable to total market effects (accounting for self-report and self-selection).

The parameter estimates, or SAE Coefficients, produced by Gross Billing Model #2 are not that much different than Gross Billing Model #1 results. The results are adjusted in Net Billing Model #2 by introducing an Inverse Mills Ratio to account for self-report and self-selection. Exhibit 4.4.1-1 presents the result of Net Billing Model #2.

Exhibit 4.4.1-1
Net Billing Model #2 Results

Parameter Descriptions	Units	1995 Post Period Parameter Estimate	1995 Post Period t-Statistic	1995 Post Period Sample Size	1996 Post Period Parameter Estimate	1996 Post Period t-Statistic	1996 Post Period Sample Size	1997 Post Period Parameter Estimate	1997 Post Period t-Statistic	1997 Post Period Sample Size
Mills Ratio	Unitless	-1123	-0.397	894	1001	0.245	846	-1474	-0.458	815
SAE Coefficients										
Lighting End Use										
Fluorescents	Mills * kWh	-0.78	-9.98	154	-0.76	-7.56	153	-0.76	-9.32	149
HIDs	Mills * kWh	-0.14	-0.42	23	-0.07	-0.14	23	0.15	0.39	23
Compact Fluorescents	Mills * kWh	-0.22	-0.70	74	-0.43	-0.96	76	-0.30	-0.87	74
Other Lighting	Mills * kWh	-0.14	-0.76	25	-0.22	-0.85	25	-0.01	-0.07	25
Customized Lighting	Mills * kWh	-1.62	-4.21	5	-1.80	-3.24	4	-1.48	-3.42	4
Outdoor Lighting	Mills * kWh	-0.27	-1.00	46	-0.18	-0.47	47	0.04	0.13	47
Other End Uses										
Other Impacts	kWh	-0.15	-0.33	15	-0.67	-1.00	16	-0.59	-1.31	22
Other Site Changes										
Lighting Additions	kWh	0.05	3.50	58	-0.02	-0.85	72	-0.02	-1.66	83
Lighting Replacements - Removed From Model			-	-	-	-	-	-	-	-
Lighting Removals	kWh	0.12	0.28	3	0.29	0.48	2	-0.08	-0.06	2
HVAC Replacements	kWh	-0.09	-0.58	3	-0.13	-0.59	3	-0.26	-1.49	4
Other Equip Replacements	kWh	-0.10	-3.00	24	-0.08	-3.88	41	-0.08	-4.88	56
Add Employees	# Emp	321.98	4.23	147	282.72	4.45	154	298.42	5.66	128
Reduce Employees	# Emp	-750.64	-1.84	80	-149.91	-0.45	87	-139.95	-0.53	67
Other Equip Additions	kWh	0.02	2.02	206	0.05	4.68	269	0.07	7.74	312
Total Sample Size				894			846			815

Exhibit 4.4.1-1 highlights two technologies where results were statistically significant. Comparing these SAE Coeffcients to Net Billing Model #1 as shown in Exhibit 4.3.2-3 indicates little or no difference on a year by year basis. For the "Fluorescent" technology group, the SAE Coefficients were the same in 1995 & 1997 and slightly different in 1996. The "Customized Lighting" group yielded similar findings as the "Fluorescent" group. Because the parameter estimate for the "Lighting Replacements" variable that was included in the Model #1 specification was not statistically significant, its removal from the Model #2 specifications had little impact.

Although the "Lighting Replacements" parameter estimate was statistically insignifcant, the value was the correct sign and was of a reasonable order of magnitude. The results lead to a revised approach discussed below.

Revised Approach

A second approach for estimating total market effects through a billing analysis is to utilize results already available from the Baseline and Gross Model #1. Recall that Baseline and Gross Model #1 include the "Lighting Replacements" change variable. The "Lighting Replacements" parameter estimate from Baseline Model #1 and the actual post-period energy usage of the nonparticipant are incorporated to establish a "nonparticipant lighting adoption" impact. This impact reflects the post-period energy decrease that accompanies a nonparticpant lighting replacement. Likewise for participants, impacts attributable to lighting replacements are calculated with the "Lighting Replacements" parameter estimate from Gross Model #1 and the actual post-period energy usage. The sample participant and nonparticipant lighting adoption impacts for each post-period year are leveraged to the entire MDSS and commercial population. Exhibit 4.4.1-2 presents the results of this analysis.

Exhibit 4.4.1-2
Total Non-Rebated Market Effects
Annual kWh Savings

Pre-Post Model Period / Technology Group	1993 - 1995 Baseline and Gross Model #1 Parameter Estimate	1993 - 1995 Adoption Ratio	1993 - 1995 Annual kWh Savings	1993 - 1996 Baseline and Gross Model #1 Parameter Estimate	1993 - 1996 Adoption Ratio	1993 - 1996 Annual kWh Savings	1993 - 1997 Baseline and Gross Model #1 Parameter Estimate	1993 - 1997 Adoption Ratio	1993 - 1997 Annual kWh Savings
Participants									
Fluorescents	0.03	0.02	2,285,631	0.01	0.05	2,020,841	0.02	0.09	2,239,363
Other High Efficiency	0.03	0.05	990,216	0.01	0.05	480,519	0.02	0.07	470,437
Total	-	-	3,275,846	-	-	2,501,360	-	-	2,709,800
Nonparticipants									
Fluorescents	0.05	0.06	257,337,991	0.02	0.08	75,437,874	0.02	0.11	89,853,971
Other High Efficiency	0.05	0.06	127,433,636	0.02	0.09	42,050,143	0.02	0.11	41,978,965
Total	-	-	384,771,628	-	-	117,488,016	-	-	131,832,935
Total	-	-	388,047,474	-	-	119,989,377	-	-	134,542,735

Exhibit 4.4.1-2 summarizes the kWh savings of non-rebated adoptions for participants and nonparticipants. Non-fluorescent technologies are grouped together to create a comparable fluorescent group. The adoption ratio represents the proportion of customers who made adoptions relative to the total customer sample in the models. For example, only 2% of the participant sample and 6% of the nonparticipant sample reportedly made a adoption between 1993-1995. The annual kWh savings is a cumulative value of the whole respective population from pre-period year to post-period year.

Exhibit 4.4.1-3 provides another viewpoint of the results discussed above. Since each subsequent post-period overlaps the previous post-period, mean annual kWh savings are calculated. The Exhibit examines the mean savings by technology for participants and nonparticpants over time. Not surprisingly, particpant savings are small compared to nonparticpant savings. This is because the size of the commercial nonparticpant population, more than 400,000 customers, is so much larger than the participant population, about 5000 customers. These results are used to validate the self report analysis of total market effects.

Exhibit 4.4.1-3
Total Non-Rebated Market Effect
Mean Annual kWh Savings

	Fluorescents			Other High Efficiency			Fluorescents and Other High Efficiency		
Year	Participant	Nonparticipant	Total	Participant	Nonparticipant	Total	Participant	Nonparticipant	Total
94	2,181,945	140,876,612	143,058,557	647,057	70,487,581	71,134,639	2,829,002	211,364,193	214,193,195
95	2,181,945	140,876,612	143,058,557	647,057	70,487,581	71,134,639	2,829,002	211,364,193	214,193,195
96	2,130,102	82,645,922	84,776,024	475,478	42,014,554	42,490,032	2,605,580	124,660,476	127,266,056
97	2,239,363	89,853,971	92,093,334	470,437	41,978,965	42,449,402	2,709,800	131,832,935	134,542,735

4.4.2 Self Report Market Effects Analysis, 1994-1997

4.4.2.1 Overview

This section presents the results of our examination of self-reported commercial lighting adoptions in the PG&E service territory over the 1994-1997 period. This analysis reveals trends in commercial lighting adoptions and quantifies the load impact resulting from these adoptions. Adoptions are examined for nine different measure categories. These include four fluorescent lighting measure categories: standard fluorescents, T-8 lamp and ballasts, electronic ballasts, and efficient lamp conversions (e.g. energy savers). In addition, we examined five other high efficiency lighting technolgies: halogen, compact fluorescents, exit signs, HIDs and controls.

The final output of this analysis is an estimate of total load impact for nonrebated and rebated commercial lighting adoptions for each year from 1994 through 1997. Participant adoptions were analyzed using the MDSS and CIS databases, together with the results of Gross Model #1 Billing Analysis. To analyze non-rebated adoptions, a total of 12 surveys taken for PG&E commercial customers between 1994 and 1998 were used, as well as the Gross Model #1 Billing Analysis results. For each survey the number of adoptions for each measure category was calculated. Next, the number of fixtures installed and kWh savings associated with these adoptions were calculated. The third step was to distribute the kWh savings over the period covered by the survey. An examination of the distribution of lighting adoptions by year was used to distribute kWh savings to specific years. The final step was to combine the results of this analysis for the 12 surveys

4.4.2.2 Self-Report Approach

Rebated Lighting Adoptions

Rebated commercial lighting adoptions were analyzed without input from survey data. All the required information was drawn directly from the MDSS. The MDSS provided the number of adoptions, total number of fixtures, and kWh saved by measure for each program year. No estimation methods were used in this analysis to calculate the number of adoptions or fixtures. The kWh were adjusted by the Gross Model #1 Billing Analysis results to provide an estimate of ex-post load impacts. The data are presented with the results of our analysis of nonrebated adoptions.

Nonrebated Lighting Adoptions

A total of 12 surveys taken for PG&E commercial customers between 1994 and 1998 were used in the analysis of nonrebated lighting adoptions. Each survey was analyzed independently, and the results were combined into summary tables. Results were summarized for groups of surveys, as well as for all of the surveys combined. Specifically, information from the 1994 nonparticipant and participant surveys are shown in a combined form. For 1995 and 1996, the canvass, nonparticipant and participant surveys are shown together. The 1994 recontacted participant and nonparticipant surveys are also shown together. The 1995 recontacted nonparticipant survey and the new uncontacted survey are shown independently.

In addition to the 12 customer surveys referenced above, the results of the billing analysis and two PG&E databases were also used. The MDSS and results of the Gross Model #1 Billing Analysis were used to provide kWh savings per fixture. The CIS and the MDSS databases were used to identify the population of participants and nonparticipants in the CEEI Program in PG&Es service territory. We found the nonparticipant population to be approximately 414,000, and the participant population to be 5,000.

<u>Number of Adoptions by Measure</u>

For each survey, the number of reported non-rebated adoptions was tabulated by measure. We used the ratio of reported adoptions divided by the survey sample size as an estimate of the population adoption rate for each measure. For the canvass and nonparticipant surveys, these adoption rates were applied to the total nonparticipant population to calculate adoptions by measure. For participant surveys, we applied the rate of nonrebated adoptions from the survey to the participant population to determine participant nonrebated adoptions.

<u>Number of Fixture per Adoption by Measure</u>

The next task was to identify the number of fixtures associated with the total nonrebated adoptions described above. For this estimation, we began with an examination of the survey data. The average number of fixtures per adoption was extracted from the survey data. This average served as an estimate of fixtures per adoption in the population. Fixtures were estimated for each measure category separately.

We multiplied the estimate of fixtures per adoption by the number of population adoptions. This produced an estimate of the total number of fixtures installed in the population for each measure. Similar to our analysis of adoptions, the average number of fixtures per installation derived from nonparticipant surveys was applied to nonparticipant installations. The average number of fixtures per installation derived from participant surveys was applied to participant installations.

<u>kWh Saved by Measure</u>

The third step in this analysis was the calculation of total kWh saved from nonrebated adoptions in the population. We began by calculating the kWh saved per fixture using ex-post estimates of energy savings from the Gross Model #1 Billing Analysis. By aggregating the total ex-post load impact by measure and dividing by the number of fixtures installed from the MDSS, we derived an estimate of energy savings per fixture for each measure.

As described earlier, we have already determined the number of fixtures installed for each measure. A simple product of the number of fixtures and the kWh savings per fixtures resulted in our estimate of total kWh savings associated with nonrebated adoptions in the population.

kWh Saved by Measure by Year

Most of the 12 surveys used in our analysis asked respondents to discuss lighting changing occurring over a 3 ½ year period. Therefore it was necessary to distribute the total kWh savings calculated for each survey over the years it covered. This not only gave meaning to our estimate of energy savings, but also revealed trends in the adoption data.

Every survey asked respondents the date of each lighting installation. This enabled us to look at the distribution of adoptions over the years covered by the survey. Doing this for each survey revealed that regardless of when a survey was taken, the most recent two years always had a very high percentage of total adoptions. We believe that this is because it is more difficult to gain reliable information reaching back more than a couple of years. The reasons for this are twofold. First, people are better able to recall events in recent years than in more distant years. Second, in commercial establishments there is often staff turnover, resulting in less information about events occurring more than a couple of years in the past.

We used our awareness of this phenomenon to estimate adoption rates for different years. Specifically, the adoption rates experienced over the most recent two years were interpreted as reflective of population adoption rates for these two years. For the third year back, we used the average rate experienced over the entire 3-year period covered by the survey. For periods extending back over three years, we disregarded the adoption rate data, because we felt it was not reflective of the true rate. This method may somewhat underestimate adoption rates for more distant years. However, the large number of surveys and variety of time frames is likely to minimize this bias.

4.4.2.3 Self Report Market Effects Analysis Results

Exhibit 4.4.2-1 below shows rebated and nonrebated commercial lighting installations in PG&E's service territory over the period 1994 through 1997. Rebated adoption data were extracted directly from the MDSS (adjusted by the results from the Gross Model #1 Bill Analysis), while nonrebated adoptions were estimated as described in Section 4.4.2.2 above. The table shown below reflects the results of this analysis for all surveys combined.

Exhibit 4.4.2-1
Commercial Lighting Installations by Rebate, 1994-1997

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
PG&E Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	1.55%	900,859	84,280,182	1.32%	603,518	65,522,990	1.19%	512,067	61,264,225	0.84%	559,628	51,614,563
Electronic Ballasts	0.17%	52,471	3,967,130	0.04%	10,411	959,932	0.04%	7,042	556,529	0.02%	6,284	179,643
Efficient Lamp Conversions	0.61%	590,326	79,321,124	0.29%	197,436	34,894,658	0.24%	159,856	31,411,171	0.22%	198,986	30,310,502
Total Fluorescents	2.33%	1,543,657	167,568,436	1.66%	811,365	101,377,580	1.47%	678,965	93,231,924	1.08%	764,898	82,104,709
Other High Efficiency												
Halogen	0.10%	21,446	6,176,408	0.06%	8,876	829,302	0.05%	9,578	1,325,524	0.04%	11,199	1,666,589
Compact Flourescents	0.75%	124,491	19,545,229	0.48%	70,162	12,179,480	0.38%	46,231	10,119,829	0.47%	61,880	21,140,790
Exit Signs	0.19%	15,856	4,482,343	0.16%	9,496	2,522,894	0.16%	10,304	2,863,122	0.18%	13,989	4,278,110
HID	0.19%	15,156	34,557,487	0.09%	7,609	16,318,498	0.07%	5,672	12,408,503	0.11%	8,236	11,521,370
Controls	0.33%	23,543	11,136,255	0.15%	8,936	4,842,039	0.11%	7,092	3,741,003	0.11%	6,788	3,236,730
PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	2.20%	986,403	-	1.71%	716,534	-	1.34%	240,487	-	1.53%	47,345	-
T-8 Lamp & Ballasts	2.06%	534,303	58,920,147	2.15%	537,298	60,424,019	2.11%	674,973	74,329,994	2.38%	782,326	85,813,289
Electronic Ballasts	0.30%	11,688	1,207,986	0.27%	19,750	1,739,294	0.24%	26,265	1,985,778	0.33%	28,828	2,179,545
Efficient Lamp Conversions	0.43%	71,457	6,794,755	0.33%	50,155	4,879,654	0.20%	33,139	2,915,870	0.04%	1,787	250,848
Total Fluorescents	4.99%	1,603,851	66,922,888	4.46%	1,323,736	67,042,967	3.88%	974,864	79,231,642	4.27%	860,286	88,243,682
Other High Efficiency												
Halogen	0.30%	39,948	11,504,949	0.37%	31,857	9,174,716	0.40%	34,777	10,015,854	0.46%	22,949	6,609,267
Compact Flourescents	0.49%	344,296	64,482,126	0.46%	334,981	60,844,410	0.29%	127,815	20,017,747	0.27%	122,865	19,548,600
Exit Signs	0.14%	8,688	2,449,427	0.19%	15,302	1,863,748	0.13%	9,921	130,385	0.16%	12,330	140,323
HID	0.58%	42,484	46,253,368	0.76%	49,904	81,242,712	0.68%	45,540	99,374,976	0.81%	48,168	119,987,454
Controls	0.00%	967	481,122	0.07%	1,741	877,018	0.08%	1,790	902,464	0.11%	1,875	949,475

For fluorescent lighting rebated adoptions, 1994 was by far the greatest year. 1994 produced the highest adoption rate, the greatest number of installed fixtures, and over twice the energy savings of both 1996 and 1997. From 1994 through 1997, there is a steady decline in adoption rates, fixtures and energy savings associated with rebated fluorescent lighting adoptions.

Adoptions of electronic ballasts and efficient lamp conversions have dropped as a share of fluorescent lighting adoptions. In 1994 electronic ballasts and efficient lamp conversions comprised 34% of fluorescent lighting adoptions. In 1997, the share falls to 22%. Conversely, T-8 adoptions have become more common among rebated fluorescent lighting adopters, rising from 66% to 78% of fluorescent lighting adoptions.

Among other high efficiency lighting technologies, compact fluorescents are consistently the most popular. Adoption rates for all technologies fall over the four-year period. However, exit signs have the most stable adoption rate, .19% in 1994 and .18% in 1997. In terms of energy savings, HID installations are the highest in 1994, 1995 and 1996. However, in 1997 compact fluorescents surpass HID's, 21 million versus 12 million kWh.

In contrast to rebated installations, the load impact from nonrebated fluorescent installations rises over the four-year period. Conversely, the overall adoption rate for fluorescent technologies declines moderately over the period. The rise in energy savings is due to a shift away from standard efficiency technologies and into high efficiency technologies. Specifically, there was an increase in both T-8 and electronic ballast installations. On the other hand, efficient lamp conversions tapered off markedly over the period, falling from 71 thousand fixtures and 7.3 million kWh in 1994 to less than 2 thousand fixtures and 0.3 million kWh in 1997.

There are several notable trends within the other nonrebated high efficiency lighting technologies. Adoption rates for halogen, exit signs, and HIDs have risen over the four year period. At the same time, the number of fixtures associated with these adoptions has declined, reflecting smaller average project sizes for these three measures. Compact fluorescent adoption rates decline modestly over the period, as does the total number of fixtures installed. Controls remain relatively uncommon, but have experienced an increase over the four year period in both adoption rates and fixtures.

1994 Survey Results – Nonrebated Installations

The results of our analysis of the 1994 participant and nonparticipant surveys are presented in Exhibit 4.4.2-2 below. Nonrebated installations increased over the period and the adoption rates for fluorescent lighting technologies are relatively high, 7.4% in 1994 and 9.3% in 1995. A closer examination of the data reveal a preference by adopters for T-8 lamp and ballast installations relative to electronic ballasts and efficient lamp conversions. Among other lighting technologies, compact fluorescents are the most popular. The 1994 surveys did not address halogen lighting or lighting controls, which is why the data are missing from the table.

Exhibit 4.4.2-2
Non-Rebated Commercial Lighting Installations, 1994 Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
1994 Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	2.92%	2,024,879	-	3.69%	2,560,876	-	0.00%	-	-	0.00%	-	-
T-8 Lamp & Ballasts	3.02%	597,006	67,108,107	3.82%	755,037	84,872,018	0.00%	-	-	0.00%	-	-
Electronic Ballasts	0.85%	14,792	2,091,214	1.07%	18,708	2,644,771	0.00%	-	-	0.00%	-	-
Efficient Lamp Conversions	0.57%	78,475	8,747,731	0.72%	99,248	11,063,307	0.00%	-	-	0.00%	-	-
Total Fluorescents	7.35%	2,715,152	77,947,053	9.30%	3,433,869	98,580,096	0.00%	-	-	0.00%	-	-
Other High Efficiency												
Halogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compact Flourescents	1.04%	896,786	173,263,526	1.31%	1,134,170	219,127,400	0.00%	-	-	0.00%	-	-
Exit Signs	0.28%	24,464	6,905,253	0.36%	30,939	8,733,115	0.00%	-	-	0.00%	-	-
HID	1.03%	60,464	31,605,745	1.31%	76,469	39,971,971	0.00%	-	-	0.00%	-	-
Controls	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

1995 Survey Results – Nonrebated Installations

The results of our analysis of the 1995 participant, nonparticipant and canvas surveys are presented in Exhibit 4.4.2-3 below. Similar to the 1994 results presented above, the adoption rates for fluorescent lighting technologies increased over the 1994-1995 period. T-8 lighting technologies were favored by adopters, while electronic ballasts were the least favorite. This is somewhat different from the 1994 survey results which showed electronic ballasts to be more popular then efficient lamp conversions.

Among other lighting technologies, compact fluorscents are again the most common adoption. However, the 1995 surveys reveal a larger average installation size for HID than for compact fluorescents, resulting in a greater number of HID fixtures installed than compact fluorescent fixtures.

Exhibit 4.4.2-3
Non-Rebated Commercial Lighting Installation, 1995 Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
1995 Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	0.99%	885,680	-	1.06%	944,725	-	1.16%	1,033,293	-	0.00%	-	-
T-8 Lamp & Ballasts	1.67%	511,616	57,007,372	1.78%	545,724	60,807,863	1.94%	596,885	66,508,600	0.00%	-	-
Electronic Ballasts	0.05%	20,273	1,532,745	0.05%	21,624	1,634,928	0.05%	23,652	1,788,202	0.00%	-	-
Efficient Lamp Conversions	0.72%	135,895	11,636,533	0.77%	144,955	12,412,302	0.84%	158,545	13,575,956	0.00%	-	-
Total Fluorescents	3.43%	1,553,464	70,176,650	3.66%	1,657,029	74,855,093	4.00%	1,812,375	81,872,758	0.00%	-	-
Other High Efficiency												
Halogen	0.30%	39,948	11,504,949	0.32%	42,611	12,271,946	0.35%	46,606	13,422,441	0.00%	-	-
Compact Flourescents	0.43%	136,102	20,182,853	0.46%	145,176	21,528,377	0.50%	158,786	23,546,662	0.00%	-	-
Exit Signs	0.00%	381	114,832	0.00%	406	122,488	0.00%	444	133,971	0.00%	-	-
HID	0.40%	43,595	48,491,264	0.43%	46,501	51,724,015	0.47%	50,860	56,573,141	0.00%	-	-
Controls	0.00%	1,934	962,244	0.005%	2,063	1,026,394	0.01%	2,257	1,122,618	0.00%	-	-

1996 Survey Results – Nonrebated Installations

The results of our analysis of the 1996 participant, nonparticipant and canvas surveys are presented in Exhibit 4.4.2-4 below. Similar to the 1994 and 1995 results presented above, the adoption rates for fluorescent lighting technologies increased over the 1995-1997 period. In addition T-8 lighting technologies continued to be the favorite fluorescent technology. Similar to 1994, but different from 1995, the second most popular fluorescent technology was electronic ballasts.

Unlike the 1994 and 1995 surveys which show compact fluorescents to have the highest adoption rates, the 1996 surveys reveal a preference for halgen and HID technologies, followed closely by exit signs. On the other hand, an examination of the number of fixtures installed reveals compact flourescents to be the dominant technology. The average size of a compact fluorescent installation was significantly larger than for any other technology.

Exhibit 4.4.2-4
Non-Rebated Commercial Lighting Installations, 1996 Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
1996 Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	0.00%	-	-	0.34%	21,026	-	0.37%	22,865	0	0.37%	22,865	-
T-8 Lamp & Ballasts	0.00%	-	-	1.42%	191,314	23,064,017	1.54%	208,054	25,082,118	1.54%	208,054	25,082,118
Electronic Ballasts	0.00%	-	-	0.22%	57,716	4,363,646	0.24%	62,766	4,745,465	0.24%	62,766	4,745,465
Efficient Lamp Conversions	0.00%	-	-	0.15%	6,574	922,660	0.16%	7,149	1,003,392	0.16%	7,149	1,003,392
Total Fluorescents	0.00%	-	-	2.13%	276,630	28,350,323	2.32%	300,835	30,830,976	2.32%	300,835	30,830,976
Other High Efficiency												
Halogen	0.00%	-	-	0.42%	21,103	6,077,487	0.46%	22,949	6,609,267	0.46%	22,949	6,609,267
Compact Flourescents	0.00%	-	-	0.25%	374,383	60,431,756	0.27%	407,142	65,719,535	0.27%	407,142	65,719,535
Exit Signs	0.00%	-	-	0.40%	43,685	61,895	0.43%	47,507	67,311	0.43%	47,507	67,311
HID	0.00%	-	-	0.42%	47,283	116,035,607	0.46%	51,421	126,188,722	0.46%	51,421	126,188,722
Controls	0.00%	-	-	0.01%	225	114,125	0.01%	245	124,111	0.01%	245	124,111

1994 Recontacted Survey Results – Nonrebated Installations

The results of our analysis of the 1994 recontacted participant and nonparticipant surveys are presented in Exhibit 4.4.2-5 below. The table shows a significant increase in fluorescent lighting adoption rates between 1995 and 1996, and a more modest increase between 1996 and 1997. In addition, the surveys reveal a stark preference for T-8s over electronic ballasts and efficient lamp conversions. The latter two showing adoption rates near zero, while T-8s show healthy and increasing adoption rates.

Similar to the 1996 surveys, the 1994 recontacted surveys reveal a notable increase in the popularity of HID fluorescent technology. While the average number of fixtures per installation remains much lower than for compact fluorescents, the energy savings per HID fixture is significant.

Exhibit 4.4.2-5
Non-Rebated Commercial Lighting Installations
1994 Recontacted Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
1994 Re-Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	0.00%	-	-	0.44%	904	-	0.601%	1,246	-	0.68%	1,402	-
T-8 Lamp & Ballasts	0.00%	-	-	2.03%	634,216	73,711,906	2.80%	874,780	101,671,595	3.14%	984,128	114,380,545
Electronic Ballasts	0.00%	-	-	0.01%	703	53,124	0.01%	969	73,274	0.01%	1,090	82,433
Efficient Lamp Conversions	0.00%	-	-	0.00%	-	-	0.00%	-	0	0.00%	-	-
Total Fluorescents	0.00%	-	-	2.47%	635,822	73,765,030	3.40%	876,996	101,744,869	3.83%	986,620	114,462,978
Other High Efficiency												
Halogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compact Flourescents	0.00%	-	-	0.29%	21,178	3,134,516	0.40%	29,211	4,323,471	0.45%	32,863	4,863,904
Exit Signs	0.00%	-	-	0.00%	95	29,289	0.00%	131	40,399	0.00%	148	45,449
HID	0.00%	-	-	1.29%	52,752	131,997,127	1.78%	72,762	182,065,003	2.00%	81,857	204,823,129
Controls	0.00%	-	-	0.29%	4,676	2,367,552	0.39%	6,449	3,265,589	0.44%	7,255	3,673,788

1995 Recontacted Survey Results – Nonrebated Installations

The results of our analysis of the 1995 re-contacted nonparticipant survey are presented in Exhibit 4.4.2-6 below. The table shows a significant increase in fluorescent lighting adoption rates between 1996 and 1997. Again, T8 lamps are the most popular high efficiency fluorescent technology. Electronic ballasts were the second most popular, with less than half the adoption rate and twenty times fewer fixtures installed.

Adoption rates for other high efficiency technologies were modest. Compact fluorescents and HIDs were tied in their popularity, with adoption rates of 0.30% in 1996 and 0.35% in 1997. Exit signs and controls had zero adoption rates. In terms of energy savings, HIDs outperformed compact fluorescents due to the greater energy savings per fixture from HIDs.

Exhibit 4.4.2-6
Non-Rebated Commercial Lighting Installations
1995 Re-Contact Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
1995 Re-Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	0.00%	-	-	0.00%	-	-	1.194%	84,214	-	1.40%	98,622	-
T-8 Lamp & Ballasts	0.00%	-	-	0.00%	-	-	2.39%	1,077,289	112,581,453	2.80%	1,261,596	131,842,377
Electronic Ballasts	0.00%	-	-	0.00%	-	-	0.90%	43,938	3,321,948	1.05%	51,455	3,890,281
Efficient Lamp Conversions	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-
Total Fluorescents	0.00%	-	-	0.00%	-	-	4.48%	1,205,441	115,903,401	5.24%	1,411,673	135,732,658
Other High Efficiency												
Halogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compact Flourescents	0.00%	-	-	0.00%	-	-	0.30%	43,938	6,499,070	0.35%	51,455	7,610,959
Exit Signs	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-
HID	0.00%	-	-	0.00%	-	-	0.30%	23,416	58,719,143	0.35%	27,422	68,765,069
Controls	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-

Previously Uncontacted Survey Results – Nonrebated Installations

The results of our analysis of the previously uncontacted survey is presented below. The table shows a steady increase in fluorescent lighting adoption rates between 1994 and 1997. This survey revealed a zero adoption rate for electronic ballasts and efficient lamp conversions. T-8 lamp adoption rates are moderate, at 1.5% in 1994 rising to 2.0% in 1997. The rate of standard efficiency fluorescent adoptions is quite significant, and composes a larger percent of total fluorescent lighting adoptions than in any other survey group.

Adoption rates for other high efficiency technologies were modest and somewhat anomalous relative to other survey results. The survey revealed zero adoption rates for compact flourescents and controls. HIDs and exit signs were the only other high efficiency technologies with positive adoption rates. HIDs had twice the adoption rate of exit signs, 37 times more fixtures and 310 times more energy savings.

Exhibit 4.4.2-7
Non-Rebated Commercial Lighting Installations
Previously Uncontacted Survey Results

	1994 Adoption Rate	1994 Fixtures Installed	1994 kWh Savings	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
Previously Uncontacted Survey: PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
Standard Flourescents	2.68%	48,651	-	3.04%	55,138	-	3.355%	60,814	-	3.67%	66,490	-
T-8 Lamp & Ballasts	1.49%	494,287	52,644,963	1.69%	560,192	59,664,291	1.86%	617,858	65,806,203	2.04%	675,525	71,948,116
Electronic Ballasts	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-
Efficient Lamp Conversions	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-
Total Fluorescents	4.17%	542,938	52,644,963	4.73%	615,330	59,664,291	5.22%	678,673	65,806,203	5.71%	742,015	71,948,116
Other High Efficiency												
Halogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compact Flourescents	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-
Exit Signs	0.15%	1,219	328,195	0.17%	1,382	371,954	0.19%	1,524	410,244	0.20%	1,666	448,533
HID	0.30%	23,394	58,663,095	0.34%	26,513	66,484,840	0.37%	29,242	73,328,868	0.41%	31,972	80,172,896
Controls	0.00%	-	-	0.00%	-	-	0.00%	-	-	0.00%	-	-

4.4.3 Self Reported Spillover Analysis

This section contains the results of our examination of self-reported spillover lighting adoptions in the PG&E service territory over the 1994-1997 period. A self-reported spillover adoption is defined as a high efficiency adoption for which the customer claimed to have been influenced by the program. The objective of this analysis is to identify the spillover adoption rates for each measure and to quantify the load impact resulting from spillover adoptions. The overall impact of spillover adoptions represents a lower bound of the market transformation effects of the CEEI program.

4.4.3.1 Self Report Method for Scoring Spillover

The following discussion explains the methods employed to calculate "self-report" estimates of spillover amongst program participants and nonparticipants. In counting the total number of surveyed participants and nonparticipants contributing towards spillover, the following three conditions were used:

1. The lighting adoption involved the installation of high efficiency equipment as recognized by the CEEI program.

2. The action was not rebated as part of the program.

3. The respondent stated that this action was taken as a result of the CEEI program's influence.

In other words, the respondent's knowledge of, awareness of, or participation in the CEEI program encouraged them to install high efficiency equipment outside the program. These three spillover conditions were evaluated in the participant and nonparticipant surveys using the following questions[3]:

1. Have you heard of PG&E's Retrofit Express or Customized Incentives programs?
2. Have you made any changes in indoor lighting at your facility other than the routine replacement of burned out bulbs?
3. What type of fixtures were added?
4. Was your firm paid a rebate by PG&E for these changes in your lighting equipment.
5. Did you become aware of the Retrofit Express/Customized Incentives program before or after you made the decision to purchase your new lighting?
6. To what extent did your knowledge of the program influence your equipment selection?

To qualify as a spillover action, respondents must answer "yes" to question one, indicating awareness of the program. Of course, participants were not asked question one, because it can be assumed they were aware of the program. The response to question two must also be "yes," indicating that a lighting adoption outside the program took place. Question three must indicate that a program qualifying high efficiency lighting technology was installed. The answer to question four must be "no," a rebate was not received. Question five must indicate the respondent had knowledge of the program prior to the decision to make the lighting adoption. Finally, the response to question six must indicate that the program influenced them to purchase high efficiency lighting equipment. If all of these conditions are met, the adoption was considered a spillover adoption.

4.4.3.2 Spillover Impact Calculation

Once all of the spillover adoptions had been identified, we then used this information to calculate the adoption rate, fixtures and kWh savings associated with spillover actions. The methods used for these calculations relied upon the results of the adoption analysis presented above. The approach was to calculate spillover adoptions as a percentage of high efficiency adoptions. This percentage was used as an estimator of the portion of high efficiency nonrebated adoptions that are attributable to spillover. For each survey, this percentage was applied as a scaling factor to the results of the adoption analysis.

Specifically, spillover adoption rates were calculated by multiplying the ratio of spillover adoptions to high efficiency adoptions by the population adoption rate for each measure. The number of fixtures and kWh savings attributable to spillover were calculated similarly. That is, they were calculated as a percentage of population high efficiency fixtures and kWh savings calculated in the adoption analysis. Again, this percentage was defined as the portion of high efficiency adoptions that are spillover.

[3] There is a slight variation in the wording of these questions between different survey instruments, and between participant and nonparticipant surveys. However, the meanings of the questions remain the same.

The reason for using this approach is twofold. First, we believe that the characteristics of spillover adoptions are similar to other high efficiency adoptions. Specifically, the type of adopted technologies, number of fixtures per adoption, and kWh savings per fixture have similar distributions in the two groups. In addition, the number of spillover installations was not large enough to provide reliable population estimates of these characteristics.

4.4.3.3 Results of the Self Report Spillover Analysis

The spillover analysis was performed on all 12 surveys independently. The results of the participant and nonparticipant surveys were grouped together and combined providing separate participant and nonparticipant spillover estimates.

Nonparticipant Spillover

The table shown below shows nonparticipant spillover adoptions of fluorescent lighting technologies tripled over the 1994-1997 period. Fluorescent lighting adoptions rose from 0.10% in 1994 to 0.30% in 1997. During 1994, program spillover resulted in the installation of approximately 28 thousand high efficiency fluorescent lighting fixtures, saving about 2.9 million kWh. During 1997, program spillover resulted in 94 thousand fixtures, with associated energy savings of 10.2 million kWh.

Among non-fluorescent lighting technologies, HIDs had by far the highest adoption rate in 1995, 1996 and 1997. However, in 1994 HIDs slightly lag behind Halogens. The adoption rate for Compact Fluorescents grows notably over the period, matching the rate for Halogens in 1997. From a kWh savings perspective, HIDs provide the bulk of the impact from non-fluorescent technologies.

Exhibit 4.4.3-1
Nonparticipant Lighting Spillover Installations, 1994-1997

	1994			1995			1996			1997		
	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings
PG&E Nonparticipant Spillover Non-Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	0.08%	24,626	2,661,980	0.11%	32,292	3,624,212	0.16%	57,382	6,187,550	0.26%	91,197	9,952,295
Electronic Ballasts	0.00%	162	15,602	0.00%	430	35,064	0.03%	2,179	164,768	0.04%	2,891	218,565
Efficient Lamp Conversions	0.01%	2,756	267,086	0.01%	1,819	177,746	0.01%	1,791	173,290	0.00%	74	10,440
Total Fluorescents	0.10%	27,544	2,944,669	0.12%	34,541	3,837,022	0.20%	61,353	6,525,608	0.30%	94,162	10,181,300
Other High Efficiency												
Halogen	0.02%	3,047	877,395	0.02%	1,880	541,384	0.03%	2,470	711,479	0.03%	1,387	399,331
Compact Flourescents	0.01%	3,969	734,002	0.01%	5,580	966,251	0.02%	7,909	1,250,663	0.03%	10,113	1,596,121
Exit Signs	0.01%	124	34,432	0.01%	334	25,560	0.01%	688	7,950	0.01%	863	10,799
HID	0.02%	1,880	2,945,425	0.05%	6,259	5,699,442	0.04%	12,789	7,171,737	0.09%	16,885	12,389,146
Controls	0.00%	-	-	0.01%	138	69,707	0.00%	62	31,601	0.01%	215	108,727

Participant Spillover

Adoption rates, fixtures installed, and kWh savings for participant spillover adoptions are shown in the table below. Adoption rates are expressed as a percentage of the participant population- not the PG&E commercial customer population. In general, participants have higher rates of spillover adoption than nonparticipants.

Exhibit 4.4.3-2
Pariticpant Lighting Spillover Installations, 1994-1997

	1994			1995			1996			1997		
	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings	Adoption Rate	Fixtures Installed	kWh Savings
Participant Spillover PG&E Non-Rebated Installations												
Technology Group												
Fluorescents												
T-8 Lamp & Ballasts	0.52%	9,321	1,010,629	0.88%	6,619	712,684	1.40%	10,027	1,078,682	1.79%	4,611	486,358
Electronic Ballasts	0.09%	2,501	193,048	0.18%	1,541	119,004	0.28%	2,258	170,739	0.40%	600	45,395
Efficient Lamp Conversions	0.09%	172	12,986	0.06%	100	7,730	0.07%	139	11,078	0.02%	16	1,706
Total Fluorescents	0.700%	11,995	1,216,662	1.126%	8,260	839,417	1.749%	12,425	1,260,499	2.208%	5,228	533,459
Other High Efficiency												
Halogen	0.09%	98	28,210	0.07%	89	25,621	0.08%	97	27,957	0.06%	80	23,002
Compact Flourescents	0.14%	989	148,395	0.14%	584	88,221	0.17%	821	122,498	0.17%	145	23,009
Exit Signs	0.04%	87	25,618	0.05%	79	21,783	0.08%	98	27,121	0.09%	88	22,724
HID	0.07%	183	57,812	0.12%	145	79,472	0.21%	227	124,903	0.26%	139	128,249
Controls	0.12%	591	294,213	0.04%	210	104,609	0.05%	230	114,416	0.00%	-	-

The most popular technology category was T-8 Lamps and Ballasts. In addition, the adoption rate for T-8s grew over the four year period quite significantly, from 0.5% in 1994 to 1.8% in 1997. Ranked by adoption rates, Electronic Ballasts took a distant second place in the 1995-1997 period. The adoption rate for T-8s was at least four times as great as that of Electronic Ballasts in each of the four years.

The average number of fixtures per installation for T-8s Lamps and Ballasts fell markedly over the 1994-1997 period. As a result, the energy savings from T-8 installations is much smaller in 1997 than in 1994. Nevertheless, T-8s provide the largest energy savings in each year by a comfortable margin. Moreover, fluorescent technologies provided significantly more energy savings than non-fluorescent technologies in each year. The higher energy savings is due primarily to the higher adoption rates for fluorescent technologies.

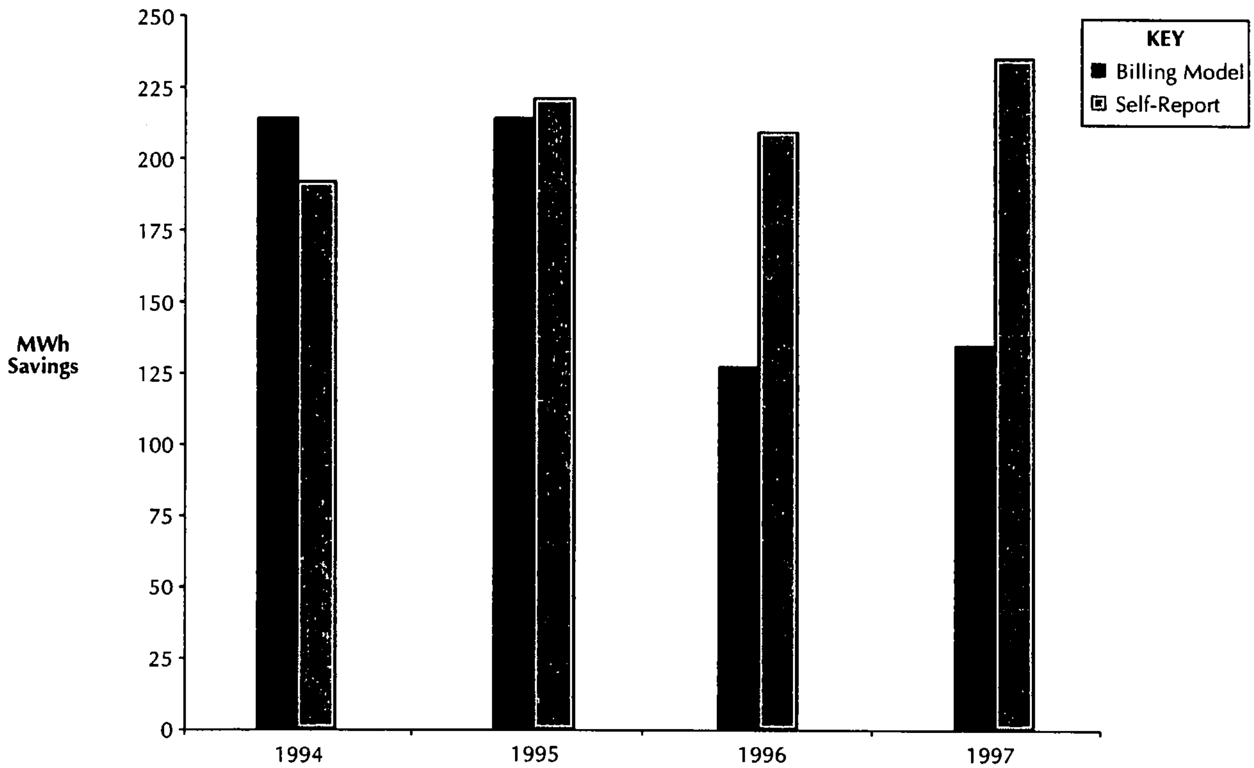
Among non-fluorescent technologies, HID measures had the highest adoption rate from 1995 through 1997. In 1994, Compact Fluorescents were the most popular non-fluorescent technology. In regards to energy savings, Control measures had the greatest impact among non-fluorescents from 1994 through 1996. In 1997, there was a zero adoption rate for Controls, therefore there was a zero energy impact. The high energy savings is attributable to the significant savings per fixture for Control measures; the adoption rate and fixtures installed were lower than for other non-fluorescent technologies.

4.4.4 Comparison of Results: Bill Analysis versus Self-Report

This section will compare the results of the bill analysis and the self-report analysis of total market effects. Total market effect estimates are compared on an annual basis and by technology. In addition, participant spillover results are compared similarly.

The total market effects results from the billing analysis are more variable than the results of the self-report analysis. This is apparent in Exhibit 4.4.4-1 below, which presented annual results of total non-rebated market effects for all technologies. The results in 1994 and 1995 are similar for both analysis methods, near 200 MWh. However, in 1996 and 1997, the billing model results decline to near 125 MWh, while the self-report results remain relatively stable.

Exhibit 4.4.4-1
Comparison of Billing Model and Self-Report Analysis
Total Non-Rebated Market Effects
All Technologies



When the results from both analysis methods are separated by technology, greater differences are revealed. Exhibit 4.4.4-2 below shows total annual non-rebated market effects for all non-fluorescent technologies. For non-fluorescent technologies, the billing analysis results are just under 75 MWh in 1994 and 1995, and fall to approximately 40 MWh in 1996 and 1997. These results are considerably lower than the self-report results, which are between 125 and 150 MWh. An examination of the data revealed that this difference is primarily due to a large HID self-report result. Without HIDs, results between the two analyses are within 10% (not shown in exhibit).

Exhibit 4.4.4-2
Comparison of Billing Model and Self-Report Analysis
Total Non-Rebated Market Effects
All Non-Fluorescent Technologies

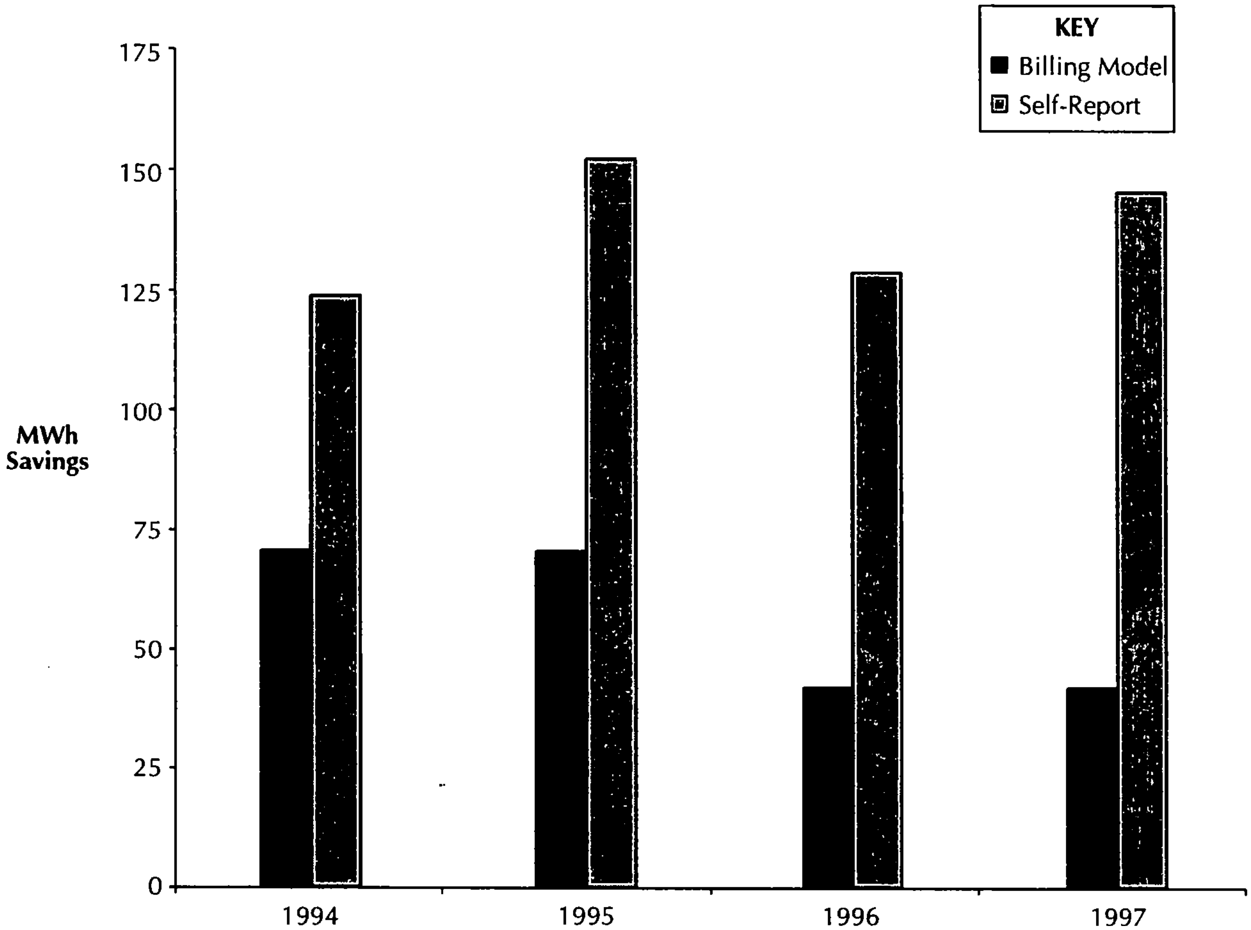


Exhibit 4.4.4-3 below shows annual total non-rebated market effects for all fluorescent technologies. Again, the self-report results are fairly stable near 75 MWh. The billing analysis results are more variable. The 1994 and 1995 bill results are significantly higher than the self-report, near 140 MWh. For 1996 and 1997, the results taper off considerably, becoming comparable to the self-report results

Exhibit 4.4.4-3
Comparison of Billing Model and Self-Report Analysis
Total Non-Rebated Market Effects
All Fluorescent Technologies

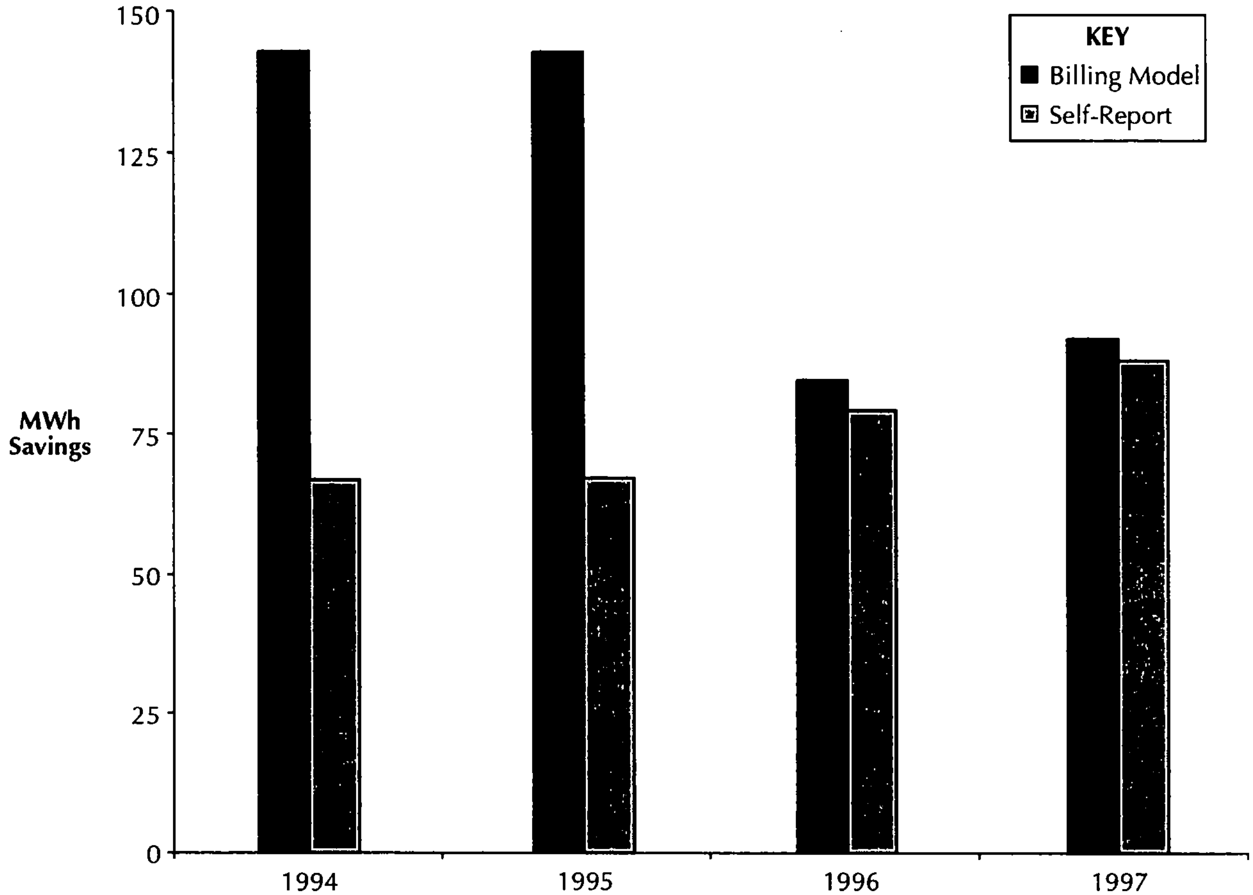


Exhibit 4.4.4-4 is a comparison of billing model and self-report spillover participant savings for all fluorescent technologies. The bill analysis technique resulted in a somewhat larger estimate of spillover than the self-report technique. The bill analysis estimate is stable over the period near 2.25 MWh. The self-report analysis is somewhat more variable, fluctuating between about 1.25 MWh down to near .50 MWh.

Exhibit 4.4.4-4
Comparison of Billing Model and Self-Report Spillover
All Fluorescent Technologies

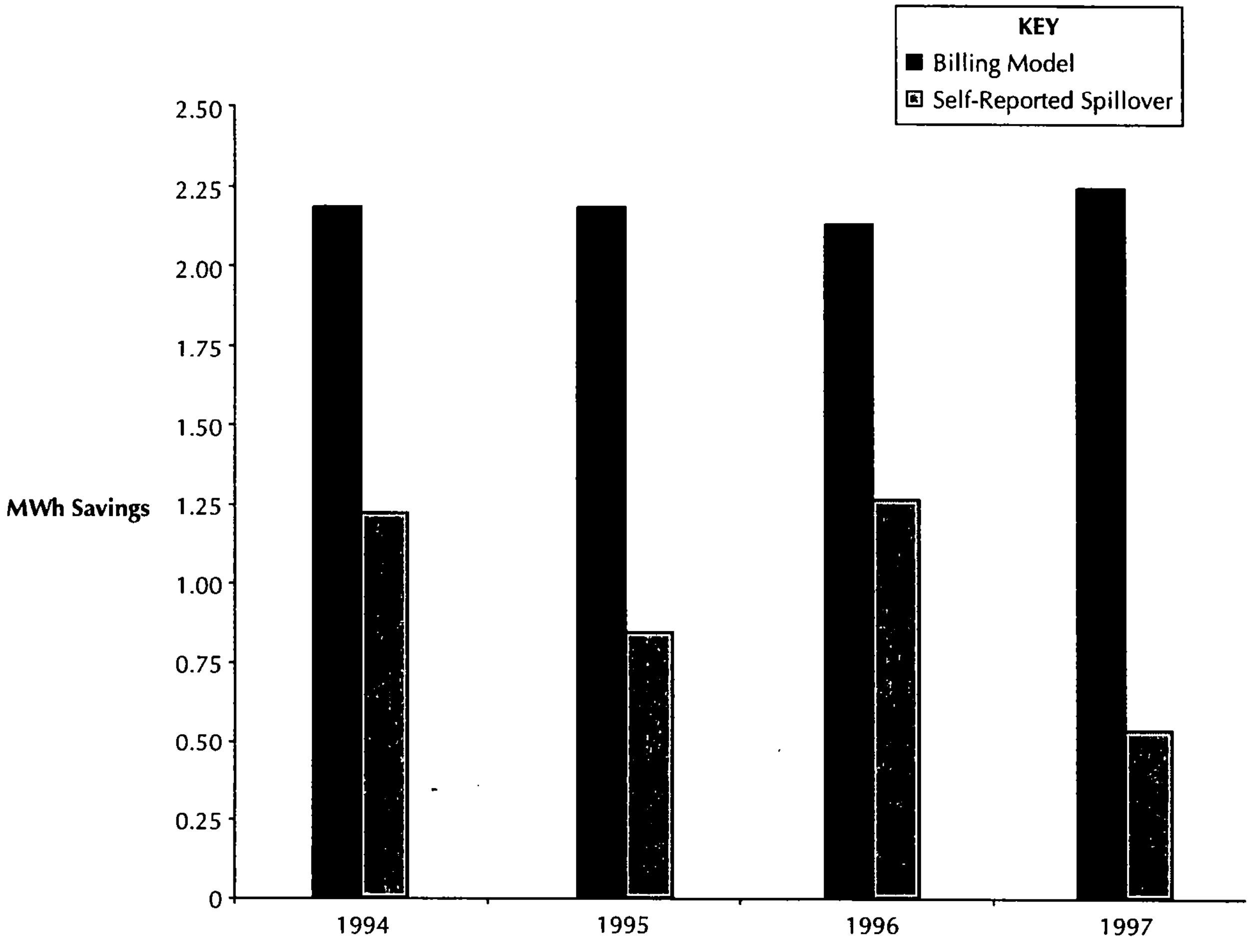
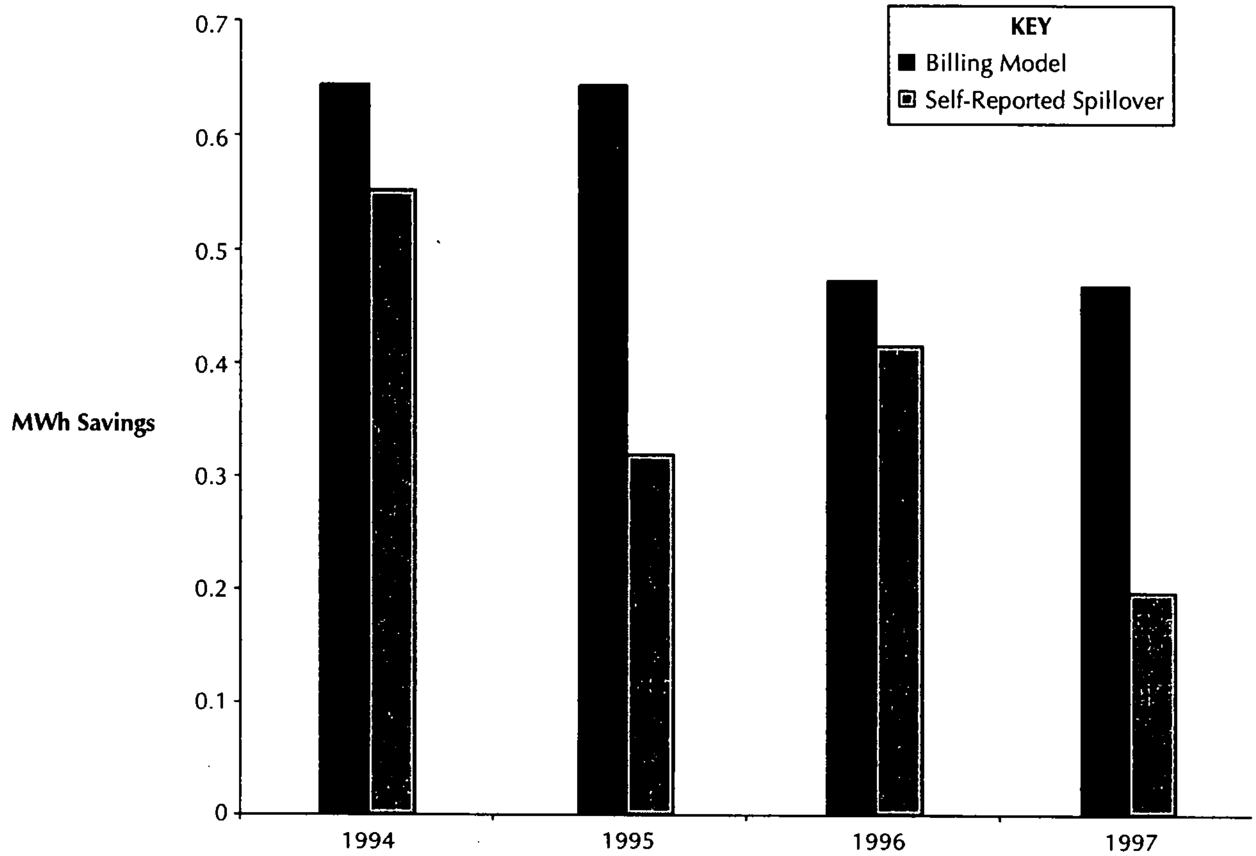


Exhibit 4.4.4-5 below is a comparison of billing model and self-reported spillover participant savings for all non-fluorescent technologies. Similar to fluorescent technologies, the bill analysis spillover estimates are somewhat higher. The bill analysis results fluctuate between just under .50 MWh in 1996 and 1997, to near .65 MWh in 1994 and 1995. Self-report results are variable over the period, but generally on a downward trend; beginning near .55 MWh in 1994 and falling to less than .20 MWh in 1997.

Exhibit 4.4.4-5
Comparison of Billing Model and Self-Report Spillover
Participant Savings
All Non-Fluorescent Technologies



4.4.5 Self-Report and Bill Analysis Methodological Challenges

Both the bill analysis and the self-report analysis faced difficulties and challenges in estimating total market effects. The self-report analysis suffered primarily from incomplete or inaccurate data. Specifically, there was a general inability of respondents to recall measure installed more than a couple years in the past. Often respondents were unsure of the technology installed, the number of fixtures, and the date of installation.

Of course the billing analysis also faced challenges of inaccurate or incomplete data. Lighting changes often correspond with other facility changes, which makes it very hard to isolate the effects of the lighting change in a billing analysis. Further, the sample size for adopters was very limited. The number re-contacted respondents limited the billing analysis sample size. Finally, large customers had to be censored from the analysis because of their disproportionate influence on the results. As a result of these problems, the billing analysis did not result in a significant lighting replacement parameter.

Although the self-report analysis had some challenges, it also had the advantage of a very large sample size. Twelve different surveys and over 9,000 observations were used to compile the self-report market effects analysis. The magnitude and diversity of the data used for this analysis compensate somewhat for the challenges of missing and/or inaccurate data.

4.5 MARKET TRANSFORMATION EFFECTS ANALYSIS

4.5.1 Objective Overview

The objective of the market transformation effects analysis was to estimate the percentage of the total market effects that are attributable to the influence of the 1994 Commercial Lighting Program. This influence could be direct, such as in the case of self-report spillover adoptions, or indirect, such as adoptions resulting from hidden market effects. 'Hidden market effects' include items such as the influence of vendor stocking practices, or easier access to information about high efficiency lighting equipment.

4.5.2 Methodology

We identified market transformation by measuring and taking the difference of total market effects, and naturally occurring conservation. 'Naturally occurring conservation' consists of those high efficiency adoptions that would have occurred in the PG&E service territory in the absence of the Lighting Program. Total market effects were measured with survey instruments and statistical inference. The results of our total market effects analysis are presented in Section 4.4. Natural conservation is somewhat more complicated to measure than total market effects because there is no group of PG&E customers who existed in the absence of the Program. In order to estimate natural conservation we used a baseline control group as a proxy for the market that would have existed in the absence of the DSM programs.

We explored two alternative types of customers as baseline control groups. The first type was made up of customers in out-of-state areas unaffected by DSM or other similar programs. While the energy conservation from these customers is clearly natural conservation, they are not a perfect baseline group. Out of state groups are made up of different population members than the PG&E service territory, with unique circumstances and demographics. As an alternative baseline, we used the nonparticipants within the PG&E service territory that did not claim to have been influenced by the program. This group consists of all nonparticipants except those classified as self-report spillover adopters. Of course this is not a perfect baseline either because it ignores all hidden market effects, clearly understating the influence of the program.

This portion of the report explains the objectives, approach, and results of the market transformation analysis. *Section 4.5.3-Out of State Survey Analysis Overview,* is an explanation of our out-of-state survey analysis, including a comparison by state and technology. The second *Section, 4.5.4-Using Georgia as Baseline to Estimate MTE,* presents analysis results using Georgia as a proxy for natural conservation. Similarly, *Section 4.5.5-Using California as Baseline to Estimate MTE,* presents analysis results using California data to estimate natural conservation. The final section, *Section 4.5.6-Comparison of Results: California versus Georgia Baseline* highlights notable characteristics and contrasts between the two approaches.

4.5.3 Out of State (SCE) Survey Analysis Overview

We utilized three surveys taken in 1997 in out-of-state territories where there was no DSM program. These surveys were conducted on behalf of Southern California Edison (SCE) in three states: Georgia, New York and Louisiana. For each survey the adoption rate, fixtures installed, and energy savings were calculated by technology. The surveys covered only fluorescent lighting technologies. Fixtures installed and energy savings were normalized to correspond to the population size of the PG&E service territory for comparison purposes. That is, these figures were normalized to estimate the energy savings that would have taken place in the PG&E service territory.

Adoption Rates, Fixtures Installed, and kWh Savings

The method used to calculate adoption rates, fixtures installed and energy savings are analogous to those used in the Market Effects Analysis. For each survey, the number of reported adoptions was tabulated by measure. The ratio of reported adoptions to the survey sample size was used as an estimate of the population adoption rate for each measure. These adoption rates were applied to the PG&E service territory population to calculate the number of adoptions. The number of adoptions was a foundation for estimating the number of fixtures and corresponding energy savings. The average number of fixtures per adoption was extracted from the survey data and multiplied by the number of adoptions to derive the number of fixtures installed.

Total energy savings were based upon ex-post algorithms. Just as in the Market Effects Analysis, the SAE coefficient was used to adjust the engineering estimate of kWh savings per fixture for each measure. By aggregating this information for each measure category and taking an average, we derived an estimate of energy savings per fixture for each measure category. A simple product of the number of fixtures and the kWh savings per fixtures resulted in our estimate of total kWh savings.

The three SCE surveys covered adoptions taking place from 1995 through the first half of 1997. Therefore it was necessary to distribute the total kWh savings calculated for each survey over the years it covered. This not only gave meaning to our estimate of energy savings, but also revealed trends in the adoption data. The method we used to distribute the adoptions over the period was the same as the method used in the Total Market Effects Analysis. Specifically, the adoption rates experienced over the most recent two years were interpreted as reflective of population adoption rates for these two years. For the third year back, we used the average rate experienced over the entire period covered by the survey.

Results

Although there was no DSM program in New York at the time of the survey, there had been one in place that was phased out in 1993, and there were significant rebated adoptions in the survey data. Exhibit 4.5.3-1 reflects both rebated and non-rebated adoptions.

Exhibit 4.5.3-1
New York SCE Survey Analysis
Rebated and Non-Rebated Lighting Adoptions, 1995-1997

	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
New York: All Adoptions									
Technology Group									
Fluorescents									
Standard Flourescents	2.74%	7,418	-	2.88%	7,789	-	3.70%	10,015	-
T-8 Lamp & Ballasts	1.92%	642,469	67,976,638	2.02%	674,592	71,375,470	2.60%	867,333	91,768,462
Electronic Ballasts	0.32%	33,988	2,569,688	0.34%	35,688	2,698,173	0.44%	45,884	3,469,079
Efficient Lamp Conversions	1.81%	127,487	2,019,558	1.91%	133,861	2,120,536	2.45%	172,108	2,726,404
Total Fluorescents	6.80%	811,362	72,565,885	7.14%	851,931	76,194,180	9.18%	1,095,339	97,963,945

Exhibit 4.5.3-2 reflects only non-rebated adoptions. A comparison to the data shown above reveals that a notable portion of New York adoptions were rebated adoptions. In addition, there are significant portions of T-8 lamp and ballast adoptions.

Exhibit 4.5.3-2
New York SCE Survey Analysis
Non-Rebated Lighting Adoptions, 1995-1997

	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
NEW YORK: Non-Rebated Installations									
Technology Group									
Fluorescents									
Standard Flourescents	1.88%	40,426	-	1.98%	42,447	-	2.54%	54,575	-
T-8 Lamp & Ballasts	1.92%	158,036	16,721,076	2.02%	165,938	17,557,130	2.60%	213,349	22,573,453
Electronic Ballasts	0.57%	74,418	5,626,386	0.59%	78,139	5,907,705	0.76%	100,464	7,595,621
Efficient Lamp Conversions	2.26%	191,425	3,032,424	2.37%	200,997	3,184,045	3.05%	258,424	4,093,772
Total Fluorescents	6.63%	464,305	25,379,886	6.96%	487,520	26,648,880	8.95%	626,812	34,262,845

Georgia has somewhat lower overall adoption rates than New York (non-rebated) as shown in Exhibit 4.5.3-3. However the overall energy savings in Georgia is higher, this is due to larger installations of T-8 lamps and ballasts and, in particular, efficient lamp conversions.

Exhibit 4.5.3-3
Georgia SCE Survey Analysis
Lighting Adoptions, 1995-1997

	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
GEORGIA									
Technology Group									
Fluorescents									
Standard Flourescents	3.41%	164,539	-	4.35%	209,787	-	5.04%	242,695	-
T-8 Lamp & Ballasts	1.22%	181,358	19,188,612	1.56%	231,231	24,465,480	1.80%	267,503	28,303,203
Electronic Ballasts	0.17%	74,329	136,456	0.22%	2,301	173,981	0.26%	2,662	201,273
Efficient Lamp Conversions	1.13%	972,810	15,410,553	1.45%	1,240,333	19,648,455	1.67%	1,434,895	22,730,566
Total Fluorescents	5.94%	1,393,036	34,735,621	7.58%	1,683,652	44,287,917	8.77%	1,947,754	51,235,041

Louisiana has the lowest overall adoption rates, and by far the highest proportion of standard adoptions as shown in Exhibit 4.5.3-4. For each year, total energy savings in Louisiana is less than five times smaller than the energy savings in Georgia, and about 4 times lower than New York.

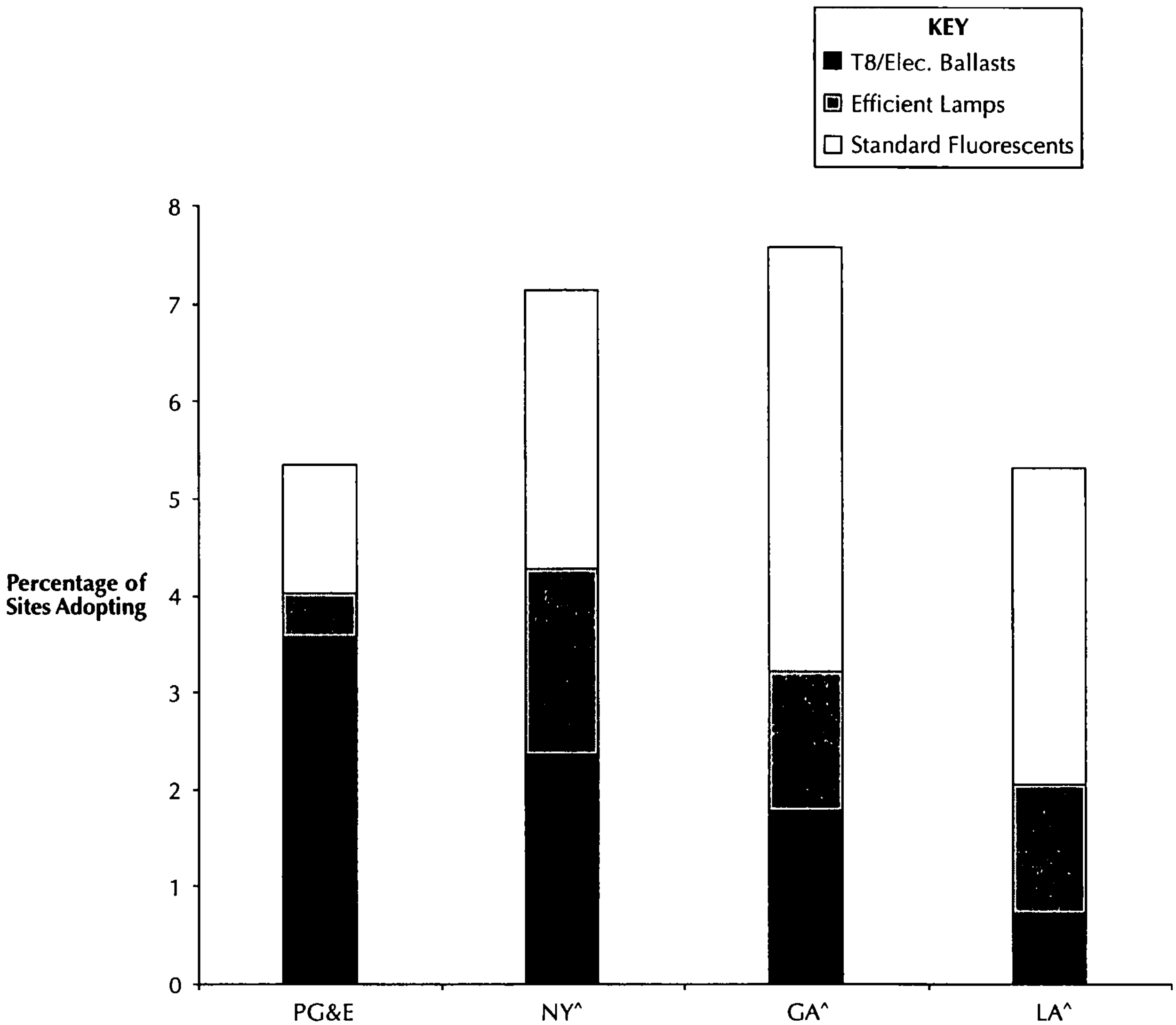
Exhibit 4.5.3-4
Louisiana SCE Survey Analysis
Lighting Adoptions, 1995-1997

	1995 Adoption Rate	1995 Fixtures Installed	1995 kWh Savings	1996 Adoption Rate	1996 Fixtures Installed	1996 kWh Savings	1997 Adoption Rate	1997 Fixtures Installed	1997 kWh Savings
LOUISIANA									
Technology Group									
Fluorescents									
Standard Flourescents	2.67%	105,598	-	3.27%	129,358	-	4.75%	187,437	-
T-8 Lamp & Ballasts	0.60%	29,399	3,110,572	0.73%	36,014	3,810,450	1.06%	52,183	5,521,265
Electronic Ballasts	0.00%	0	0	0.00%	0	0	0.00%	-	-
Efficient Lamp Conversions	1.08%	114,833	1,819,107	1.32%	140,671	2,228,407	1.91%	203,829	3,228,916
Total Fluorescents	4.35%	249,831	4,929,679	5.33%	306,043	6,038,857	7.72%	443,449	8,750,180

Comparison by State and Technology

Exhibits 4.5.3-5 through 4.5.3-8 highlight the differences between the three out of state territories: New York, Louisiana and Georgia; and compare these groups to PG&E. For the sake of simplicity, comparisons are made over 1996 data. The first graph shown below is a comparison of 1996 adoption rates by technology. The data show that while PG&E does not have the highest overall adoption rate, it has the highest adoption rate for T-8 lamps and ballasts. Note the New York data reflect all adoptions, rebated and non-rebated.

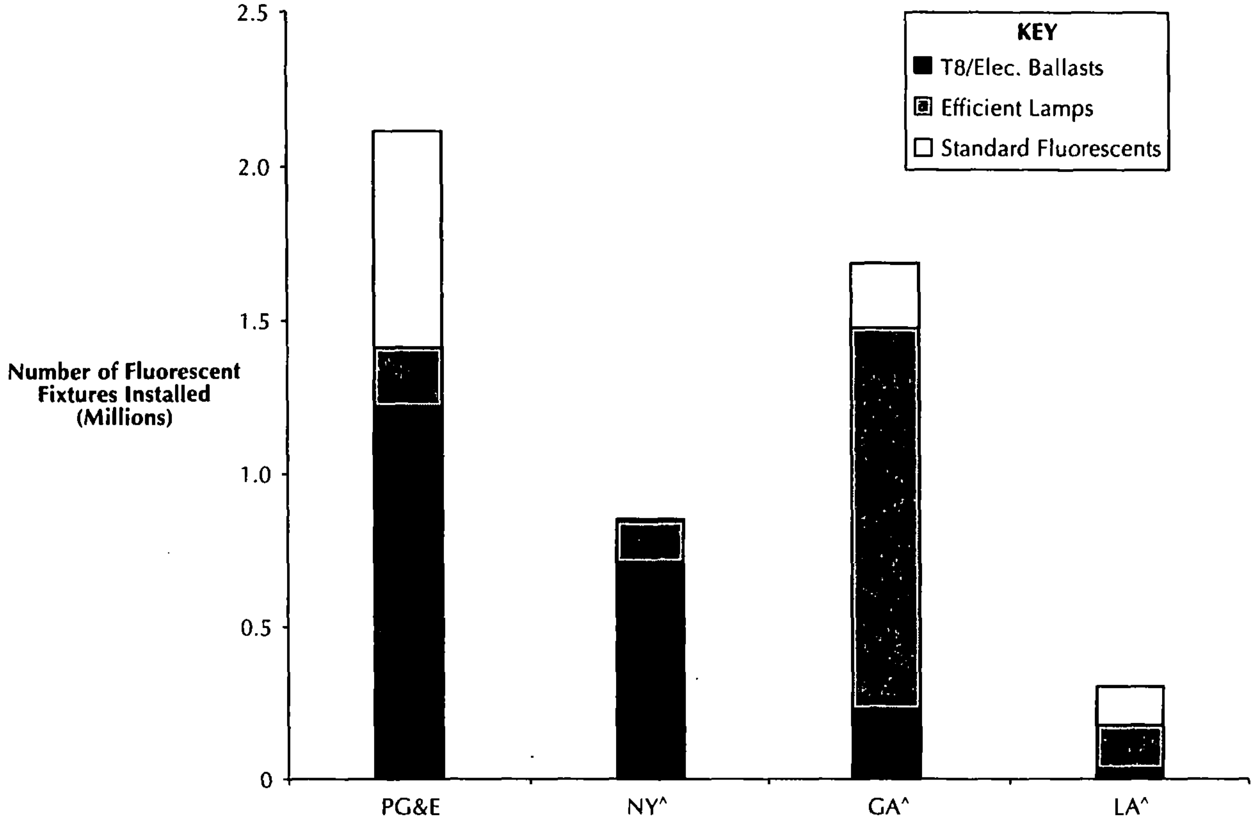
Exhibit 4.5.3-5
Comparison of 1996 Adoption Rates
Fluorescent Installations
By State & Technology



Note: Based on MDSS and self reports.
^ Normalized to the number of sites in PG&E's Service Territory.

A comparison of 1996 fixture installations reveals PG&E had by far largest number of fixtures installed overall. This is illustrated in Exhibit 4.5.3-5. Furthermore, the majority of fixtures installed in the PG&E service territory were T-8 lamps and ballasts. PG&E had significantly more T-8 fixtures than the other states. New York had the second highest number of T-8 fixture installations, reflecting the legacy of their DSM program.

Exhibit 4.5.3-6
Comparison of 1996 Fixture Installations
Fluorescent Installations
By State & Technology

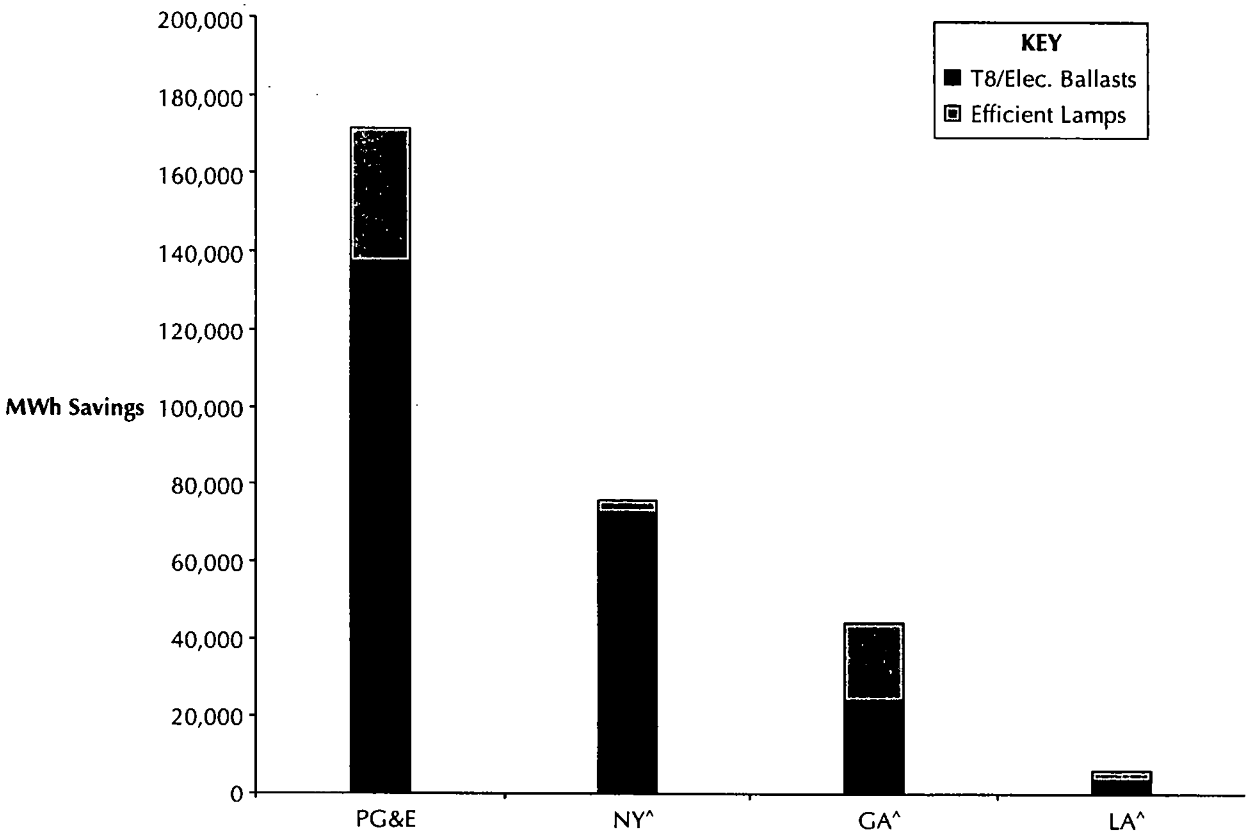


Note: Based on MDSS and self reports.
^ Normalized to the number of sites in PG&E's Service Territory.

The superior efficiency of the PG&E service territory is marked in Exhibit 4.5.3-7. Exhibit 4.5.3-7 shows 1996 energy savings associated with high efficiency fluorescent installations to be significantly higher in PG&E than any other territory. New York has the second highest energy savings[4], reflecting rebated adoptions, and perhaps some of its own market transformation. Georgia has significantly less energy savings than New York, but at least four times more than Louisiana.

[4] New York data reflect rebated and non-rebated installations.

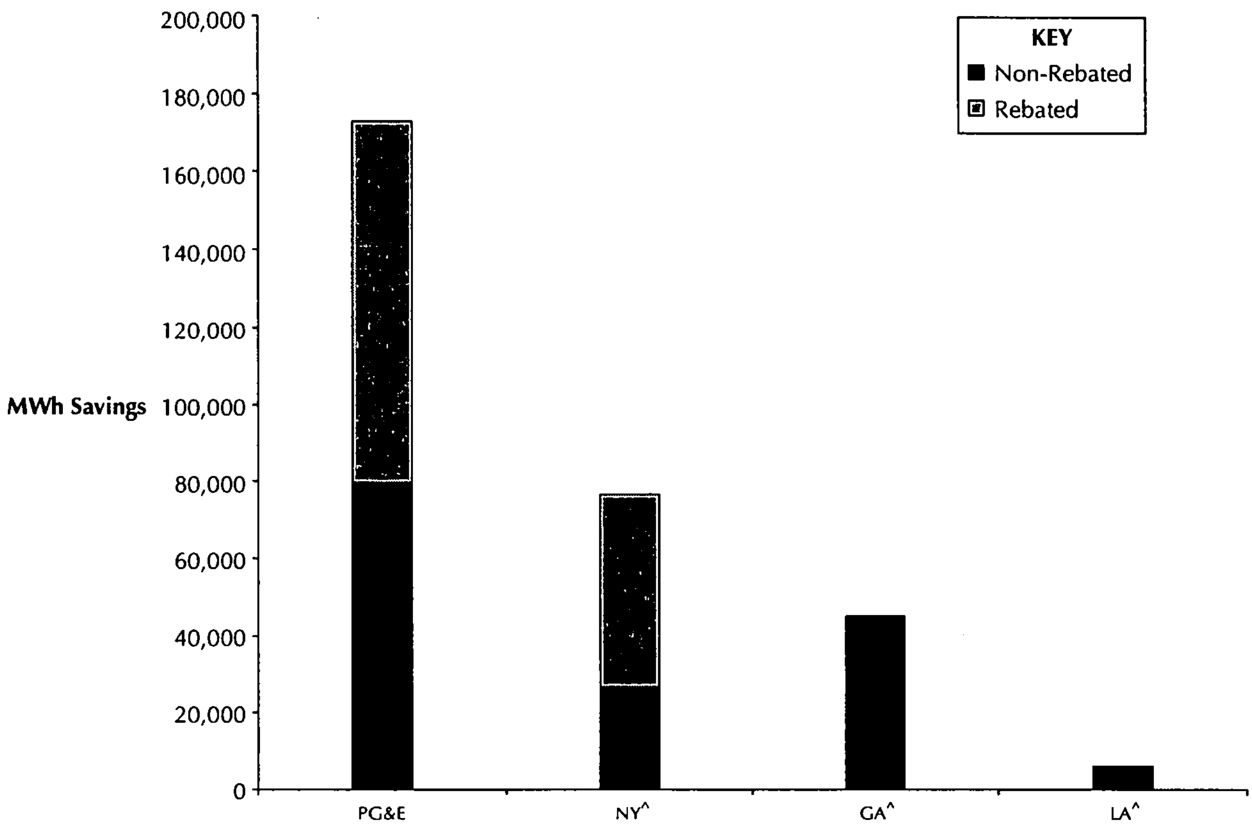
Exhibit 4.5.3-7
*Comparison of 1996 Energy Savings**
Associated with High Efficiency Fluorescent Installations, By State & Technology



* Based on MDSS, self reports, and 1994 Ex-Post kWh savings algorithms.
^ Normalized to the number of sites in PG&E's Service Territory.

Similar to the previous exhibit, Exhibit 4.5.3-8 is a comparison of 1996 energy savings associated with high efficiency fluorescent installations. However, the following graph shows what portion of this savings is due to rebated adoptions. It is clear from this graph that PG&E has substantially more energy savings associated with non-rebated adoptions than the other territories. The difference illustrates the clear presence of sizable market transformation.

Exhibit 4.5.3-8
*Comparison of 1996 Energy Savings**
Associated with High Efficiency Fluorescent
Installations, By State & Rebated Adoption



* Based on MDSS, self reports, and 1994 Ex-Post kWh savings algorithms.
^ Normalized to the number of sites in PG&E's Service Territory.

4.5.4 Using Georgia as Baseline to Estimate MTE

Due to the prior existence of a DSM program in New York, the New York market had its own market transformation component and would not serve as the ideal out-of-state baseline group. There were never any DSM programs in either Georgia or Louisiana, making both of these surveys better potential baseline groups. The Georgia survey seemed most appropriate for several reasons. First, the Georgia survey contained significantly more observation than the Louisiana survey, 778 versus 500. In addition, Louisiana appeared excessively low in terms of fixture installations and annual energy savings relative to both Georgia and New York. Thus, we felt that Georgia would make a better baseline group than Louisiana because the Louisiana data appeared disproportionate in the key area of high efficiency adoptions. Furthermore, in terms of average facility size and number of employees, Georgia, Louisiana, and New York are all fairly comparable. Finally, as will be shown in Section 5, a comparison of attitudes and awareness about energy related issues revealed all three states to be fairly comparable. Georgia was a moderate or "middle" choice from most perspectives.

In order to use Georgia as a baseline, we needed to correct for the fact that the Georgia data reflected only fluorescent lighting adoptions, and the PG&E data contained both fluorescent and other high efficiency lighting technology adoptions. To adjust for this incongruity, we assumed that the energy savings in Georgia from other high efficiency lighting adoptions were in the same proportion to PG&E as fluorescent lighting adoptions.

Annual Market Transformation Effects Ratio –Georgia Baseline

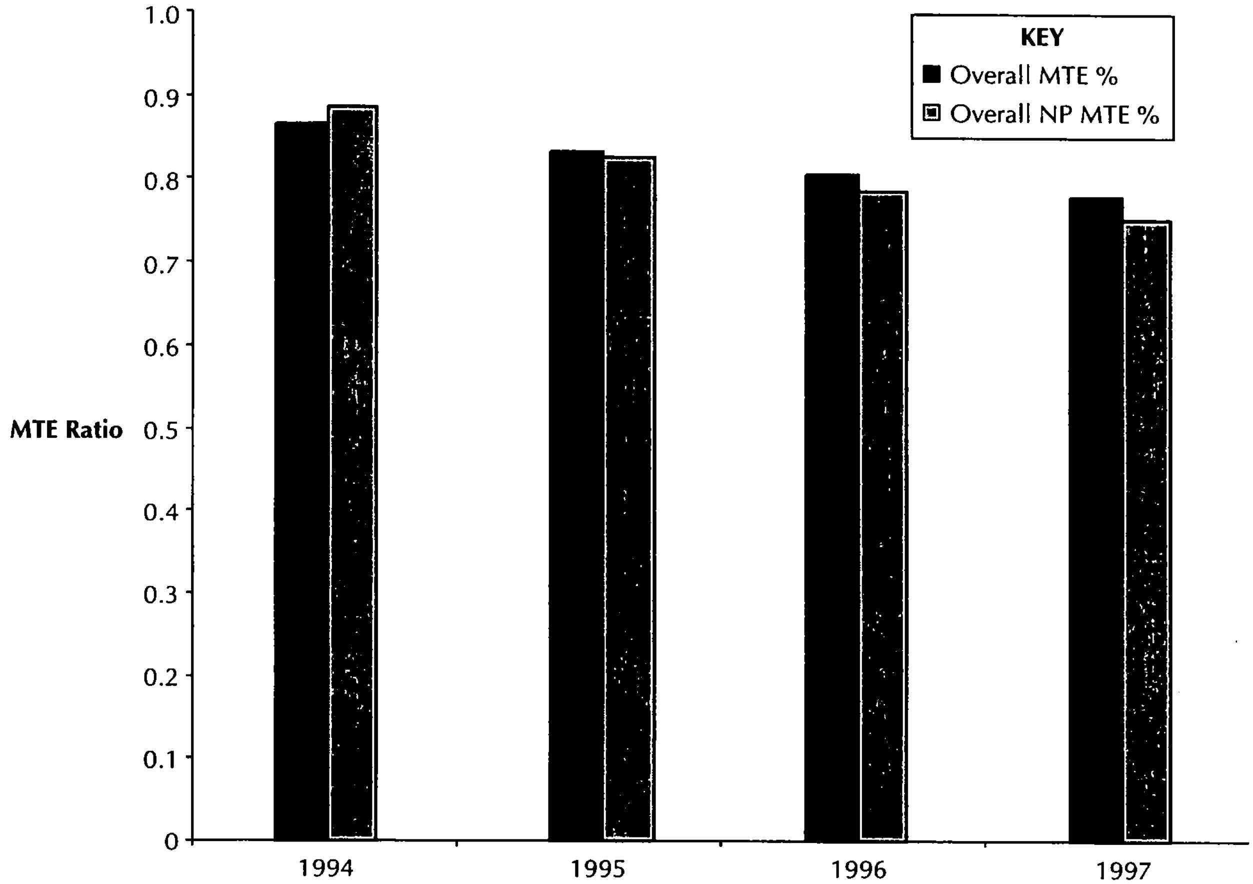
<u>All Measures</u>

Using Georgia as a proxy for natural conservation enabled us to identify market transformation effects within the PG&E service territory from 1994 through 1997. All energy savings from high efficiency lighting adoptions in the PG&E service territory in excess of natural conservation is market transformation. The percentage of total energy savings that is market transformation is referred to as the "Market Transformation Effects Ratio" (MTE ratio). The total market effects are the results of the analysis presented in section 4.4.2, Self-Report Market Effects Analysis. Exhibit 4.5.4-1 presents the MTE ratio annually for the total population, as well as for nonparticipants only.

The MTE ratio for nonparticipants is the portion of nonparticipant load impact that can be attributed to the Lighting Program. The portion attributable to the program is the total nonparticipant load impact minus the nonparticipant portion of natural conservation. Nonparticipant natural conservation can be identified by subtracting free-ridership (participant natural conservation) from total natural conservation. In sum, total nonparticipant load impact minus the nonparticipant portion of natural conservation, divided by total nonparticipant load impact yields the nonparticipant MTE ratio.

The MTE ratio for the whole population is fairly comparable to the MTE ratio for the nonparticipant population. Both ratios are declining over time. This is due to a faster rate of growth in natural conservation than in overall total market effects. The MTE ratio for the whole population is 86% in 1994, and drops to 78% in 1997. The Nonparticipant MTE ratio is 88% in 1994, and drops more significantly over the period, reaching 74% in 1997.

Exhibit 4.5.4-1
PG&E's Annual Market Transformation Effects Ratio
All Measures
Georgia Baseline

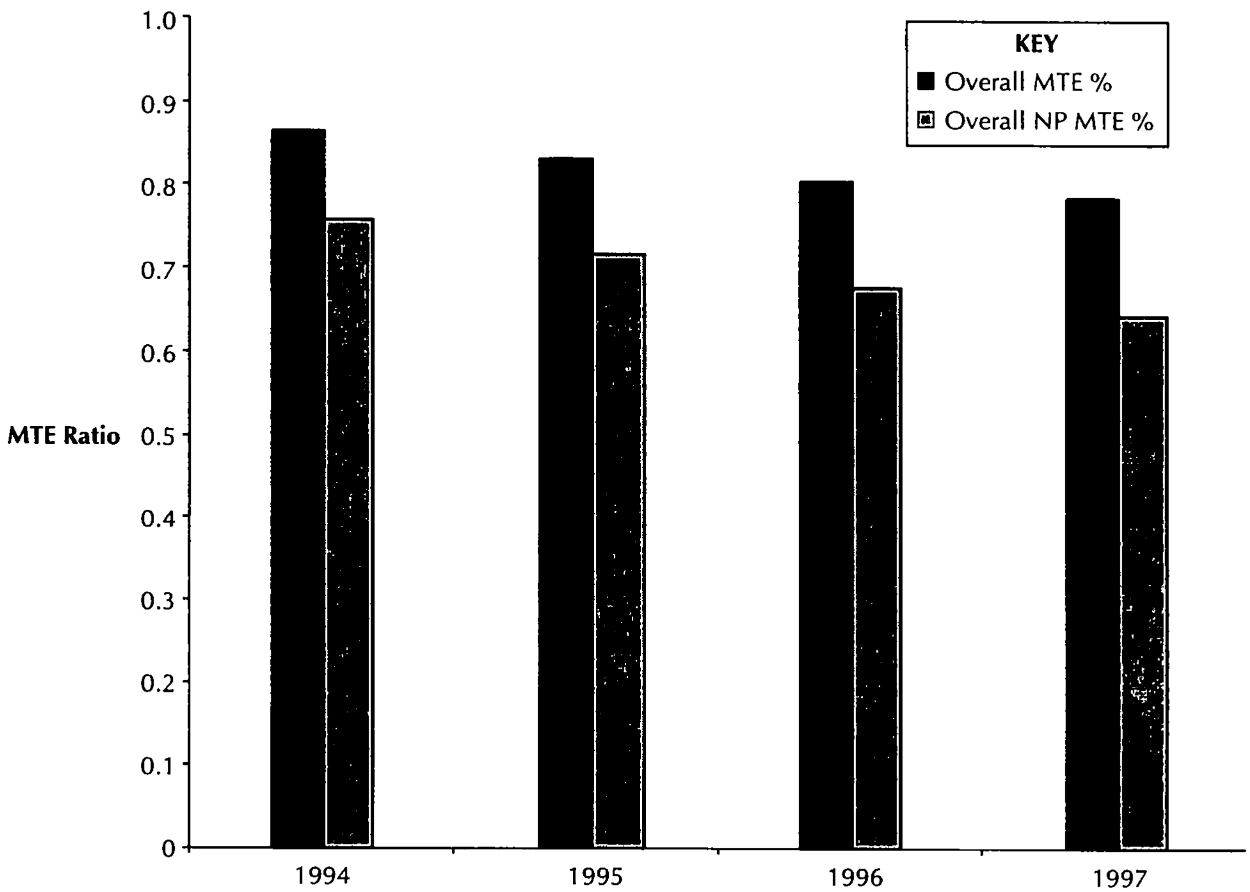


Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

<u>All Fluorescent Technologies</u>

Exhibit 4.5.4-2 is similar to Exhibit 4.5.4-1, except that it reflects only fluorescent lighting technologies. Within fluorescent lighting technologies, the MTE ratio for the whole population is noticeably higher than for the nonparticipant population. Both ratios decline over time. The nonparticipant ratio falls measurably; from 76% in 1994 to 64% in 1997. The MTE ratio for the whole population declines more moderately, falling from 86% in 1994 to 78% in 1997.

Exhibit 4.5.4-2
PG&E's Annual Market Transformation Effects Ratio
All Fluorescent Technologies
Georgia Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

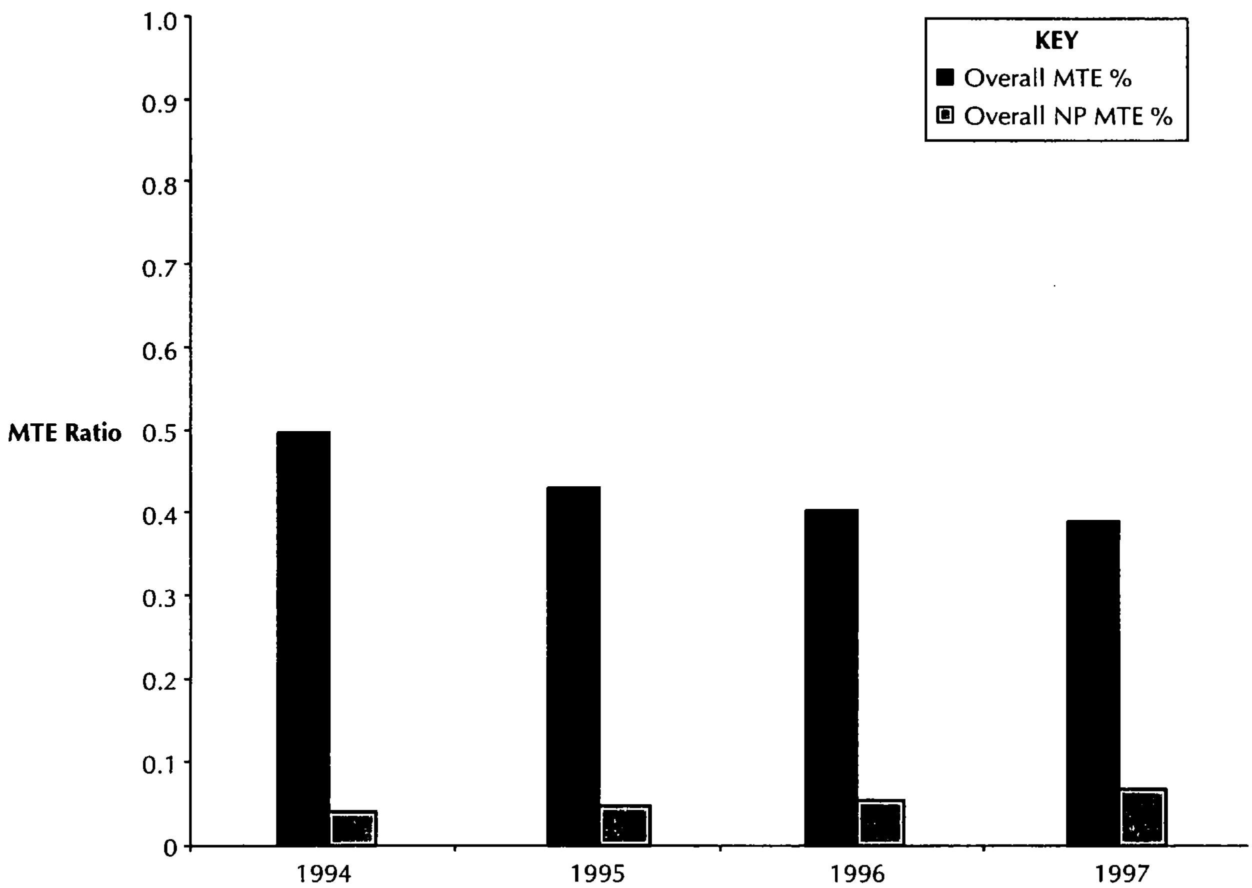
4.5.5 Using California as Baseline to Estimate MTE

Data from PG&E service territory was used as an alternative baseline to estimate MTE. Specifically, we assumed that all adoptions for which the respondent claimed not to have been influenced by the program were due to natural conservation. That is, all non-rebated adoptions that could not be classified as self-reported spillover adoptions were treated as natural conservation adoptions. This approach markedly understates market transformation by ignoring all 'hidden market effects,' or the indirect influence of the program. However, using California as a baseline remains an interesting exercise, because the results represent a lower bound for the estimation of MTE.

All Measures

Exhibit 4.5.5-1 presents the MTE ratio annually for the total population, as well as for nonparticipants only. For the total population, the portion of total market effects attributable to the program is calculated by summing the load impact from rebated adoptions, participant spillover, and nonparticipant spillover adoptions. Market transformation expressed as a percentage of total market effects is the overall MTE ratio for the population. The nonparticipant market transformation effect was calculated analogously to the method used for the 'Georgia as Baseline' analysis presented in Section 4.5.4 above. In this case, however, the portion attributable to the program includes only the nonparticipant spillover adoptions. Thus, the nonparticipant MTE ratio is the ratio of NP spillover to total non-rebated load impact (excluding participant spillover).

Exhibit 4.5.5-1
PG&E's Annual Market Transformation Effects Ratio
All Measures
Using California As a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

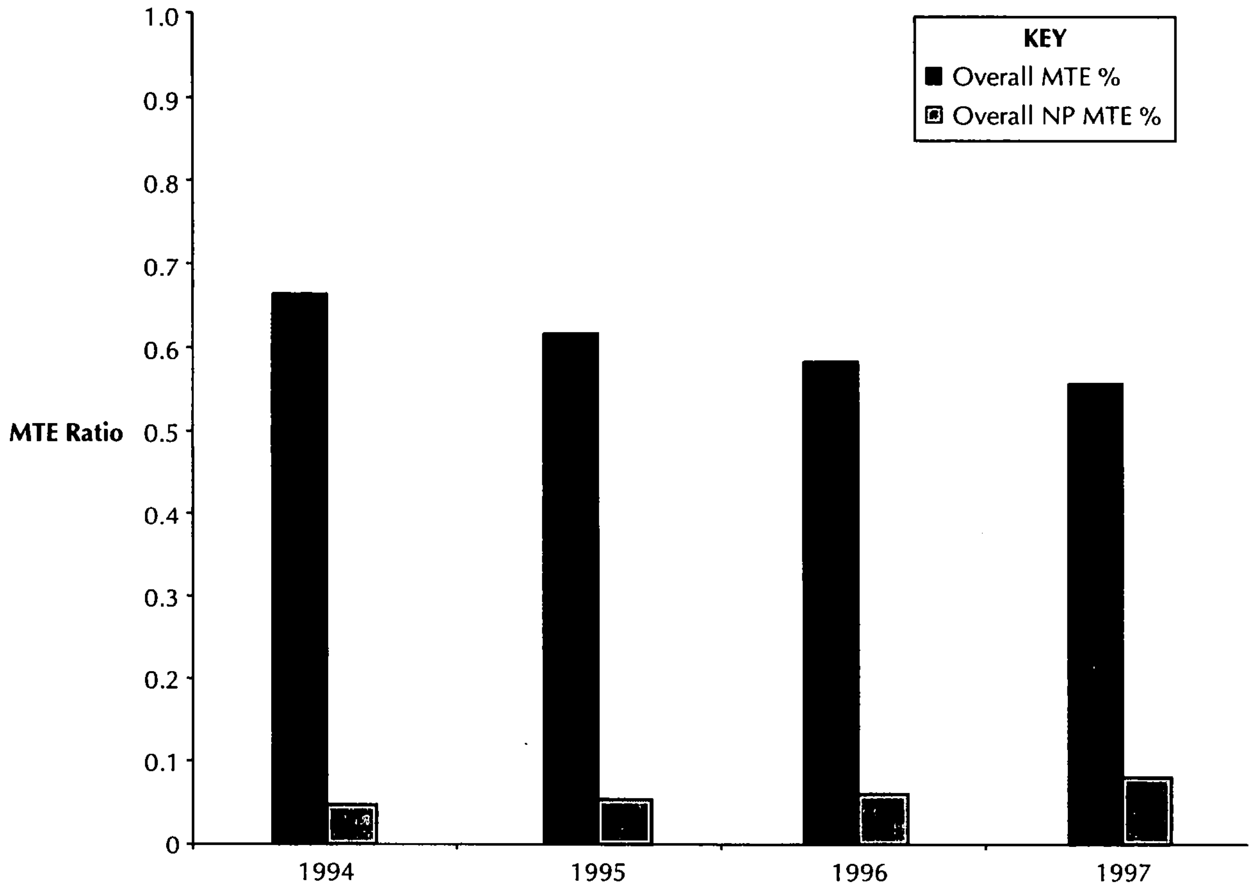
Using California non-rebated, non-spillover adoptions as a proxy for natural conservation resulted in modest estimates of annual market transformation effects ratios from 1994 through 1997. The MTE ratio for the whole population is highest in 1994, 49%. It falls notably over the period, reaching 39% by 1997. The drop-off is due primarily to a slower growth rate in rebated load impacts relative to natural conservation over the period.

The nonparticipant MTE ratio is significantly smaller than the population MTE ratio, about 16 times smaller in 1994. However, the gap narrows over the period, as the nonparticipant MTE ratio increases over the period while the population ratio declines. The nonparticipant MTE ratio is 4% in 1994, and climbs to 7% by 1997. The increase is due to growth over the period in nonparticipant spillover. As detailed in Section 4.4.3 (Self-Reported Spillover Analysis), nonparticipant spillover adoptions that occurred in 1994 contribute an annual load impact of 3.8 million kWh. In contrast, the nonparticipant spillover adoptions that occurred in 1997 contribute 10.2 million kWh of load impact each year.

<u>All Fluorescent Technologies</u>

Exhibit 4.5.5-2 is similar to Exhibit 4.5.5-1, except that it reflects only fluorescent lighting technologies. In general the MTE ratios are higher for fluorescent technologies than other technologies. The ratios follow similar patterns to those shown in Exhibit 4.5.5-1 for all measures. For fluorescent lighting technologies, the MTE ratio for the whole population is noticeably higher than for the nonparticipant population. The population MTE ratio is 66% in 1994, and falls to 56% in 1997. The nonparticipant ratio increases over the period from 4% in 1994 to 8% in 1997.

Exhibit 4.5.5-2
PG&E's Annual Market Transformation Effects Ratio
All Fluorescent Technologies
Using California As a Baseline



Note: Based on MDSS, self-reports, and 1994 Ex-Post kWh savings algorithms.

4.5.6 Comparison of Results: California versus Georgia Baseline

There is a remarkable difference in market transformation effects analysis results between using California as a baseline and using Georgia as a baseline. Using Georgia as a baseline indicates that over two thirds of all nonparticipant adoptions are due to market transformation. Moreover, over three-fourths of all high efficiency adoption are attributable to the program. In contrast, using California as a baseline would indicate that less than 10% of the nonparticipant adoptions are attributable to market transformation, and less than 50% of all high efficiency adoptions are due to the program. The difference between the two results can be explained by the 'hidden market effects' that are included using Georgia as a baseline, but ignored in the California baseline scenario.

It is certain that there are program impacts that are not captured in self reported spillover. The program has an influence on the market which does not leave customers conscious of the source of the influence. These are the "hidden market effects", and they take many forms. For example, the program influenced vendor stocking practices which will also would effect customer behavior. In addition, the program increased familiarity with high efficiency equipment for contractors, vendors and customers. Customer choices are influenced by easier access to information and equipment. However, these effects may not leave customers conscious of the source of the change. The magnitude of the hidden market effects is substantial. With the Georgia baseline, market transformation effects are over 10 times greater than the effects of self-reported spillover alone. For these reasons, we believe that the more accurate measure of market transformation is found using Georgia as a baseline.

5 PG&E VERSUS OUT-OF-STATE SAMPLE COMPARISON

5.1 OBJECTIVE OVERVIEW

The objective of this section is to provide a variety of comparisons between PG&E and out-of-state service territories. The comparisons can be divided into three general categories. First, we compare the "firmographic" characteristics of the samples. These include the average number of employees, average square foot area of facilities, etc. This type of comparison provides a foundation for the comparability of the samples. These comparisons reveal differences or similarities in the types of firms included in each survey. The second category consists of "attitudinal" comparisons. These comparisons are intended to reveal qualitative market transformation effects. That is, market transformation in the form of changed attitudes and perceptions about high efficiency lighting equipment. The third and final category consists of "behavioral" comparisons. These include comparisons of the degree to which high efficiency lighting technology has been incorporated into business facilities and management.

Four "non-program area" surveys were used for the comparisons. Three of which are the Southern California Edison surveys discussed in detail in Section 4.5 of this report. The fourth is a multi-state survey (excluding California) used in the Statewide Commercial Lighting Market Effects Study (Statewide Study) of April 8, 1998. For the most part, the firmographic and attitudinal comparisons incorporate data from all four surveys. The behavioral comparisons are between PG&E and the out-of-state survey from the Statewide Study ("out-of-state survey") only. When reviewing the comparisons presented in this section, please bear in mind that until the early 1990s, New York had a DSM program similar to the CEEI Program.

A major result of this study is that substantial market transformation is shown within the PG&E service territory when out-of-state surveys are used as a baseline. Thus, the selection of a suitable out-of-state baseline is critical to high quality results. The firmographic and attitudinal comparisons will illustrate that the selection of Georgia as a baseline to measure market transformation effects was a prudent choice, as Georgia is a "middle-of-the-road" state from most perspectives.

5.2 FIRMOGRAPHIC COMPARISONS

This section presents "firmographic" comparisons across the samples. These include characteristics such as the average number of employees, average square foot area of facilities, etc. This type of comparison provides a foundation for the comparability of the samples. It is intended to reveal differences or similarities in the types of firms included in each survey. Please note that in the exhibits that follow the Statewide Study survey is referred to as "out-of-state".

Exhibit 5.2-1 is a comparison of the percentage of respondents who own their facility. This is an important characteristic because owners have a greater propensity to invest in high efficiency equipment and to participate in programs such as CEEI. Owners have a longer-term interest in their facilities than people who rent or lease. High efficiency lighting equipment has a long-term "pay-back" period, and therefore is more interesting to owners than people who rent or lease. The Exhibit shows that the rates of ownership in PG&E service territory relative to the Statewide Study's out-of-state territories are comparable. PG&E reveals an ownership rate of 55% vesus 65% out-of-state. The SCE surveys did not contain ownership information.

Exhibit 5.2-1
Firmographic Comparison to Out-of-State Samples
Percentage of Respondents Who Own Their Facility

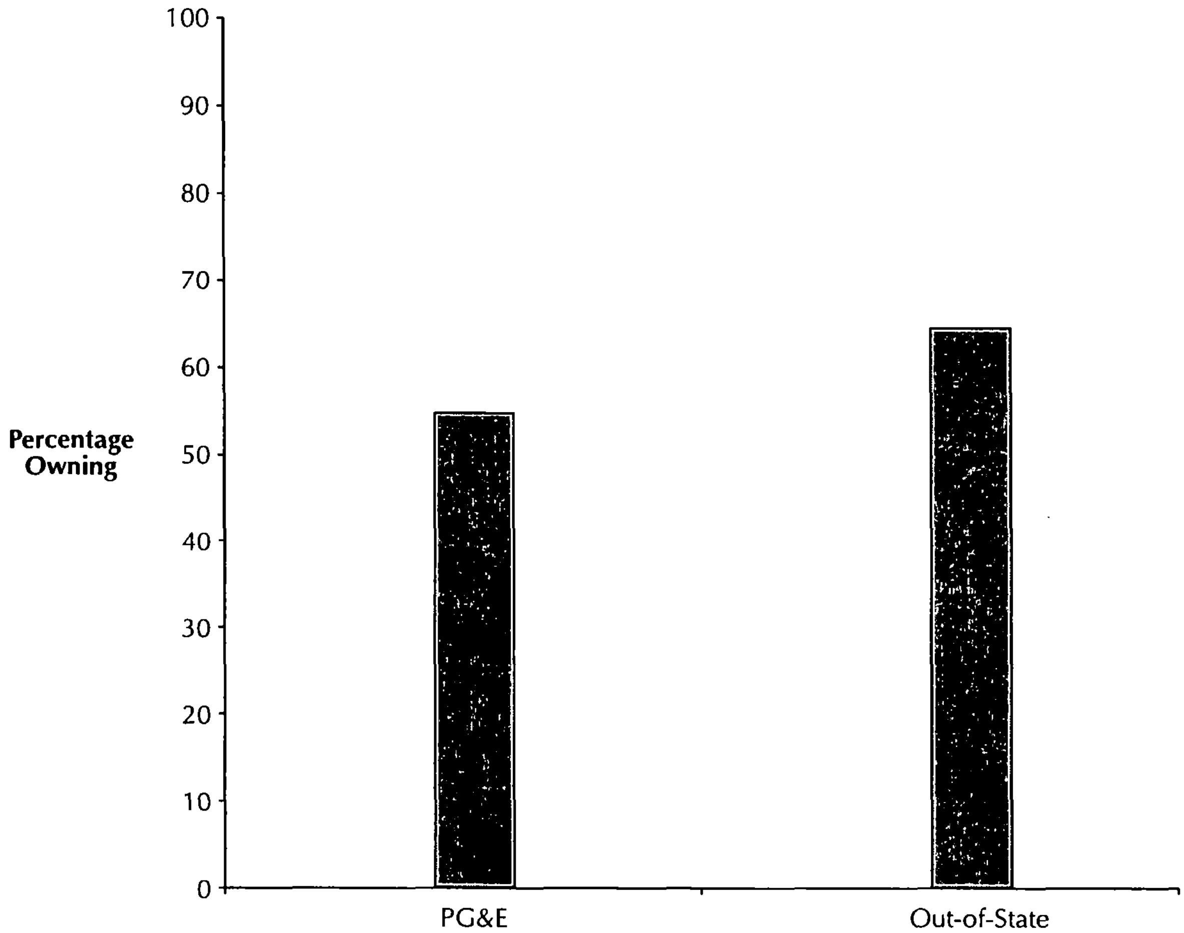
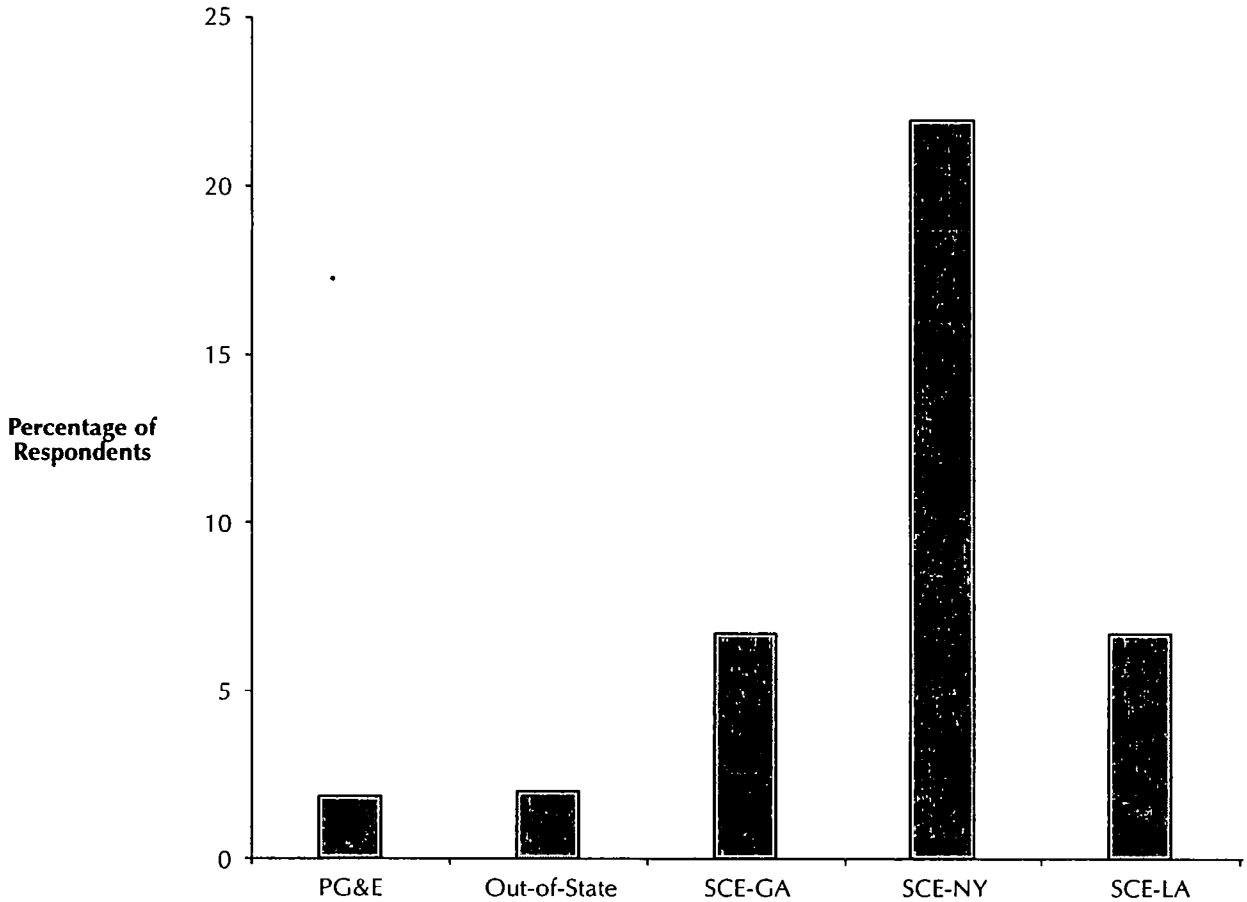


Exhibit 5.2-2 and 5.2-3 below present comparisons of the number of employees per facility in different survey territories. Exhibit 5.2-2 is a comparison of the percentage of respondents with over 100 employees. Exhibit 5.2-3 is a comparison of the mean and median number of employees. The number of employees is an important statistic because it reflects the size of the business and level of energy consumption. Larger facilities are more likely to have an interest in high efficiency lighting technology. One reason for this is that larger customers gain more substantial rewards quickly from high efficiency measures. In addition, larger businesses tend to have more capital available for investment in new equipment. The results of the probit model presented in section 3.3.2 were very supportive of this "size effect" hypothesis. The PG&E and Statewide out-of-state surveys, at about 2% each, have a smaller portion of facilities with over 100 employees than the SCE surveys. New York appears disproportionately high in

this regard, near 22%, while Georgia and Louisiana are both 7%. Exhibit 5.2-3 shows that the mean and median numbers of employees are very similar across the surveys. The out-of-state survey has a relatively small mean, and large median[1].

Exhibit 5.2-2
Firmographic Comparison to Out-of-State Samples
Percentage of Respondents with More Than 100 Employees



[1] The discrepancy between the mean and the median for the out-of-state survey is explained by a population weighting technique used to derive the mean, but not applicable to the median calculation.

Exhibit 5.2-3
Firmographic Comparison to Out-of-State Samples
Number of Employees, Mean and Median Comparison

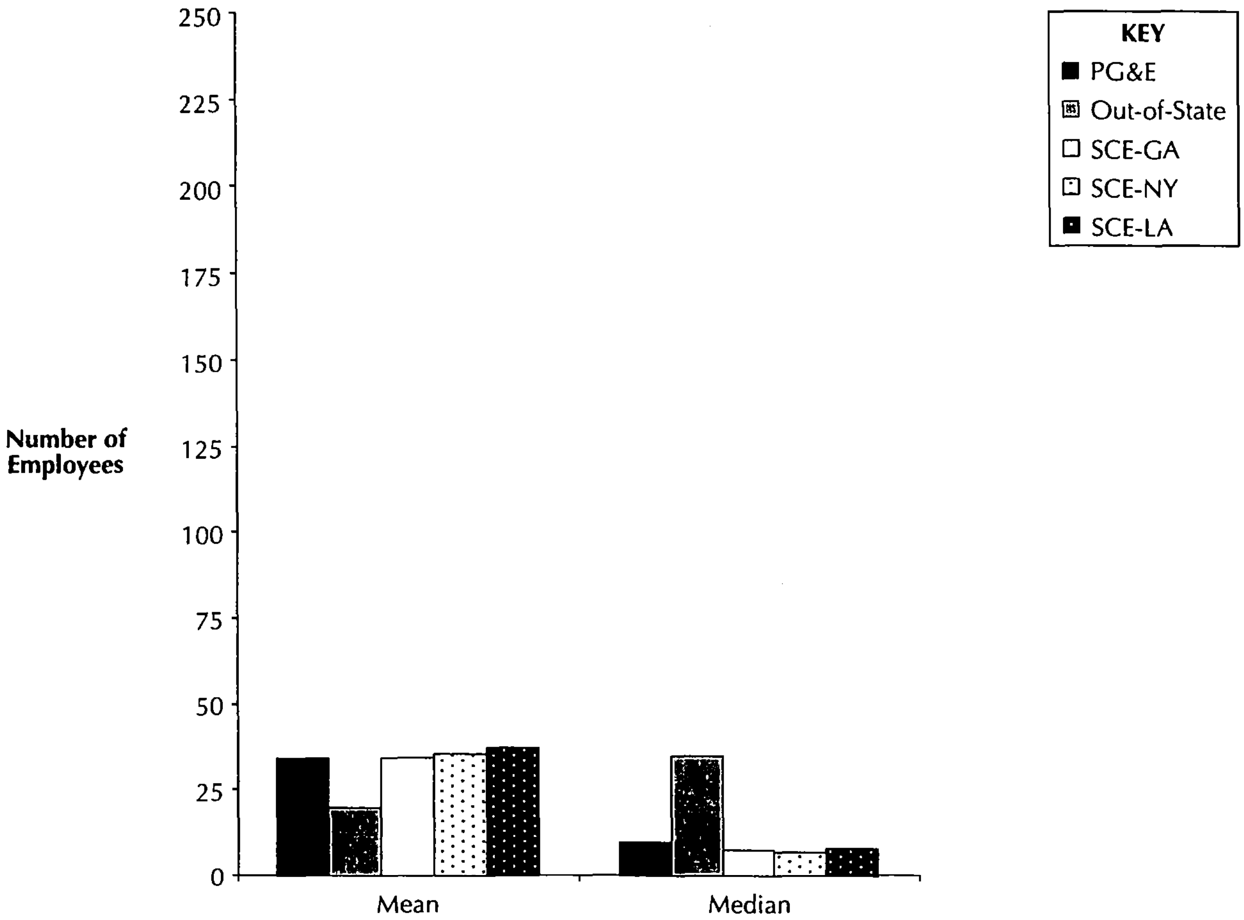


Exhibit 5.2-4 and 5.2-5 below present comparisons of the distribution of facility size in different survey territories. Exhibit 5.2-2 is a comparison of the percentage of respondents with over 50,000 square feet. Exhibit 5.2-3 is a comparison of the mean and median facility size. Similar to the number of employees, facility size is an indicator of the size of the company and the level of energy consumption. Larger facilities are more likely to have an interest in high efficiency lighting technology. Exhibit 5.2-3 shows that the percentage of respondents with over 50,000 square feet varies between about 5% and 22%, with PG&E at 8.1%. Exhibit 5.2-5 shows that the mean and median facility sizes are fairly uniform across the surveys. PG&E is somewhat smaller relative to the SCE surveys, but has a larger mean size than the Statewide out-of-state survey.

Exhibit 5.2-4
Firmographic Comparison to Out-of-State Samples
Percentage of Respondents with Over 50,000 Square Feet

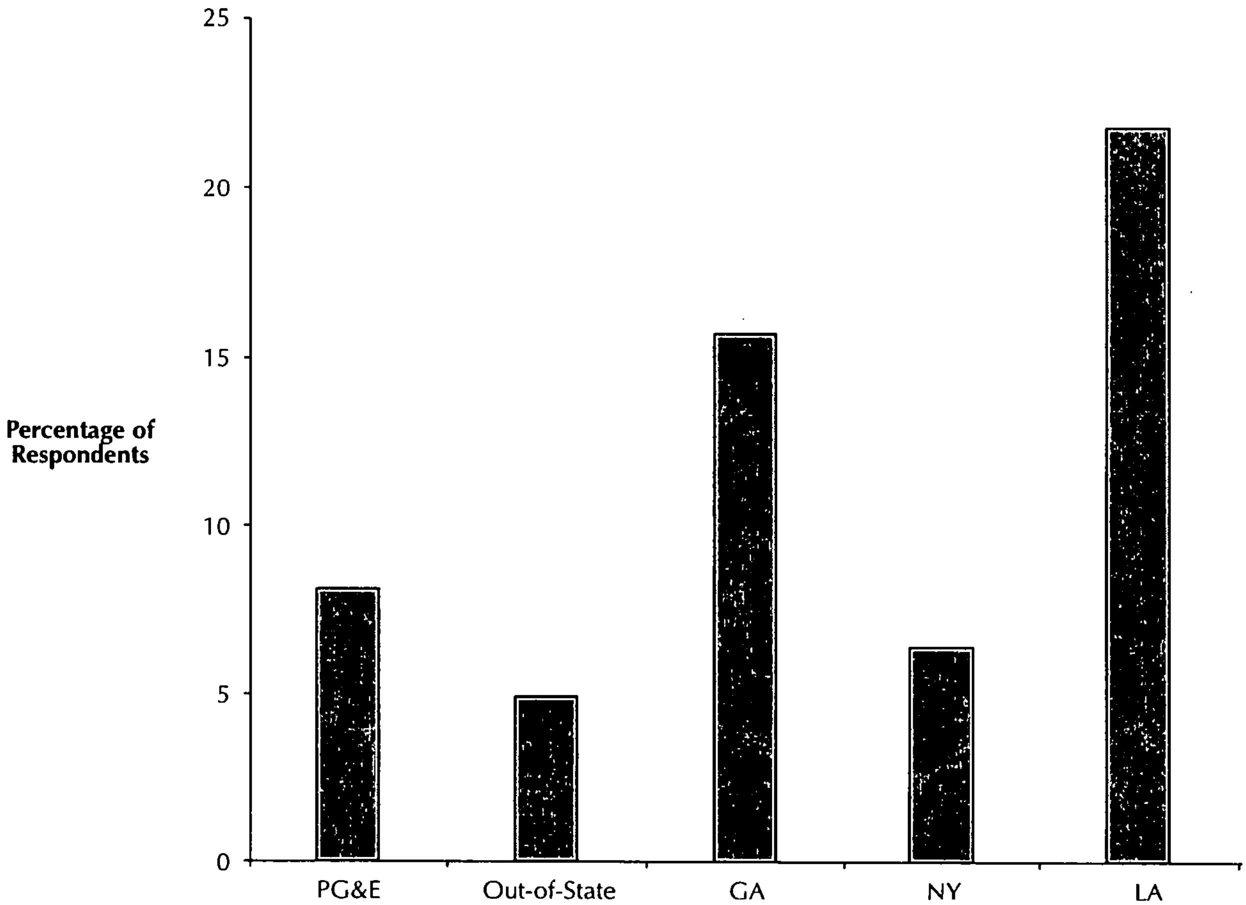
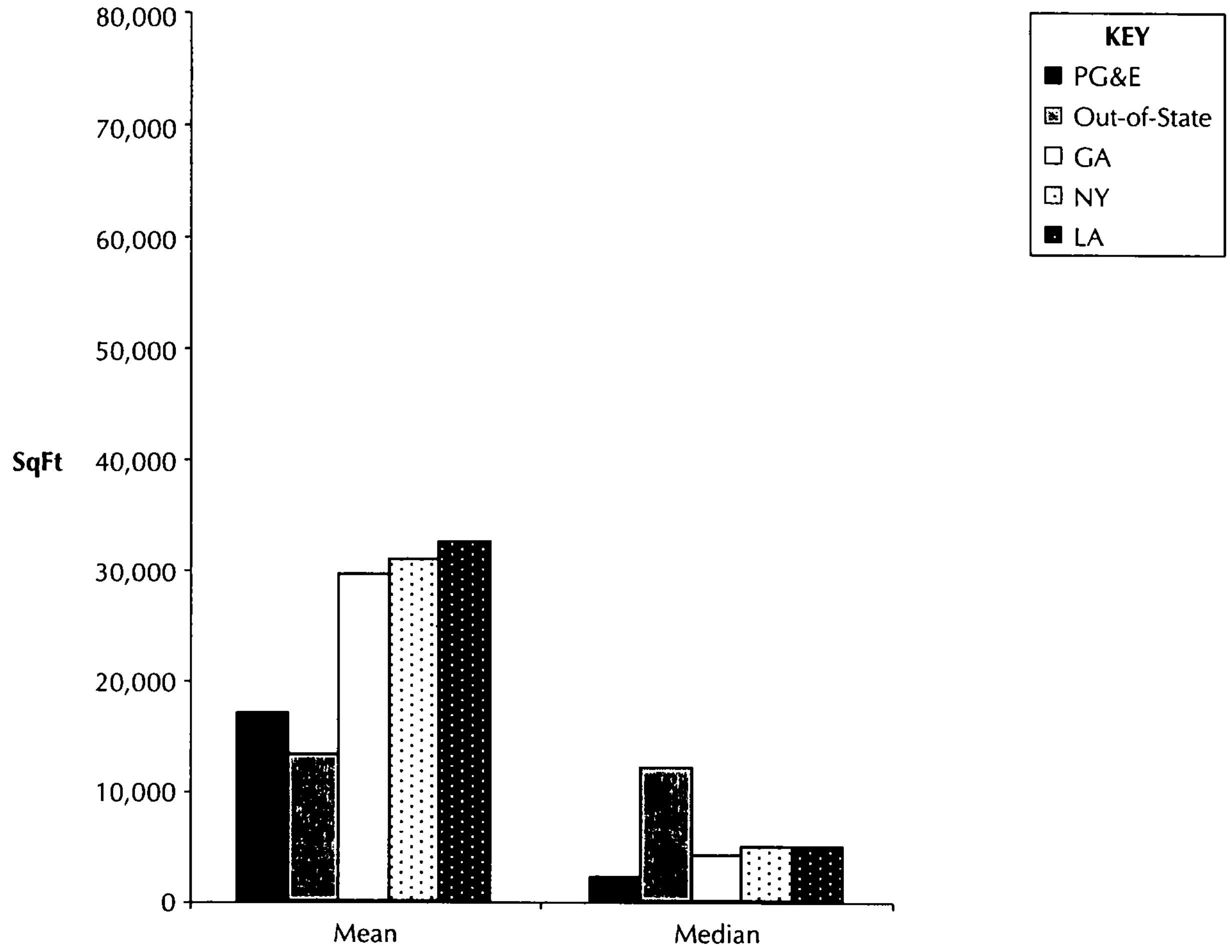


Exhibit 5.2-5
Firmographic Comparison to Out-of-State Samples
Facility Size in Square Feet, Mean and Median Comparison



5.3 ATTITUDINAL COMPARISON

These comparisons are intended to reveal qualitative market transformation effects. That is, these comparisons will contrast the attitudes and perceptions about high efficiency lighting equipment between PG&E and territories where there is no similar program. Survey data from the PG&E service territory is compared with the three SCE "out-of-program area" surveys. The Statewide survey did not include these attitudinal questions. Bear in mind that, although there is no DSM program in New York currently, there had been one in place until the early 1990s.

Exhibit 5.3-1 below shows the percentage of respondents who strongly agree with the statement "I am not familiar with high efficiency fluorescent lighting technologies." The exhibit reveals that the PG&E participants are the most familiar, and Louisiana respondents are the least familiar. PG&E nonparticipants, Georgia and New York respondents are all relatively comparable, with between about 32% and 42% strongly agreeing with the statement. PG&E nonparticipants and Georgia are very similar, 41% and 40% respectively.

Exhibit 5.3-1
Attitudinal Comparison to Out-of-State Samples
"I Am Not Familiar with High Efficiency
Fluorescent Lighting Technologies"

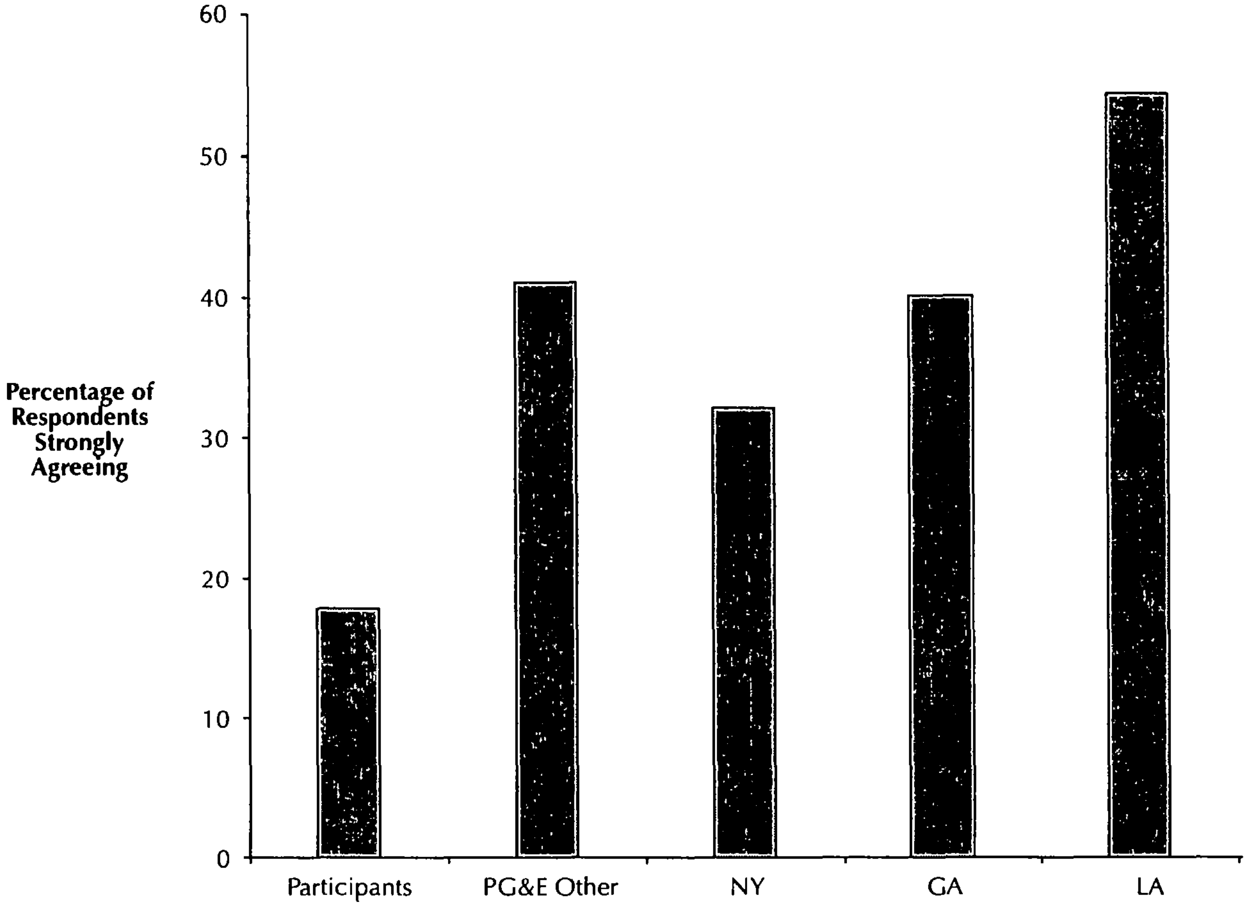


Exhibit 5.3-2 below is a comparison of the percentage of respondents who strongly agree with the statement "It is difficult to find high efficiency lighting technology in this area." The data show that customers in the PG&E service territory find it easier to find high efficiency lighting equipment. PG&E nonparticipants and Georgia are very similar, with 16.4% and 16.5% strongly agreeing, respectively.

Exhibit 5.3-2
Attitudinal Comparison to Out-of-State Samples
"It Is Difficult to Find High Efficiency Lighting Technology in This Area"

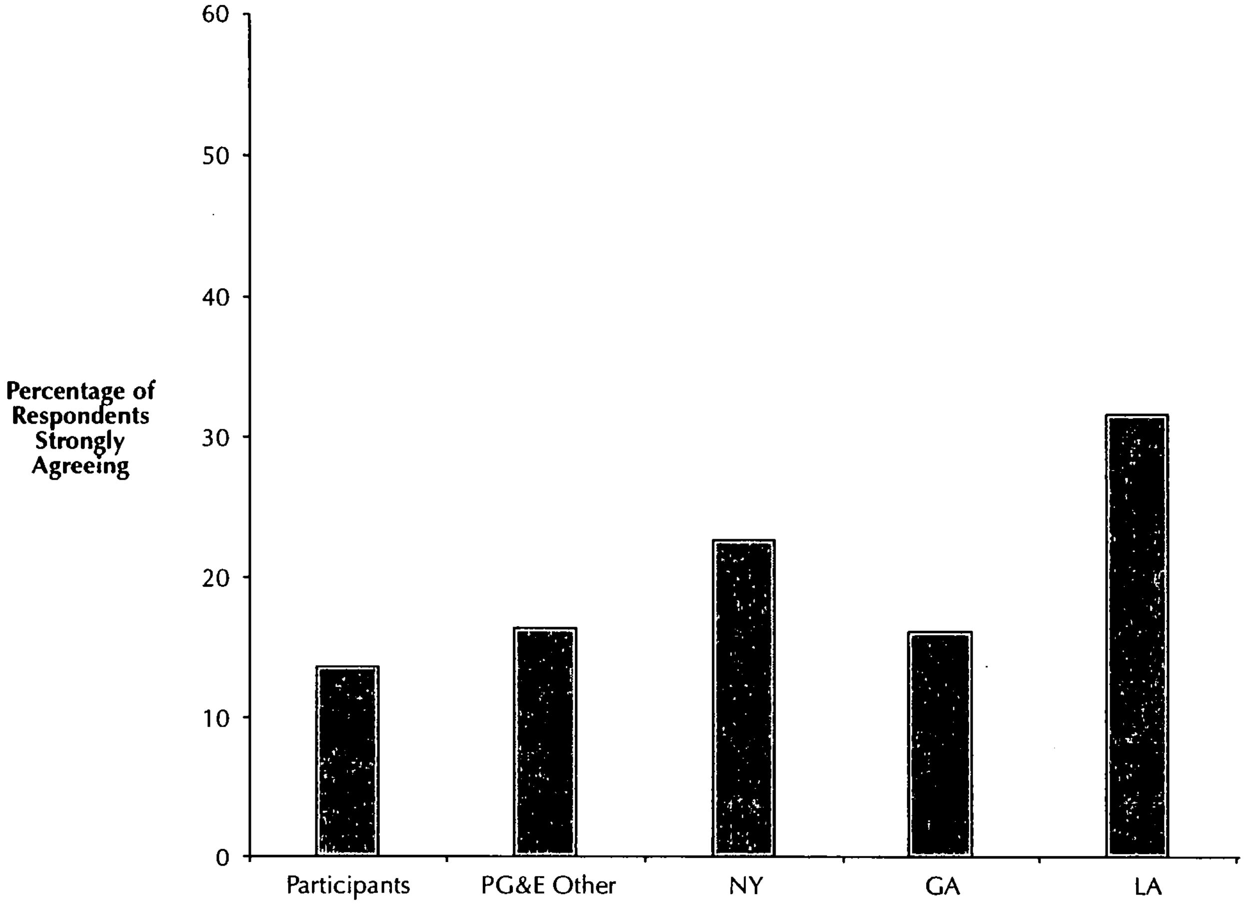


Exhibit 5.3-3 below is a comparison of the percentage of respondents that strongly agree with the statement "Acquiring high efficiency lighting equipment is more of a hassle than acquiring standard efficiency." The data show that PG&E customers find high efficiency equipment less of a hassle to obtain than respondents in out-of-state territories.

Exhibit 5.3-3
Attitudinal Comparison to Out-of-State Samples
"Acquiring High Efficiency Lighting Equipment is More of a Hassle Than Acquiring Standard Efficiency"

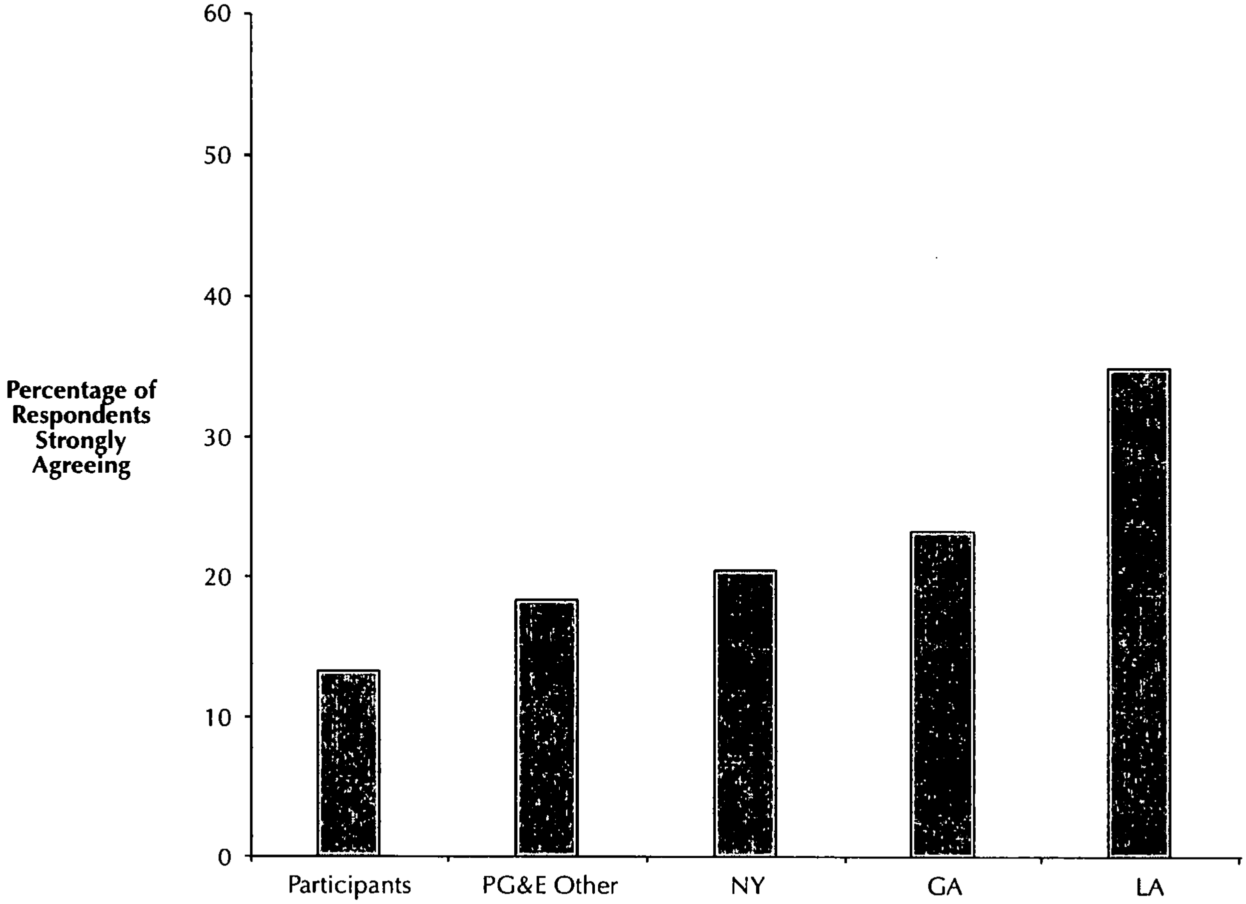


Exhibit 5.3-4 below is a comparison of the percentage of respondents that strongly agree with the statement "High efficiency lighting equipment has performance problems." The data show that the PG&E participants have the strongest perceptions of performance problems. This is likely to be a result of the implementation of some immature high efficiency lighting technologies. Most high efficiency lighting equipment performance problems have been resolved. The difference between PG&E participants and other survey groups are not very substantial. The percent that strongly agree varies from 10% (PG&E nonparticipants) to 15% (PG&E participants).

Exhibit 5.3-4
Attitudinal Comparison to Out-of-State Samples
"High Efficiency Lighting Equipment Has Performance Problems"

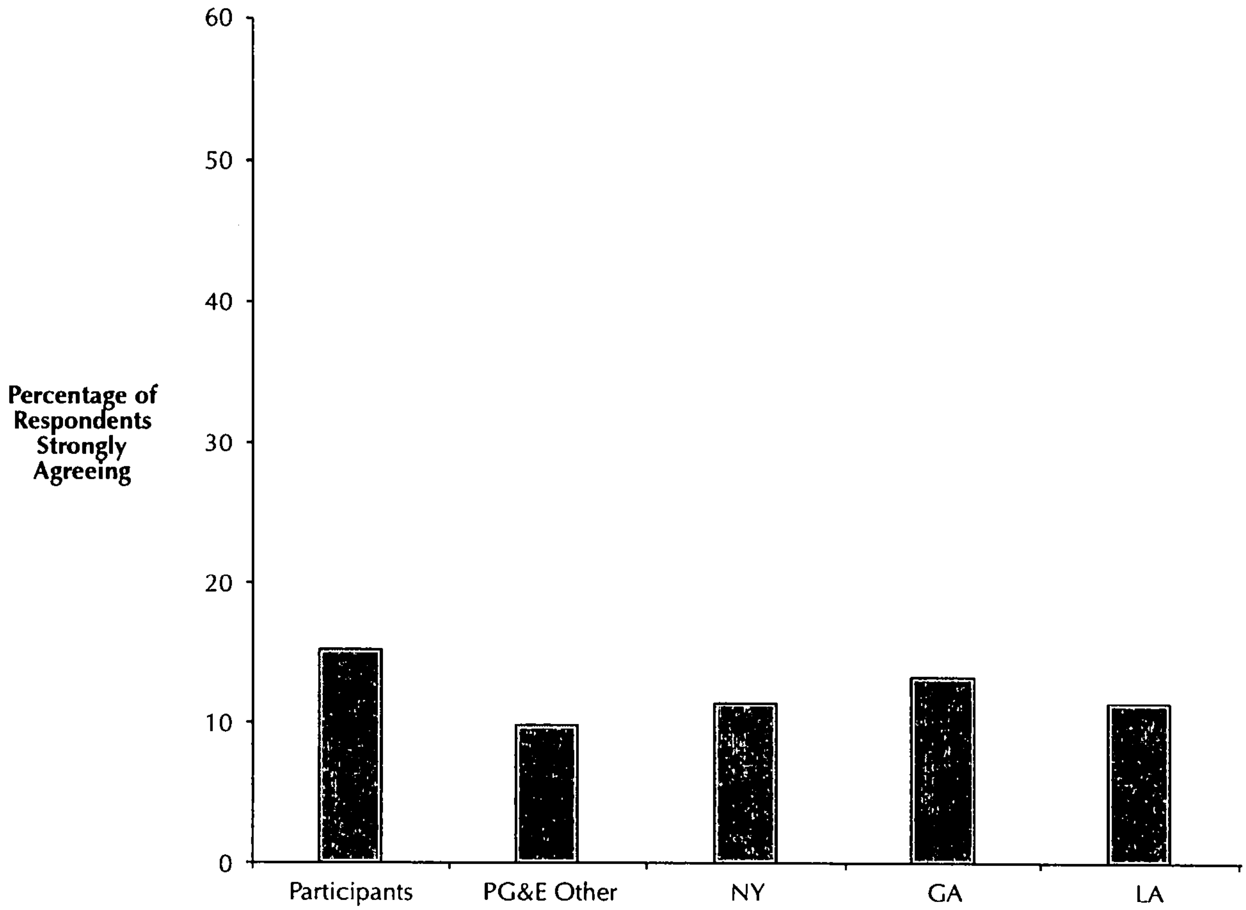


Exhibit 5.3-5 below is a comparison of the percentage of respondents who strongly agree with the statement "The initial investment for high efficiency lighting technology is too great." The data are quite similar across all survey groups. The percentages that strongly agree vary from 21% in Georgia to 27% for the PG&E nonparticipants. The PG&E participants were not asked to answer this question 'as if' the CEEI program did not exist. Thus, the Lighting Program would explain their perception that the costs are not too high.

Exhibit 5.3-5
Attitudinal Comparison to Out-of-State Samples
"The Initial Investment for High Efficiency Lighting Technology Is Too Great"

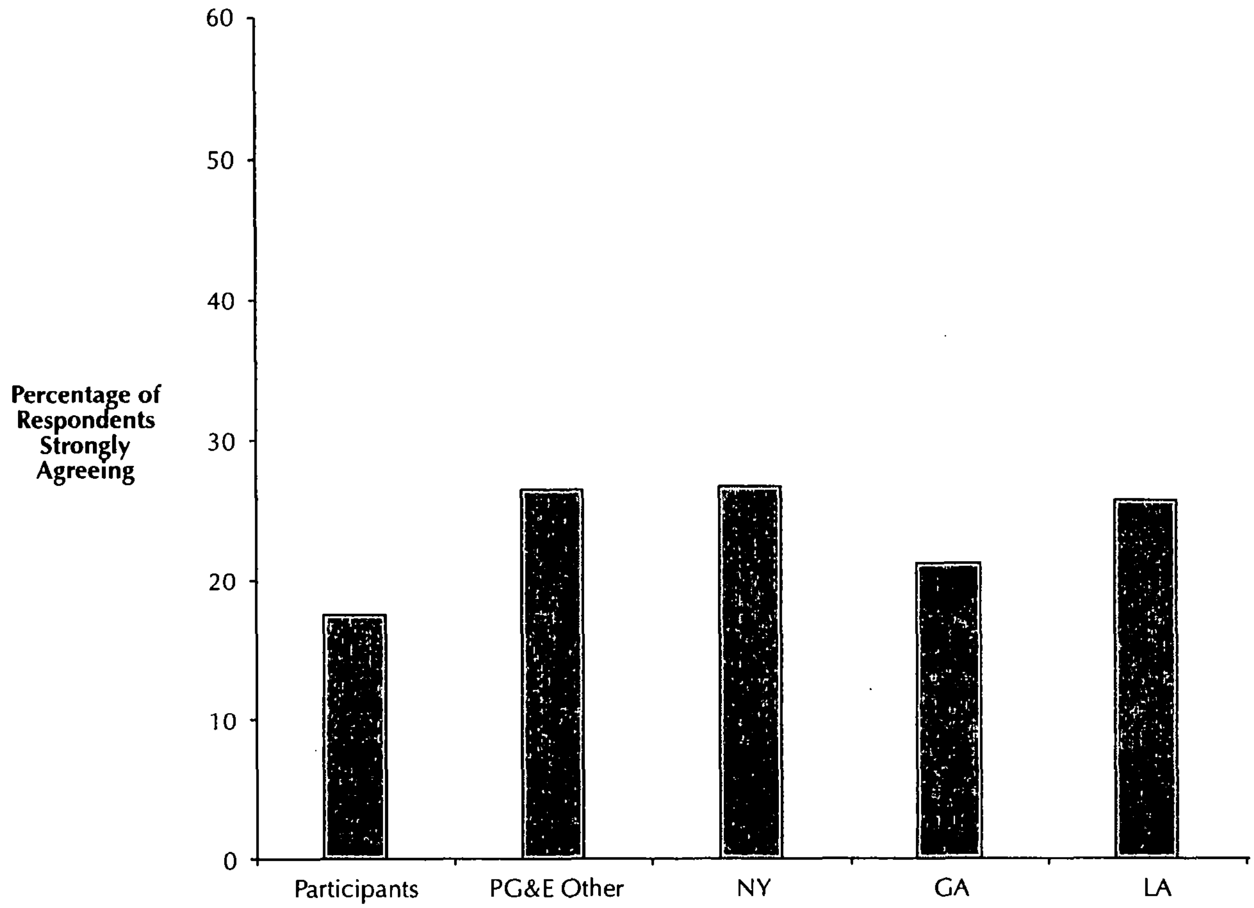
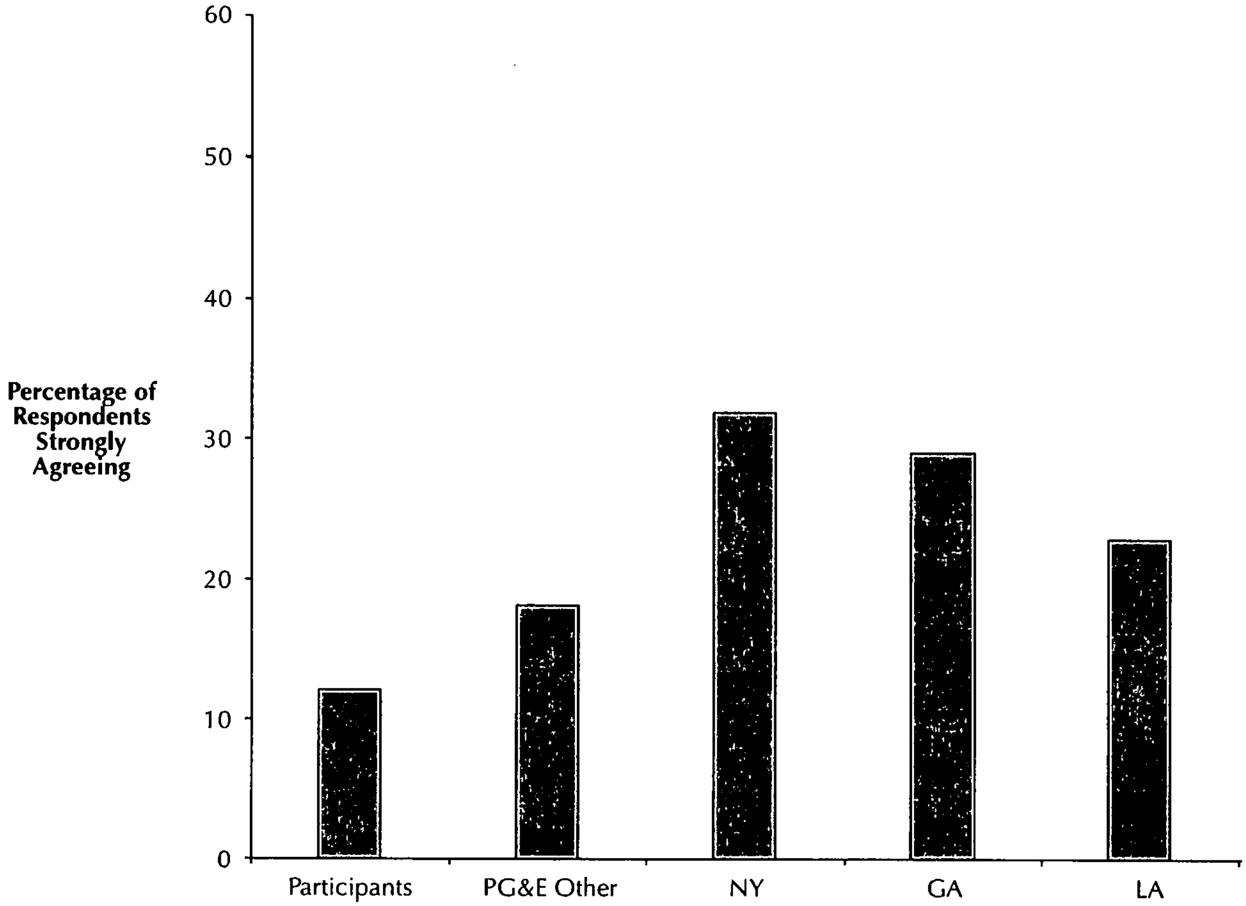


Exhibit 5.3-6 below is a comparison of the percentage of respondents who strongly agree with the statement "Our purchasing department procedures do not accommodate high efficiency lighting equipment." The exhibit shows that businesses within the PG&E territory are much more accommodating to high efficiency technologies than the other survey territories.

Exhibit 5.3-6
Attitudinal Comparison to Out-of-State Samples
"Our Purchasing Department Procedures Do Not Accommodate High Efficiency Lighting Equipment"



5.4 BEHAVIORAL COMPARISONS

The behavioral comparisons presented in this section are intended to characterize differences in the way firms conduct themselves on issues relating to energy efficiency, and in particular, relating to high efficiency lighting technologies. These comparisons are intended to capture the degree to which high efficiency lighting technology has been incorporated into business facilities and management. Data from the PG&E service territory is compared with the Statewide Study's out-of-state survey. The SCE surveys are not included in these comparisons because analogous data was not available.

Exhibits 5.4-1 below shows the percentage of organizations that have assigned responsibility for controlling energy use to an individual or group. The exhibit compares PG&E customers to the Statewide out-of-state survey respondents. The survey samples are compared in three categories: all respondents, high efficiency adopters and standard efficiency adopters[2]. The exhibit shows that PG&E customers are more likely to have assigned responsibility for energy control to a person or group than out-of-state customers are. Moreover, the high efficiency adopters are more likely to have assigned this responsibility than standard efficiency adopters are.

Exhibit 5.4-1
Behavioral Comparison to Out-of-State Samples
"Percentage of Organizations Which Have Assigned Responsibility for Controlling Energy Use to an Individual or Group"

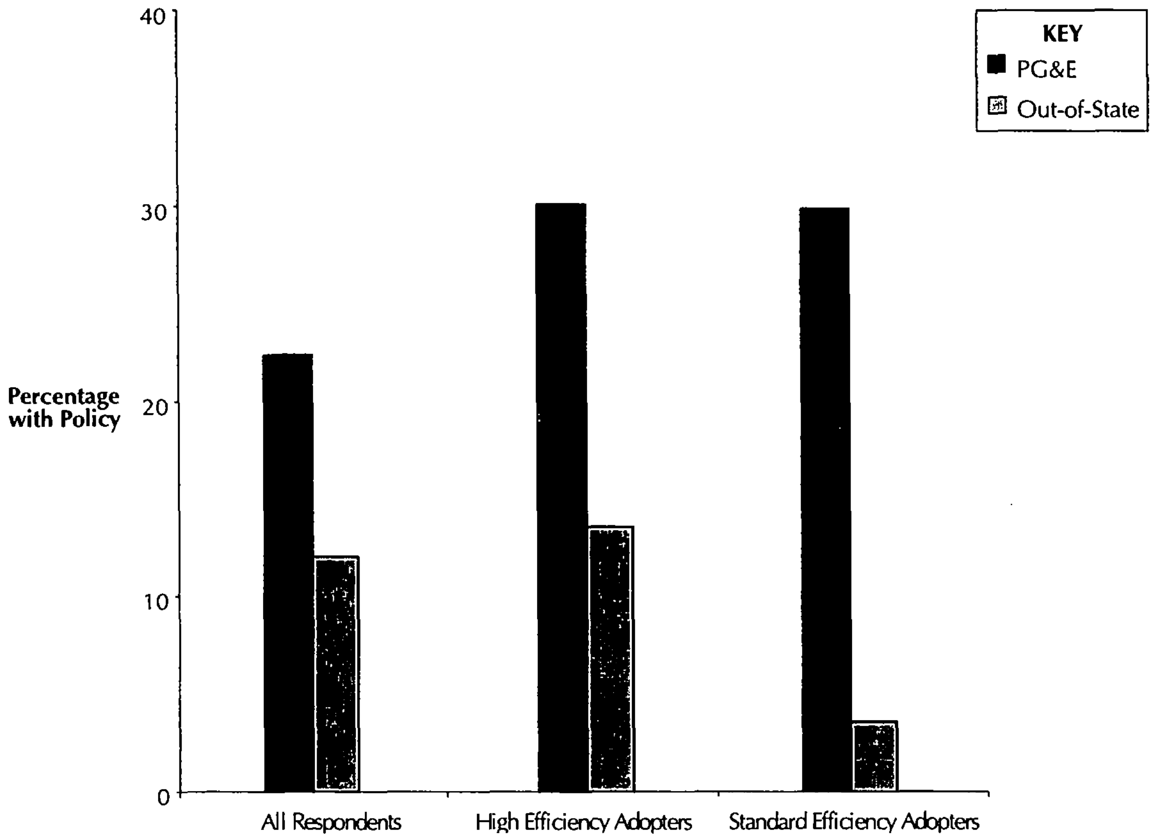


Exhibit 5.4-2 below shows the percentage or organizations that have a lighting equipment selection policy. The survey samples are compared in three adoption categories: all respondents, high efficiency adopters, and standard efficiency adopters. The data show that PG&E customers are much more likely to have a policy regarding lighting equipment selection than out-of-state respondents are. Among PG&E customers, adopters are more likely to have a policy than non-adopters are. Also, high efficiency adopters and standard efficiency adopters

[2] This data was not available for non-adopters.

are equally likely to have a policy, 30%. Among out-of-state respondents, high efficiency adopters were much more likely to have a policy than standard efficiency adopters, 13% versus 4%.

Exhibit 5.4-2
Behavioral Comparison to Out-of-State Samples
"Percentage of Organizations Which Have
A Lighting Equipment Selection Policy

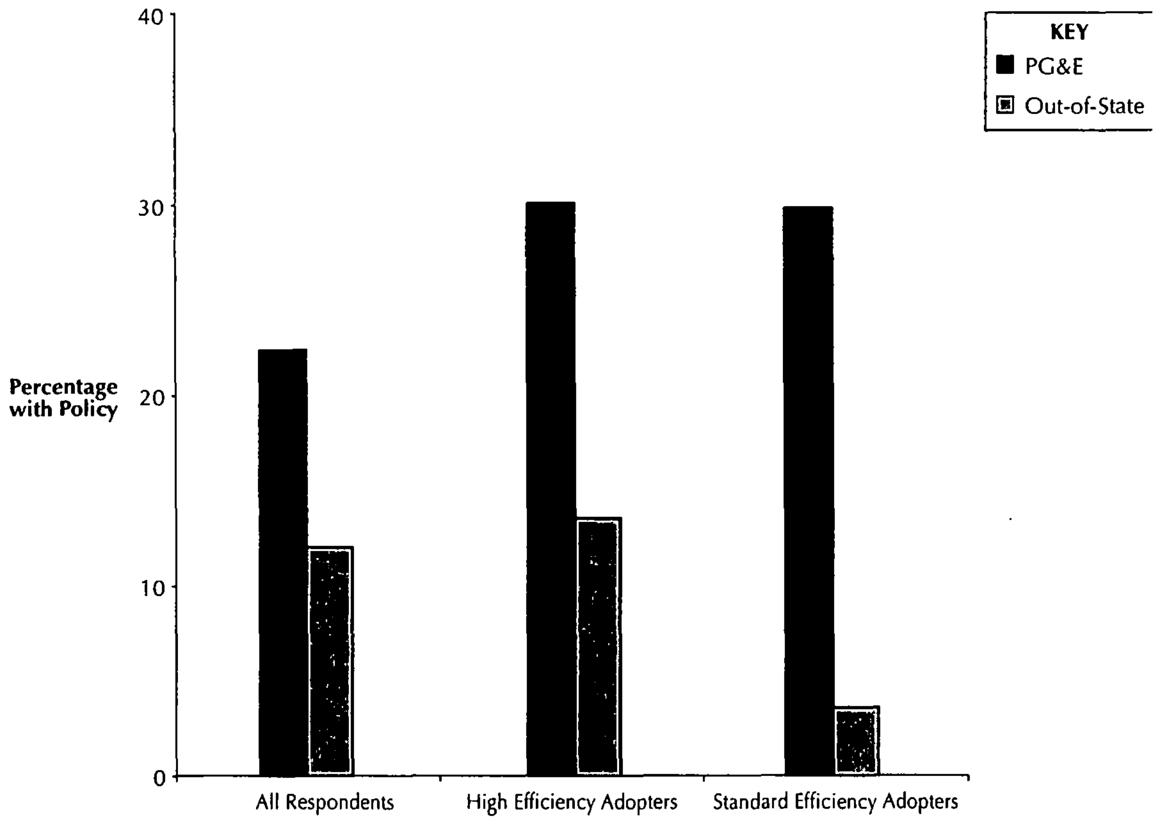
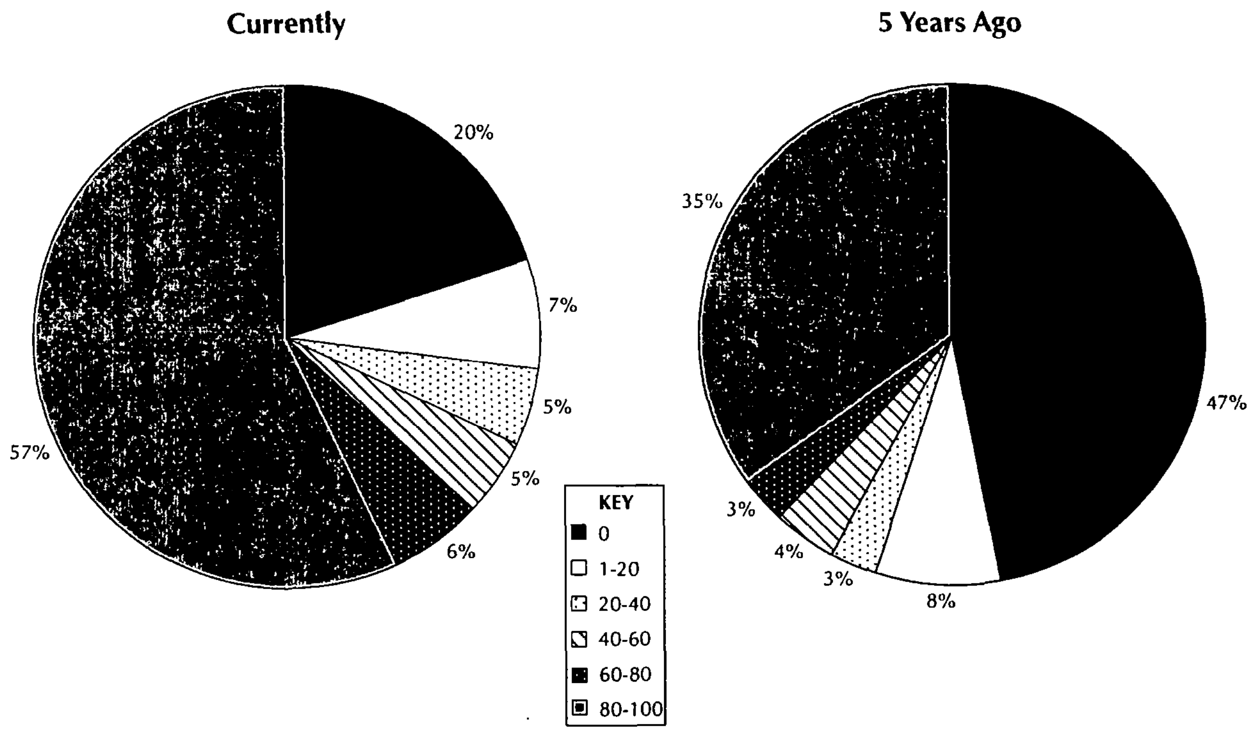


Exhibit 5.4-3 below displays how pervasive the use of electronic ballasts is within the PG&E service territory currently, as well as five years ago. The exhibit shows that currently approximately 57% of PG&E respondents have electronic ballasts on almost all (80% to 100%) of the fixtures in their facility. Five years ago, this percentage was only 35%. On the other end, 20% of PG&E customers currently have no electronic ballasts in their facility, while five years ago nearly half of all facilities had no electronic ballasts.

Exhibit 5.4-3
Behavioral Comparison to Out-of-State Samples
"What Percentage of Fixtures in the Facility
Use Electronic Ballasts?"
PG&E, All Respondents



The Exhibit 5.4-4 below is analogous to Exhibit 5.4-3 discussed above, except it reflects out-of-state survey data. The data show that currently 65% of out-of-state respondents have electronic ballasts on almost all (80% to 100%) of the fixtures in their facility. Five years ago this percentage was 56%. The percentage of respondents with no electronic ballasts has fallen from 28% five years ago to 18% currently. Relative to the PG&E survey data, the out-of-state respondents show a somewhat greater propensity to use electronic ballasts. This result should be considered suspect as it is highly unlikely that 56% of the facilities had an 80% to 100% saturation of electronic ballasts five years ago. However, the moderate increase over the period, from 56% to 65%, indicates that there is less of a trend to increase efficiency relative to PG&E. There has been a far greater improvement over the five-year period within the PG&E service territory than in the out-of-state territory over the five year period.

Exhibit 5.4-4
Behavioral Comparison to Out-of-State Samples
"What Percentage of Fixtures in the Facility
Use Electronic Ballasts?"
Out-of-State, All Respondents

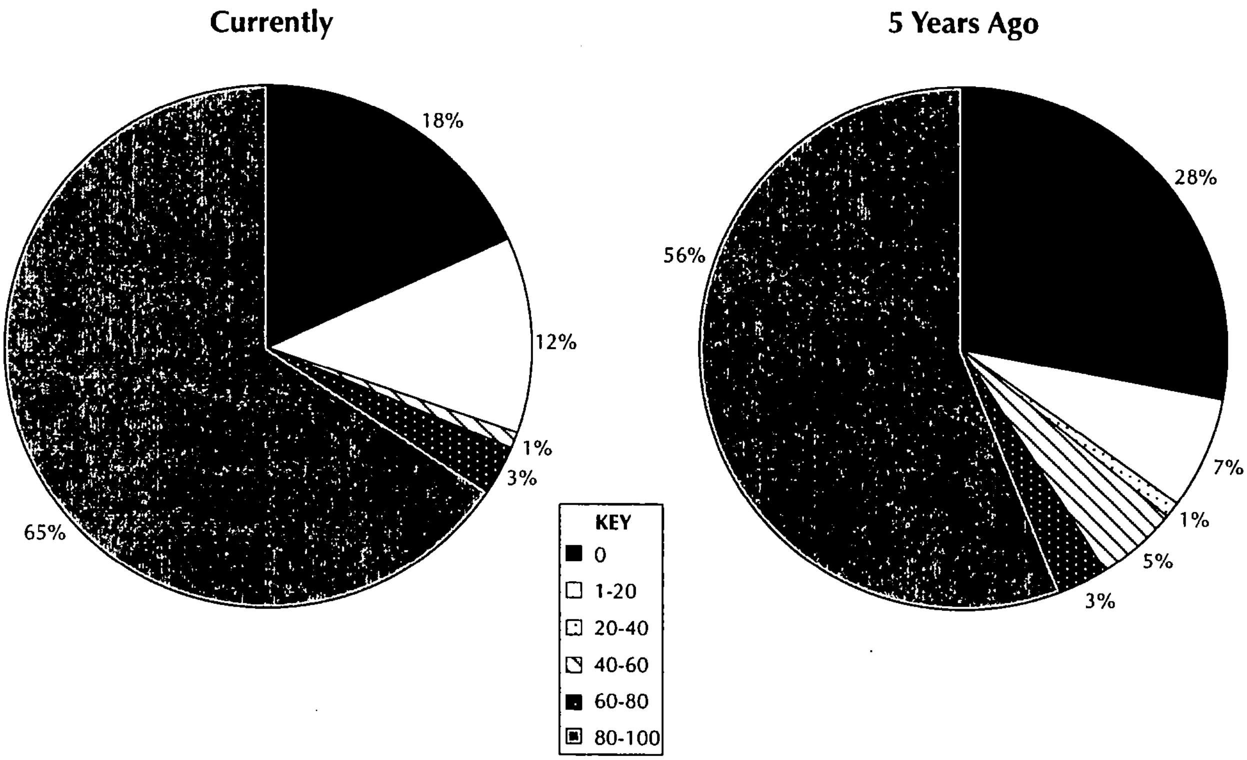


Exhibit 5.4-5 below is analogous to Exhibit 5.4-4 discussed above, except it reflects lighting adopters within the PG&E service territory. That is, the data reflect PG&E survey respondents who indicated that they had made a lighting adoption. The percentage of respondents who use electronic ballasts in almost all (80% to 100%) of their lighting fixtures is 67%,. This is notably higher than the rate for all survey respondents, 57%. Five years ago only 17% of these 'adopters' had between 80% and 100% of fixtures fitted with electronic ballasts. The increase over the five year period is a remarkable 40%. Similarly, the percentage with no electronic ballasts has dropped from 51% five years ago, to less than 10% today.

Exhibit 5.4-5
Behavioral Comparison to Out-of-State Samples
"What Percentage of Fixtures in the Facility
Use Electronic Ballasts?"
PG&E, Adopters

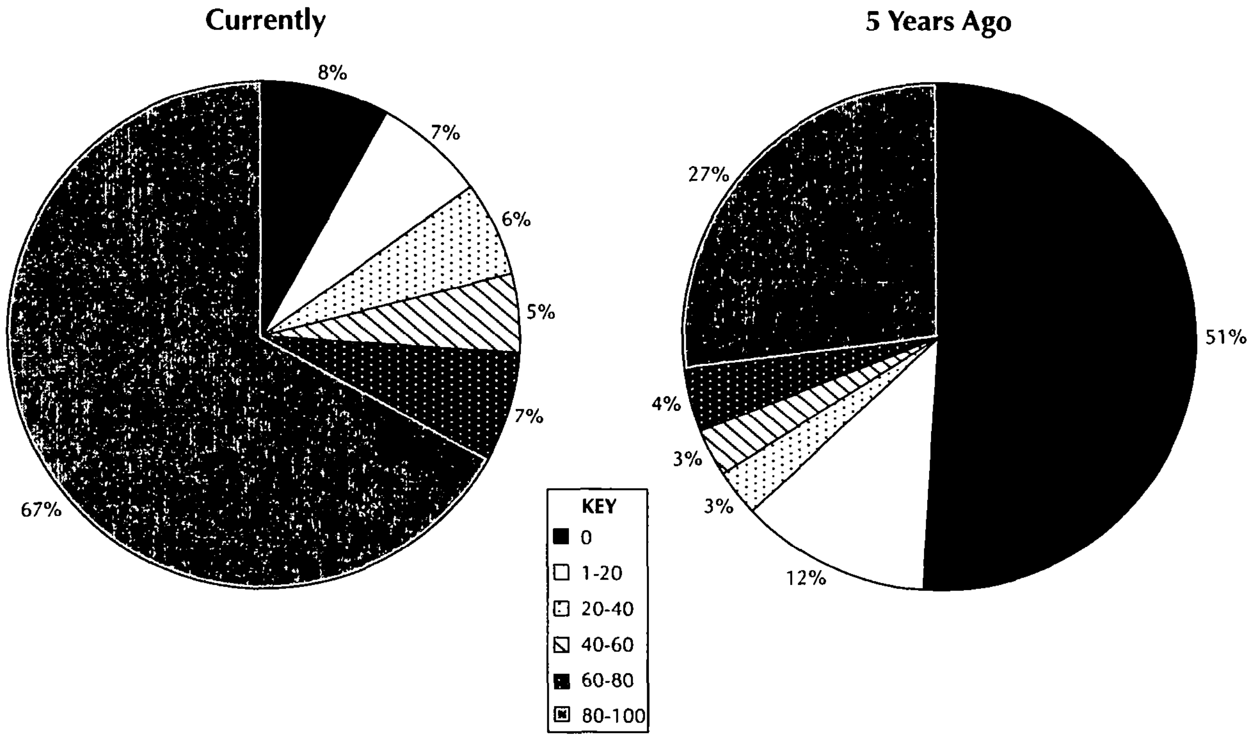


Exhibit 5.4-6 shows the pervasiveness of electronic ballasts currently and five years ago among the out-of-state survey respondents who indicated they had made a lighting adoption. The exhibit shows that 60% of these lighting adopters have fitted almost all of their fixtures with electronic ballasts. Five years ago, this percentage was 50%. Again, there is a somewhat high penetration of electronic ballasts in the out-of-state survey areas, but the degree of improvement over the five year period is much lower.

Exhibit 5.4-6
Behavioral Comparison to Out-of-State Samples
"What Percentage of Fixtures in the Facility
Use Electronic Ballasts?"
Out-of-State, Adopters

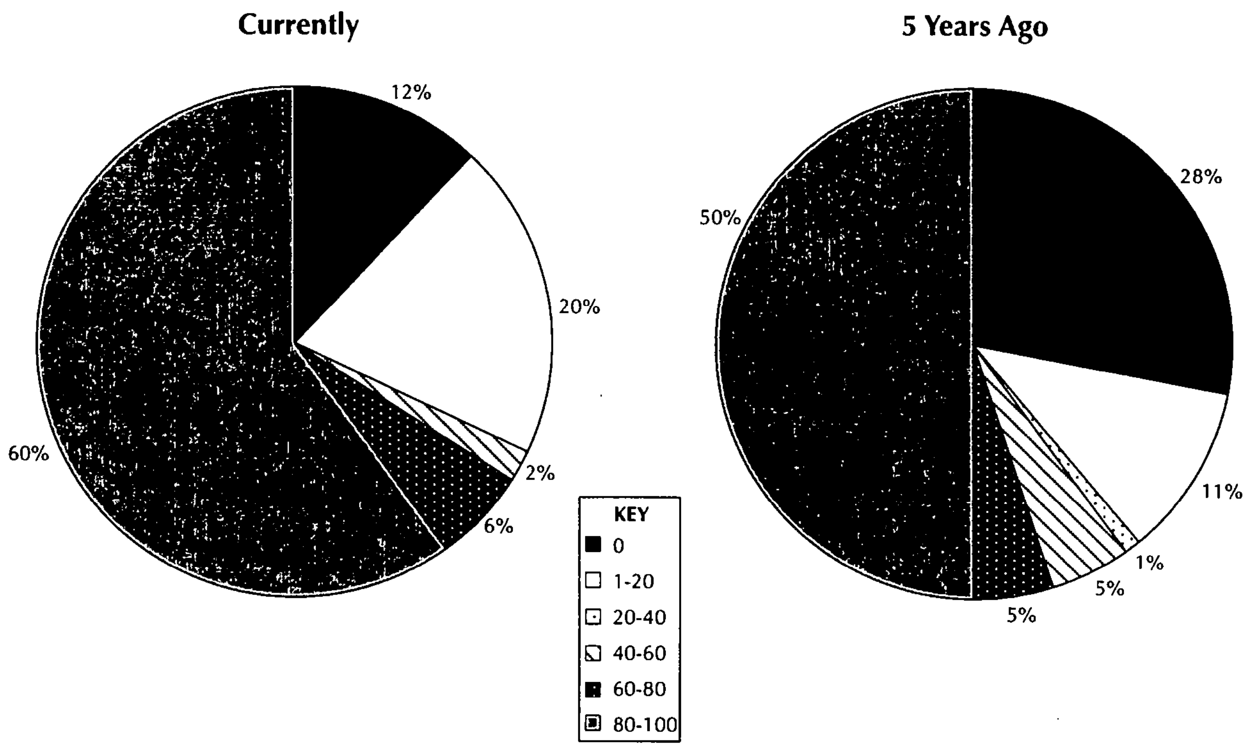


Exhibit 5.4-7 compares the reasons cited for increasing the use of electronic ballasts. The data show that more PG&E respondents indicate "promoted by utilities" and "promoted by distributors" as reasons for increasing their use of electronic ballasts than out-of-state respondents. This difference is evidence of market transformation within the PG&E service territory. The program's direct influence is evident in the larger portion of "promoted by utilities" responses in PG&E relative to out-of-state. The program's indirect influence, i.e. influence on distributor's stocking practices, is reflected in the larger portion of"promoted by distributors" responses in PG&E relative to out-of-state.

Exhibit 5.4-7
Behavioral Comparison to Out-of-State Samples
Reasons Cited for Increasing the Use of Electronic Ballasts
All Respondents

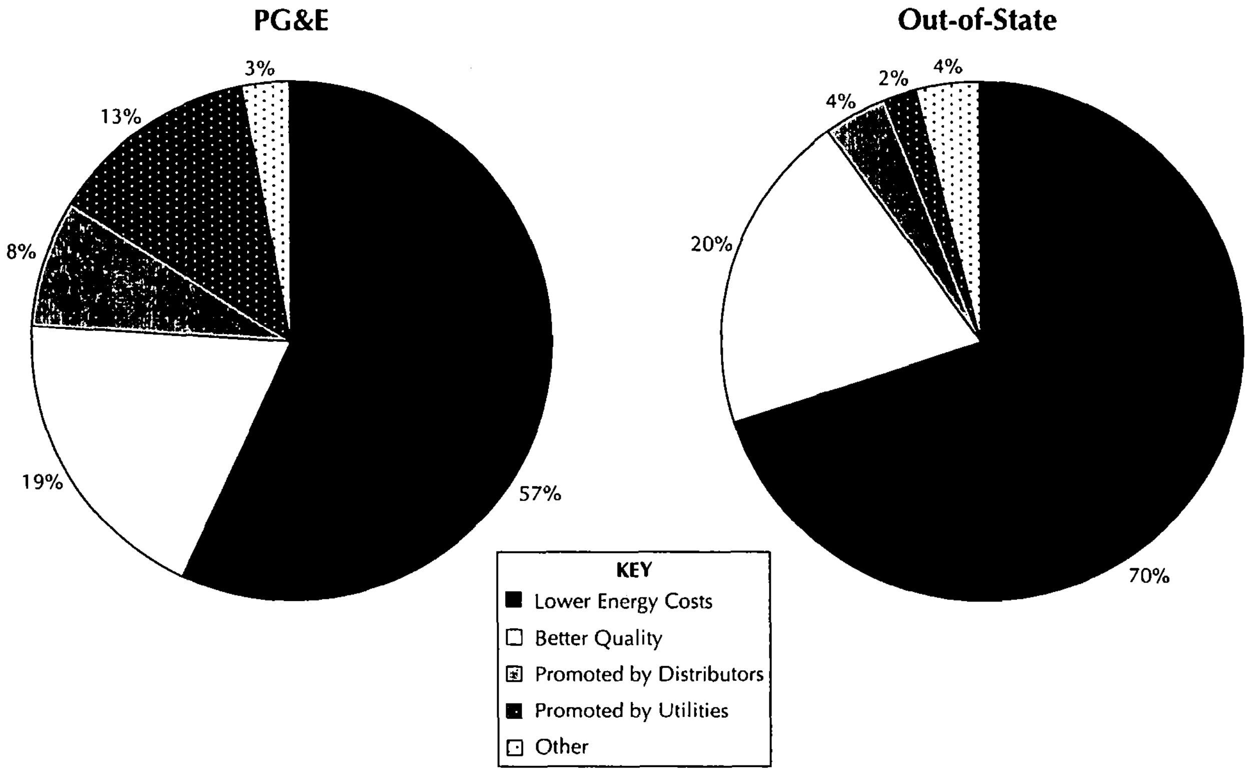


Exhibit 5.4-8 below is analogous to Exhibit 5.4-7, except it reflects data for lighting adopters only. The evidence of market transformation is even more striking for lighting adopters than for all respondents. Within the PG&E service territory 21% of adopters cited either "promoted by utilities" or "promoted by distributors" as reasons for increasing their use of electronic ballasts. This percentage within the out-of-state survey was only 6%.

Exhibit 5.4-8
Behavioral Comparison to Out-of-State Samples
Reasons Cited for Increasing the Use of Electronic Ballasts
Adopters

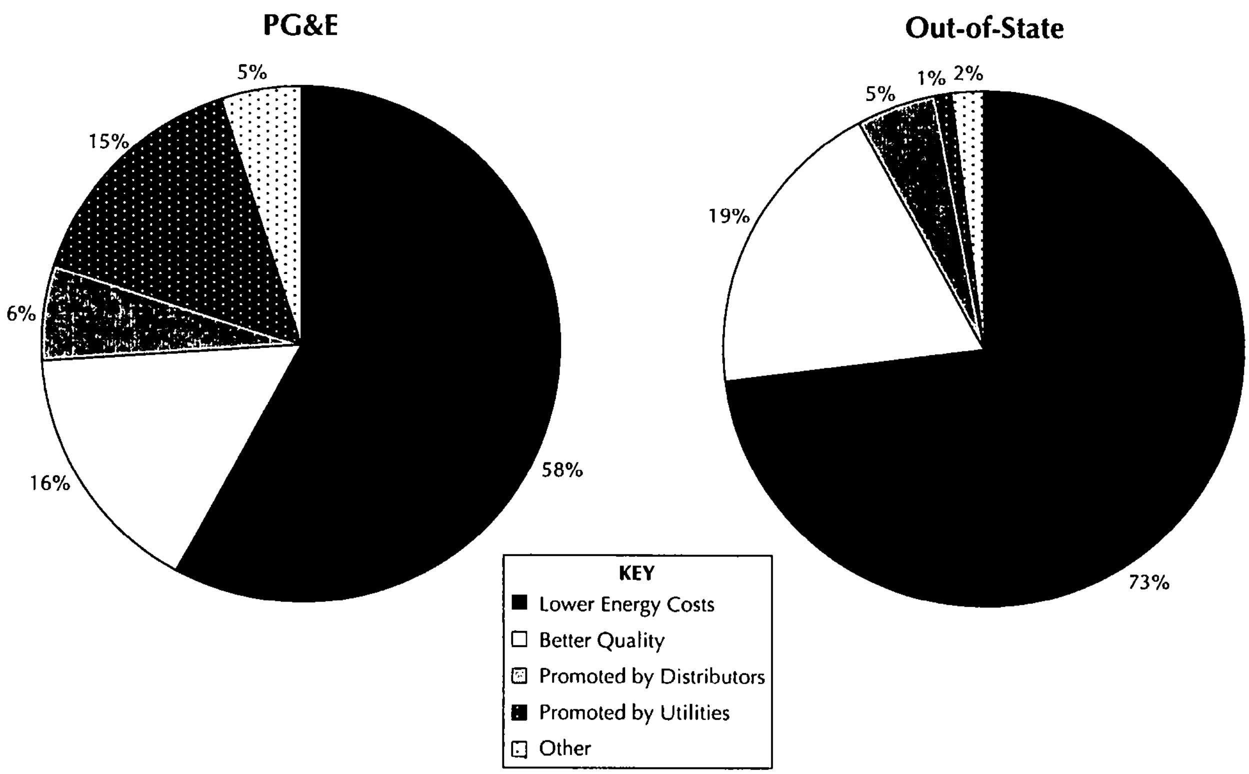


Exhibit 5.4-9 below is a comparison of the percentage of adopters using the technology is *all* installed fixtures. The data show that there are only small differences between PG&E and the out-of-state survey respondents. PG&E had a larger percentage of adopters using the technology in all installed fixtures for T-8 lamps and 2-lamp fixtures. For electronic ballasts, the out-of-state percentage was slightly higher.

Exhibit 5.4-9
Behavioral Comparison to Out-of-State Samples
Percentage of Adopters Using Technology in All Installed Fixtures

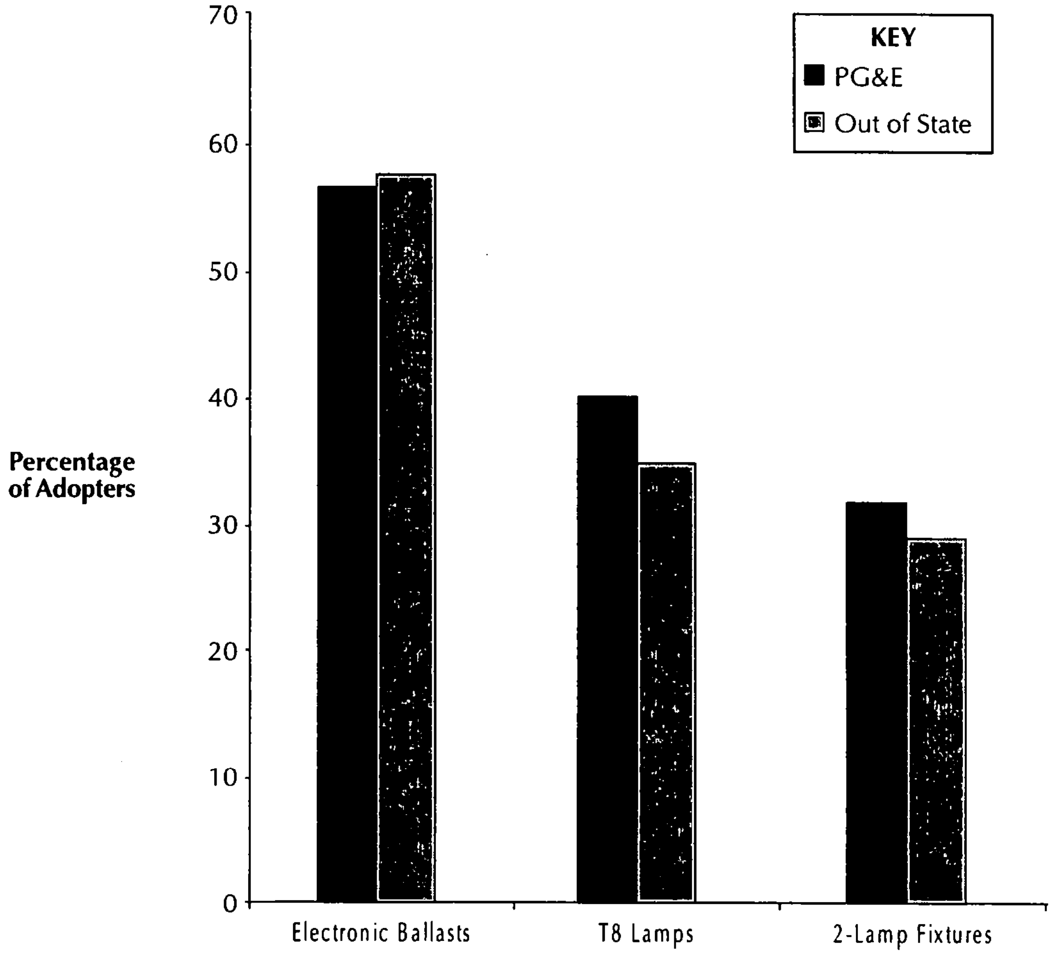
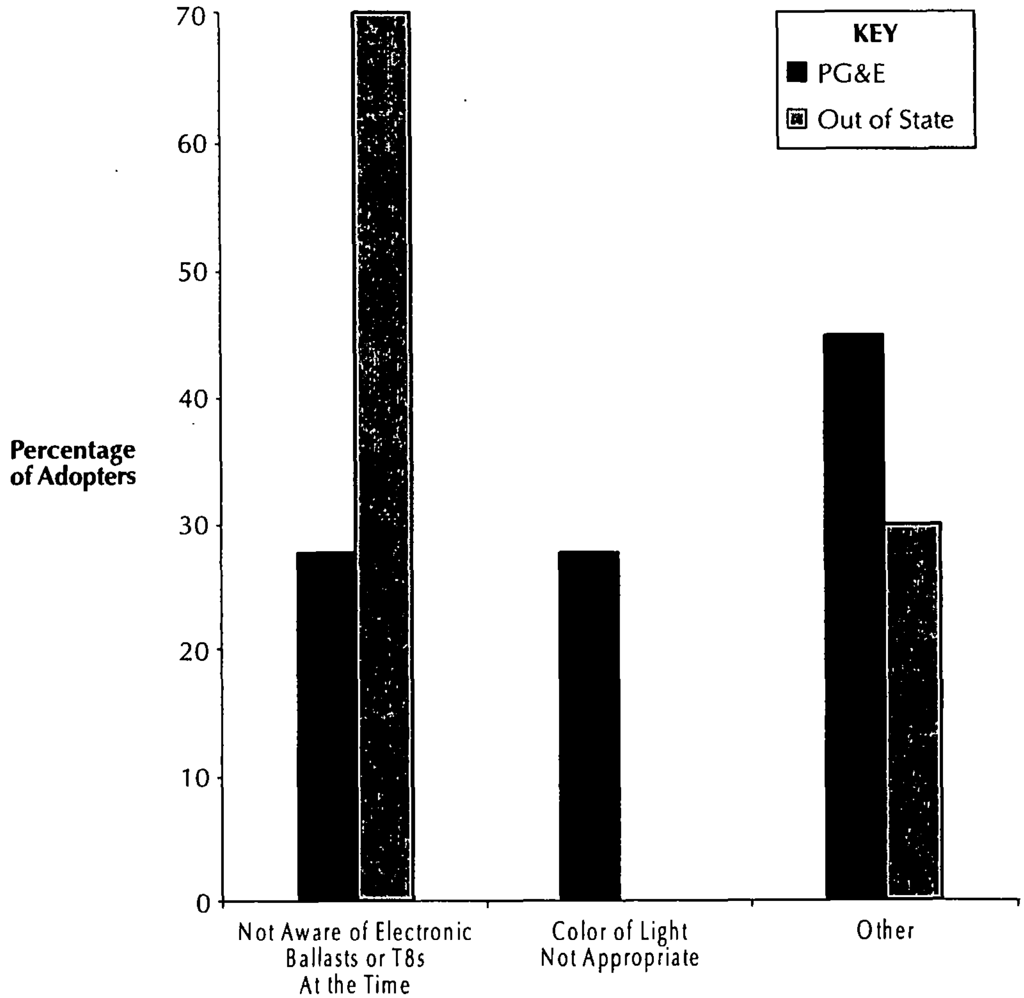


Exhibit 5.4-10 below compares the reasons cited for *not* using electronic ballasts or T-8s among lighting adopters who did not choose these technologies. The exhibit shows that "awareness" was much more of a barrier for the out-of-state respondents than for PG&E respondents. Almost 70% of out-of-state respondents indicated that being unaware of the technologies was the reason for not choosing them. Less than 30% of PG&E respondents indicated this was their reason for choosing other technologies. Almost 30% of PG&E respondents indicated "color of light not appropriate," as the reason for not choosing T-8s or electronic ballasts, while none of the out-of-state respondents indicated this reason.

Exhibit 5.4-10
Behavioral Comparison to Out-of-State Samples
Adopter Reasons for Not Using Electronic Ballasts or T8S



6 CONCLUSIONS

Through the process of completing this study, certain methodological issues were brought to our attention. These discoveries and their ramifications should be noted for use in future, similar studies. Methodological conclusions are presented for each research task.

Task 1: Estimate Gross load impacts for the 1994 PG&E commercial lighting rebate population.

Conclusion: Billing analysis, in combination with engineering analysis, is the most effective method for calculating gross load impacts over time. This study sustains the capability of a billing analysis to measure gross load impacts, whether for first year impacts or impacts over time.

Task 2: Adjust for the Persistence of installed lighting measures.

Conclusion: For a study with four years of data, persistence rates of installed lighting measures are identified more precisely with a self-report analysis than with a billing analysis. The rate of equipment attrition is too small over a four-year period to detect with billing analysis. In addition, failed equipment is often not replaced, or replaced with equally efficient equipment. As a result, the equipment failure is associated with either no change in energy consumption or a decline in consumption. It is important that self-reported data be verified, because its accuracy is a principal concern. The billing analysis is a useful tool in determining persistence because it can validate the self-report analysis results. Moreover, we recommend conducting on-site audits to verify self-reported data whenever possible.

Task 3: Determine rates of free-ridership over time.

Conclusion: We found both self-report and billing analysis to be reliable, effective techniques for estimating free-ridership. However, billing analysis requires a very large sample size in order to get valid results. For example, our sample was too small to yield statistically significant results for most technologies; only fluorescents had a statistically valid result. In addition, there are three regression analysis steps, and consequently three sources of estimation error in the billing analysis (Gross, Net and Mills). Also, large customers have to be censored from the billing analysis sample, due to their disproportionate influence on the results. This censoring biases the estimate downward. Finally, the billing analysis produces a static result, while the self-report analysis results captures the dynamic effects of accelerated adoption.

Task 4: Identify participant spillover adoptions and load impact.

Conclusion: Self-report data is used to determine whether participants were influenced by the program to make non-rebated high efficiency lighting adoptions. Billing analysis provides an estimate of the load impact derived from all of the non-rebated lighting adoptions. This estimate is an upper bound for participant spillover, and can be used to validate the self-report analysis results.

Task 5: Estimate nonparticipant market transformation load impacts.

Conclusion: Market transformation is estimated by combining estimates of total nonparticipant load impact and nonparticipant natural conservation. In this study, total nonparticipant load impact was captured using self-report adoption rates, combined with ex-post load impacts estimated with billing analysis. This method was both efficient and effective, and we recommend that it continue to be utilized in future studies.

The best method for estimating natural conservation is less clear. Two methods are presented in this study: one using out-of-state samples from territories where there are no programs similar to the Lighting Program, and the second using data gathered in the PG&E service territory.

Using out-of-state samples requires the assumption that the out-of-state territory is representative of the behavior that would have occurred in California in the absence of the program. Every territory is unique, and so results are dependent upon which territory is selected. Nonetheless, we believe this is the best estimation approach. Using California data requires the assumption that lighting adoptions by individuals *not conscious* of being influenced by the lighting program are due to natural conservation. This approach underestimates market transformation because it ignores hidden market effects. This approach could be improved with surveys of other market "actors" such as distributors, to determine other ways the program has altered the market from the supply side. Nonetheless, it is useful in providing a lower bound estimate of market transformation.

Appendix A

1994 Participant Survey Instrument

MYBS MDSS PARTICIPATION CONTACT &DNAME____________________
(&D1)   &D2 - &D3_   Ext. &DEXT_
CALLBACK DATE &DCBD___   CALLBACK TIME &DCBT_______   Def: &DDEF_
FIRM: &BILLNAME____________________   (1=def callback 0=general)
&NOTED1____
&NOTED2____
&NOTED3____
&NOTED4____
&NOTED5____

[INTRODUCTION]

[READ IF CHGOWNER=0, ELSE READ ALTERNATE HELLO]

Hello. This is &INTERVIEWER____. I'm with Quantum Consulting, a management consulting firm in Berkeley, California. We are calling on behalf of Pacific Gas & Electric Company. Your firm should have received a letter several weeks ago regarding your participation in a study that Pacific Gas & Electric Company is conducting. In &SURVDATE___ our firm conducted an interview with &CONTACT___ to discuss &BILLNAME___ 's participation in PG&E's Retrofit Program. We would like to conduct a follow-up interview with &CONTACT___ , or someone knowledgeable about the lighting changes made at &BILLNAME____. Your participation in this survey is very important.

Alternate Hello. This is &INTERVIEWER____. I'm with Quantum Consulting, a management consulting firm in Berkeley, California. We are calling on behalf of Pacific Gas & Electric Company. Your firm should have received a letter several weeks ago regarding your participation in a study that Pacific Gas & Electric Company is conducting. In &SURVDATE___ our firm conducted an interview with &CONTACT___ to discuss &OLDBILL___ 's participation in PG&E's Retrofit Program. According to our records, this business is no longer serviced at this address. However, we would still like to conduct a follow-up interview with someone knowledgeable about the lighting changes made at &BILLNAME____. Your participation in this survey is very important.

READ ONLY IF PROMPTED:

Why are you doing a survey?

This is NOT a sales call. Pacific Gas & Electric is interested in determining the longevity of the Lighting technologies installed at &SERVADDR_________, and how lighting decisions are made at &BILLNAME____ as a result of your participation in PG&E's rebate program. This information will be used to determine the effectiveness of these programs. This is proprietary information, and will not be used for any marketing purposes.

Who are you trying to reach?

We'd like to speak with the person most knowledgeable about recent changes of lighting equipment at &SERVADDR_____ in &SERVCITY_______.

1	Continue	Person Answering phone is the best contact	SC010
2	Continue	Transferred to Technical Contact	SC010
3	Arrange a Callback	Given Technical	1ST SCREEN AND

		Contact Name and Telephone	EITHER SET AN APPOINTMENT FOR A CALLBACK OR NOTE AS REFUSAL IF APPROPRIATE
88	Refused	Thank and Term.	GOODBYE

SC010. This survey is designed to take approximately 10 minutes. Is now a good time?

1	Yes		SC020
2	No	ARRANGE FOR A CALLBACK	1ST SCREEN AND EITHER SET AN APPOINTMENT FOR A CALLBACK OR NOTE AS REFUSAL IF APPROPRIATE

[ASK IF CHGOWNER = 0, ELSE SKIP TO EQCONF]

SC020. Pacific Gas and Electric's Retrofit Express Program provides rebates to encourage customers to install energy-efficient lighting. Do you recall &BUSINESS__________ having lighting installed as part of PG&E's 1994 program?

1	Yes		MN001
2	No		EQCONF
88	Refused		EQCONF
99	Don't Know		EQCONF

EQCONF. Before we get started, I'd like to confirm some information in PG&E's database. Our records show that &OLDBILL_____ had the following equipment installed at &SERVADDR_______ through the Retrofit Express Program. Can you confirm these technologies?

[ALL MEASURES RECOMMENDED WILL LIST:]

&MEAS1_________________________ &QUAN1____________
&MEAS2_________________________ &QUAN2____________
&MEAS3_________________________ &QUAN3____________
&MEAS4_________________________ &QUAN4____________
&MEAS5_________________________ &QUAN5____________

1	Yes		MN001
2	No		RADICAL
88	Refused		RADICAL
99	Don't Know		RADICAL

RADICAL. **DO NOT READ.** If respondent's descriptions are RADICALLY different than our descriptions, or they cannot recall ANY of the measures, thank and terminate. Otherwise, continue…

1	Continue		MN001
2	Radically Different	Thank and Term.	GOODBYE

MN001. I would like to inform you that for quality control purposes, this call may be monitored by my supervisor. Would this be OK with you?

1	OK		LP010
2	Not OK	IF NECESSARY, ASK YOUR SUPERVISOR TO STEP AWAY	LP010

I'm going to be asking you a number of questions regarding your "FACILITY," which means ALL of the buildings and tenants SERVICED BY PG&E UNDER THE FOLLOWING billing name: &BILLNAME___________ at this address: &ADDRESS_______________

[PERSISTENCE]

[ASK IF BALLAST = 1, ELSE SKIP TO DELAMP]

LP020. Your company received a rebate for retrofitting lamps that required the use of an electronic ballast. This could include T8 fluorescent Lamps, High Intersity Discharge (HIDs), Compact Fluorescents, or Exit Signs. After these ballasts were installed in 1994, do you recall removing or replacing any of then?

Read If Prompted:
An electronic ballast is a device attached to your fluorescent lamp that controls the amount of electricity that flows into the fixture. All energy efficient lamps require a ballast to operate.

1	Yes		LP030
2	No		LP060
88	Refused		LP060
99	Don't Know		LP060

LP030. In what year did you make these changes?

1	1995		LP040
2	1996		LP040
3	1997		LP040
4	1998		LP040
88	Refused		LP040
99	Don't Know		LP040

LP040. From what type of fixtures were the ballasts removed or replaced?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&LP041	2' T8 Fixtures	LP055
&LP042	4' T8 Fixtures	LP055
&LP043	8' T8 Fixtures	LP055
&LP044	2' T10 Fixtures	LP055
&LP045	4' T10 Fixtures	LP055
&LP046	8' T10 Fixtures	LP055

&LP047	Standard HID (High Intensity Discharge) Fixtures	LP055
&LP041	Compact HID (High Intensity Discharge) Fixtures	LP055
&LP048	Compact Fluorescents (Screw-In Modular)	LP055
&LP049	Compact Fluorescents (Hardwire)	LP055
&LP050	Exit Signs (Compact Fluorescent)	LP055
&LP051	Electronic Ballasts	LP055
&LP052	Other - SPECIFY: &LP052	LP055
88	Refused	LP060
99	Don't Know	LP060

[Cycle through for all technologies selected]
LP055. How many of &LP041-&LP052 were removed?

&LP041N	2' T8 Fixtures	LP060
&LP042N	4' T8 Fixtures	LP060
&LP043N	8' T8 Fixtures	LP060
&LP044N	2' T10 Fixtures	LP060
&LP045N	4' T10 Fixtures	LP060
&LP046N	8' T10 Fixtures	LP060
&LP047N	Standard HID (High Intensity Discharge) Fixtures	LP060
&LP041N	Compact HID (High Intensity Discharge) Fixtures	LP060
&LP048N	Compact Fluorescents (Screw-In Modular)	LP060
&LP049N	Compact Fluorescents (Hardwire)	LP060
&LP050N	Exit Signs (Compact Fluorescent)	LP060
&LP051N	Electronic Ballasts	LP060
&LP052N	Other - SPECIFY: &LP052	LP060
88	Refused	LP055P
99	Don't Know	LP055P

LP055P. Can you estimate what percentage was removed?

&LP055P	Percent Removed		LP060
888	Refused		LP060
999	Don't Know		LP060

[ASK IF DELAMP = 1, ELSE SKIP TO LP090]
LP060. Our records also indicate that your company removed &DELMPQN_____ lamps in 1994 as part of your rebate. Have you re-installed any lamps in these fixtures to increase lighting output?

Read If Prompted:
One way that many commercial customers save money on their electricity bill is to delamp their fluorescent fixtures and install reflectors. Reducing the number of lamps saves energy, while installing the reflectors maintains a similar amount of lighting.

1	No (No lamps re-installed)		LP090
2	Yes (re-added lamps)		LP070
88	Refused		LP090
99	Don't Know		LP090

LP070. In what year did you make these changes?

1	1995		LP080
2	1996		LP080
3	1997		LP080
4	1998		LP080
88	Refused		LP080
99	Don't Know		LP080

LP080. Can you estimate how many lamps were re-installed?

&LP080	Number of Lamps		LP090
88	Refused		LP080P
99	Don't Know		LP080P

LP080P. Can you estimate a percentage that was re-installed?

&LP080P	Percent Removed		LP090
888	Refused		LP090
999	Don't Know		LP090

[ASK IF CONTROL = 1, ELSE SKIP TO BC011]
LP090. Another way to reduce your electricity bill is by installing lighting controls. These devices control the amount of illumination needed for your facility, depending on such factors as daylight and the occupancy. PG&E's database indicates that your facility had lighting controls installed in 1994. Do you know if these are still used today?

1	Yes		BC011
2	No		LP100
88	Refused		BC011
99	Don't Know		BC011

LP100. In what year did you make these changes?

1	1995		LP110
2	1996		LP110
3	1997		LP110
4	1998		LP110
88	Refused		LP110
99	Don't Know		LP110

LP110. What kinds of lighting controls were removed or discontinued?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&LP111	Time Clocks	LP120
&LP112	Occupancy Sensors	LP120
&LP113	Bypass/Delay Timers	LP120
&LP114	Photocells	LP120
&LP115	Other: &LP115	
88	Refused	BC011
99	Don't Know	BC011

[Cycle through for all technologies selected]
LP120. How many of &LP111-&LP114 were removed?

&LP111N	Time Clocks	BC011
&LP112N	Occupancy Sensors	BC011
&LP113N	Bypass/Delay Timers	BC011
&LP114N	Photocells	BC011
&LP115N	Other: &LP115	BC011
88	Refused	LP120P
99	Don't Know	LP120P

LP120P. Can you estimate what percentage were removed?

&LP120P	Percent Removed		BC011
888	Refused		BC011
999	Don't Know		BC011

[FIRMOGRAPHICS]

[ASK IF RCD_ASK=1 or CHGOWNER=1, ELSE SKIP TO FC080]
BC011. What is the main business ACTIVITY at the facility?

1	Office		FC080
2	Retail		FC080
3	College/University		FC080
4	K-12 School		FC080
5	Grocery (Food Store)		FC080
6	Restaurant		FC080
7	Health Care (Hospital)		FC080
8	Hotel/Motel		FC080
9	Warehouse		FC080
10	Personal Service (Includes beauty salons, dentists, doctors office etc.)		FC080
11	Community Service (such as fire dept., police station)		FC080
12	Misc	SPECIFY: &BC012	FC080
88	Refused		FC080
99	Don't Know		FC080

FC080. What is the total square feet of the facility?

&FC080	Square Feet		FC110
88	Refused		FC081
99	Don't Know		FC081

FC081. Can you estimate the total square footage to be ...

1	Less than 1,000 sq ft		FC110
2	Less than 10,000 sq ft		FC110
3	Less than 100,000 sq ft		FC110
4	Less than 1,000,000 sq ft		FC110
5	Over 1,000,000 sq ft		FC110
88	Refused		FC110
99	Don't Know		FC110

FC110. Since January 1995, has the square footage of the facility increased, decreased, or stayed the same?

1	Increased floor space		FC115
2	Decreased floor space		FC120
3	Stayed the same		EI010
88	Refused		EI010
99	Don't Know		EI010

FC115. How many square feet was added?

&FC115	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC120. How many square feet was the facility reduced?

&FC120	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC130. In what year did this change in floor space occur?

1	1995		FC131
2	1996		FC131
3	1997		FC131
4	1998		FC131
88	Refused		EI010
99	Don't Know		EI010

FC131. And can you recall which month?

1	January		EI010

2	February		EI010
3	March		EI010
4	April		EI010
5	May		EI010
6	June		EI010
7	July		EI010
8	August		EI010
9	September		EI010
10	October		EI010
11	November		EI010
12	December		EI010
88	Refused		EI010
99	Don't Know		EI010

EI010. Approximately how many people are currently employed at the facility, including both full- and part-time employees?

&EI010	Number of Employees		EI020
88	Refused		EI020
99	Don't Know		EI020

EI020. Since January 1995, has the number of people employed at this facility changed by more than 10 percent?

1	Yes		EI030
2	No		AG010
88	Refused		AG010
99	Don't Know		AG010

EI030. In what year did this change in the number of employees occur?

1	1995		EI031
2	1996		EI031
3	1997		EI031
4	1998		EI031
88	Refused		EI040
99	Don't Know		EI040

EI031. And can you recall which month?

1	January		EI040
2	February		EI040
3	March		EI040
4	April		EI040
5	May		EI040
6	June		EI040
7	July		EI040
8	August		EI040
9	September		EI040
10	October		EI040
11	November		EI040
12	December		EI040
88	Refused		EI040
99	Don't Know		EI040

EI040. Approximately how many people were employed at this facility before the change occurred, including both full and part-time employees?

&EI040	Number of Employees		AG010
77	Seasonal Workforce	Enter Comments	AG010
88	Refused		AG010
99	Don't Know		AG010

Comment1 &EI0401____
Comment2 &EI0402____

AG010. Do you know in what year your facility was built?

&AG010	YYYY e.g. 1973		FM010
88	Refused		AG020
99	Don't Know		AG020

AG020. Would you say it was …(READ LIST)

1	Before 1978		FM010
2	Between 1978 and 1988		FM010
3	After 1988		FM010
88	Refused		FM010
99	Don't Know		FM010

[ASK ALL]

FM010. Has your organization assigned responsibility for controlling energy usage and costs to a specific staff person, group of staff, or contractor?

1	Yes		FM020
2	No		FM020
8	Refused		FM020
9	Don't Know		FM020

FM020. Has your organization developed a policy or standard specification for selection of fluorescent lighting equipment?

1	Yes		GL010
2	No		GL010
8	Refused		GL010
9	Don't Know		GL010

[GENERAL LIGHTING]

GL010. What is the primary type of lighting currently in use at your facility?

(READ LIST IF NECESSARY, SELECT ONLY ONE)

1	T8 Fluorescent	GL020
2	T10 Fluorescent	GL020
3	T12 Fluorescent	GL020
4	HID (High Intensity Discharge)	GL020
5	Halogen	GL020
6	Incandescent	GL020
7	Compact Fluorescent	GL020
8	Other Fluorescent	GL020
9	Other (Please Specify)	GL020
10	Skinny tubes (thin)	GL020
11	Fat tubes (thick)	GL020
88	Refused	GL020
99	Don't Know	GL020

GL020. And what was it 5 years ago?

1	T8 Fluorescent	GL030A
2	T10 Fluorescent	GL030A
3	T12 Fluorescent	GL030A
4	HID (High Intensity Discharge)	GL030A
5	Halogen	GL030A
6	Incandescent	GL030A
7	Compact Fluorescent	GL030A
8	Other Fluorescent	GL030A
9	Other (Please Specify)	GL030A
10	Skinny tubes (thin)	GL030A
11	Fat tubes (thick)	GL030A
88	Refused	GL030A
99	Don't Know	GL030A

GL030A. Roughly what percentage of fluorescent fixtures in your facility use electronic ballasts?

&GL030A	Percentage		GL030B
88	Refused		GL030B
99	Don't Know		GL030B

GL030B. What would you say that percentage was 5 years ago?

&GL030B	Percentage		GL040A
88	Refused		GL040A
99	Don't Know		GL040A

[ASK ONLY IF GL030A > GL030B, ELSE SKIP TO LF001]

GL040A. What is the main reason that your organization increased its use of electronic ballasts over the past five years?

DO NOT READ

1	Lower energy (operating) cost	GL040B
2	Longer useful life	GL040B
3	Less hum	GL040B
4	Better quality / More light	GL040B

5	New equipment looks better	GL040B
6	Better light promotes productivity / Cuts down on complaints	GL040B
7	More flexibility in installation	GL040B
8	More readily available from distributors	GL040B
9	Promoted by utilities	GL040B
10	Promoted by distributors, contractors, or designers	GL040B
11	Prices have come down	GL040B
12	Other (specify)	GL040B
88	Refused	GL040B
99	Don't Know	GL040B

GL040B. Are there other reasons?

1	Lower energy (operating) cost	LF001
2	Longer useful life	LF001
3	Less hum	LF001
4	Better quality / More light	LF001
5	New equipment looks better	LF001
6	Better light promotes productivity / Cuts down on complaints	LF001
7	More flexibility in installation	LF001
8	More readily available from distributors	LF001
9	Promoted by utilities	LF001
10	Promoted by distributors, contractors, or designers	LF001
11	Prices have come down	LF001
12	Other (specify)	LF001
13	No Other Reasons	LF001
88	Refused	LF001
99	Don't Know	LF001

[ASK IF LF4F-LF4T, LF5F-LF5T, and LF6F-LF6T ne "", ELSE SKIP TO LF004]

LF001. When we first surveyed you in 1995, you indicated that &OLDBILL_____ operated its indoor lights during the following hours for weekdays, Saturdays, and Sundays.

(READ SCHEDULE]
Weekdays &LF4F-&LF4T
Saturdays &LF5F-&LF5T
Sundays &LF6F-&LF6T

Is this still the same?

1	Yes		LF007
2	No		LF002
88	Refused		LF007
99	Don't know		LF007

LF002. In what year did this change in schedule occur?

1	1995		LF004
2	1996		LF004

3	1997		LF004
4	1998		LF004
88	Refused		LF004
99	Don't know		LF004

LF004. During what weekday hours are your INDOOR LIGHTS currently on?

1	Never On		LF005
2	On 24 Hrs		LF005
&LF4F	Hours on FROM (use 24 hour format eg 0700)		LF005
&LF4F	Hours on TIL (use 24 hour format eg 2000)		LF005
77	Same as Before		LF005
88	Refused		LF005
99	Don't know		LF005

LF005. How about Saturdays?

1	Never On		LF006
2	On 24 Hrs		LF006
&LF5F	Hours on FROM (use 24 hour format eg 0700)		LF006
&LF5T	Hours on TIL (use 24 hour format eg 2000)		LF006
77	Same as Before		LF006
88	Refused		LF006
99	Don't know		LF006

LF006. And Sundays?

1	Never On		LF007
2	On 24 Hrs		LF007
&LF6F	Hours on FROM (use 24 hour format eg 0700)		LF007
&LF6T	Hours on TIL (use 24 hour format eg 2000)		LF007
77	Same as Before		LF007
88	Refused		LF007
99	Don't know		LF007

[ASK IF &BTYPE="COLLEGE","SCHOOL", ELSE SKIP TO IL010]

LF007. As a &BTYPE_____, we realize that you operate your facility differently when classes are not in session. I'd like to ask the same set of questions for your indoor lighting schedule when students are not in the classroom. What are the weekday hours that your indoor lights are on?

1	Never On		LF008
2	On 24 Hrs		LF008
&LF7F	Hours on FROM (use 24 hour format eg 0700)		LF008
&LF7T	Hours on TIL (use 24 hour format eg 2000)		LF008
88	Refused		LF008
99	Don't know		LF008

LF008. How about Saturdays?

1	Never On		LF009
2	On 24 Hrs		LF009
&LF8F	Hours on FROM (use 24 hour format eg 0700)		LF009
&LF8T	Hours on TIL (use 24 hour format eg 2000)		LF009
88	Refused		LF009
99	Don't know		LF009

LF009. And Sundays?

1	Never On		IL010
2	On 24 Hrs		IL010
&LF9F	Hours on FROM (use 24 hour format eg 0700)		IL010
&LF9T	Hours on TIL (use 24 hour format eg 2000)		IL010
88	Refused		IL010
99	Don't know		IL010

[SPILLOVER]

IL010. Since January 1995, have you made any changes in indoor lighting at your facility other than routine replacement of burned out bulbs?

1	No Change		MT010
2	Added	&ADDED	IL020
3	Removed	&REMOVED	IL020
4	Added & Removed (Same as Replaced)	&ADDREM	IL020
88	Refused		MT010
99	Don't Know		MT010

IL020. In what year did you make these changes?

1	1995		IL030
2	1996		IL030
3	1997		IL030
4	1998		IL030
88	Refused		IL030
99	Don't Know		IL030

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO IL040]
IL030. Was your firm paid a rebate by PG&E for these changes in your lighting?

1	Yes		IL040
2	No		IL040
88	Refused		IL040
99	Don't Know		IL040

IL040. What type of fixtures were &ADDED/&REMOVED/&ADDREM?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&IL041	2' T8 Fixtures	IL070
&IL042	4' T8 Fixtures	IL070
&IL043	8' T8 Fixtures	IL070
&IL044	2' T10 Fixtures	IL070
&IL045	4' T10 Fixtures	IL070
&IL046	8' T10 Fixtures	IL070
&IL047	2' T12 Fixtures	IL070
&IL048	4' T12 Fixtures	IL070
&IL049	8' T12 Fixtures	IL070
&IL050	Standard HID (High Intensity Discharge) Fixtures	IL070
&IL051	Compact HID (High Intensity Discharge) Fixtures	IL070
&IL052	Compact Fluorescents (Screw-In Modular)	IL070
&IL053	Compact Fluorescents (Hardwire)	IL070
&IL054	Incandescents	IL070
&IL055	Exit Signs (Compact Fluorescent)	IL070
&IL056	Exit Signs (LED)	IL070
&IL057	Install Reflectors	IL070
&IL058	Electronic Ballasts	IL070
&IL059	Magnetic Ballasts	IL070
&IL060	Time Clocks	IL070
&IL061	Occupancy Sensors	IL070
&IL062	Bypass/Delay Timers	IL070
&IL063	Photocells	IL070
&IL064	OTHER FLUORESCENTS	IL070
&IL065	Other - SPECIFY: &IL065	IL070
88	Refused	SP080
99	Don't Know	SP080

[Cycle through for all technologies selected]
IL070. How many &IL041-&IL065 did you &ADD/&REMOVE/&ADDREM?

&IL041N	2' T8 Fixtures	IL080
&IL042N	4' T8 Fixtures	IL080
&IL043N	8' T8 Fixtures	IL080
&IL044N	2' T10 Fixtures	IL080
&IL045N	4' T10 Fixtures	IL080
&IL046N	8' T10 Fixtures	IL080
&IL047N	2' T12 Fixtures	IL080
&IL048N	4' T12 Fixtures	IL080
&IL049N	8' T12 Fixtures	IL080
&IL050N	Standard HID (High Intensity Discharge) Fixtures	IL080
&IL051N	Compact HID (High Intensity Discharge) Fixtures	IL080
&IL052N	Compact Fluorescents (Screw-In Modular)	IL080
&IL053N	Compact Fluorescents (Hardwire)	IL080
&IL054N	Incandescents	IL080
&IL055N	Exit Signs (Compact Fluorescent)	IL080
&IL056N	Exit Signs (LED)	IL080
&IL057N	Install Reflectors	IL080
&IL058N	Electronic Ballasts	IL080
&IL059N	Magnetic Ballasts	IL080
&IL060N	Time Clocks	IL080
&IL061N	Occupancy Sensors	IL080
&IL062N	Bypass/Delay Timers	IL080
&IL063N	Photocells	IL080
&IL064N	OTHER FLUORESCENTS	IL080
&IL065N	Other - SPECIFY: &IL065	IL080

[ASK IF &IL064 -OR- &IL065 = 1, ELSE SKIP TO IL090]
IL080. Just to confirm, is the additional lighting Standard Efficiency, or did you pay extra for a High Efficiency technology?

1	High Efficiency		IL090
2	Standard Efficiency		IL090
88	Refused		IL090
99	Don't Know		IL090

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO SP090]
IL090. Please tell me if you used the following components in all, some, or none of the remodeling or renovation projects at this facility?

IL090A. Electronic Ballasts?

1	All		IL090B
2	Some		IL090B
3	None		IL090B
8	Refused		IL090B

9	Don't Know		IL090B

IL090B. T8 Lamps?

1	All		IL090C
2	Some		IL090C
3	None		IL090C
8	Refused		IL090C
9	Don't Know		IL090C

IL090C. Two Lamp Fixtures?

1	All		IL100A
2	Some		IL100A
3	None		IL100A
8	Refused		IL100A
9	Don't Know		IL100A

[ASK IF (IL090A = 3) -AND- (IL090B = 3), ELSE SKIP TO SP080]

IL100A. What was your most important reason for not using electronic ballasts or T-8s in your renovation or remodeling projects?

DO NOT READ

1	Not aware of electronic ballasts or T-8s at the time	IL100B
2	Too expensive compared to other models	IL100B
3	Not enough construction budget for electronic ballasts	IL100B
4	Electronic ballasts not reliable	IL100B
5	Not sure about using in the particular project	IL100B
6	Designer or contractor recommended NOT to use	IL100B
7	Not readily available from distributors	IL100B
8	Energy savings not adequate to justify extra cost	IL100B
9	Company policy to use magnetic ballasts	IL100B
10	Didn't really make a formal comparison w/magnetics	IL100B
11	Rest of facility(ies) use standard equipment	IL100B
12	We lease the space; not worth the extra expense	IL100B
13	Don't pay electric bills; therefore not worth the investment	IL100B
14	Color of light not appropriate for intended application	IL100B
16	Other (specify)	IL100B
88	Refused	IL100B

99	Don't Know	IL100B

IL100B. Were there other reasons?

1	Not aware of electronic ballasts or T-8s at the time	SP080
2	Too expensive compared to other models	SP080
3	Not enough construction budget for electronic ballasts	SP080
4	Electronic ballasts not reliable	SP080
5	Not sure about using in the particular project	SP080
6	Designer or contractor recommended NOT to use	SP080
7	Not readily available from distributors	SP080
8	Energy savings not adequate to justify extra cost	SP080
9	Company policy to use magnetic ballasts	SP080
10	Didn't really make a formal comparison w/magnetics	SP080
11	Rest of facility(ies) use standard equipment	SP080
12	We lease the space; not worth the extra expense	SP080
13	Don't pay electric bills; therefore not worth the investment	SP080
14	Color of light not appropriate for intended application	SP080
15	No Other Reasons	SP080
16	Other (specify)	SP080
88	Refused	SP080
99	Don't Know	SP080

[ASK IF RESPONSES INCLUDE {(IL041-IL046) -OR- (IL050-IL053) -OR- (IL055-IL058) -OR- (IL060-IL063) -OR- ((IL064 -OR- IL065) -AND- IL080=1)} -AND- IL030 <> 1, ELSE SKIP TO SP090]

SP080. To what extent did your knowledge of PG&E's Program influence your lighting equipment selection? (READ LIST)

1	Not at all Influential		SP090
2	Slightly Influential		SP090
3	Somewhat Influential		SP090
4	Moderately Influential		SP090
5	Very Influential		SP090
88	Refused		SP090
99	Don't Know		SP090

[ASK IF SPILL94 = 1, ELSE SKIP TO MT010]

SP090. When you were originally contacted in 1995, you firm indicated it had installed energy-efficient lighting at the facility, but did not receive a rebate. Do you recall this being the case?

1	Yes		SP100
2	No		MT010
88	Refused		MT010
99	Don't Know		MT010

SP100. On a scale of 1 to 5, how would you rate the Program's influence on your decision to install those additional lighting measures?

1	Not at all Influential		MT010
2	Slightly Influential		MT010
3	Somewhat Influential		MT010
4	Moderately Influential		MT010
5	Very Influential		MT010
88	Refused		MT010
99	Don't Know		MT010

[MARKET EFFECTS]

[ASK ALL]

MT010. Next, I am going to read a list of statements which may or may not apply to your experiences when you were shopping for your new lighting equipment. Please indicate, on a scale of 1 to 10, whether you agree or disagree with the following the statements. One means you strongly disagree and 10 means you strongly agree.

&MT011	Overall, I am quite familiar with high efficiency fluorescent lighting technologies.	&MT013
&MT013	It is very difficult to find high-efficiency lighting equipment in this area.	&MT015
&MT015	Acquiring high efficiency lighting equipment is more of a hassle than for standard efficiency units.	&MT017
&MT017	High-efficiency lighting equipment has performance problems.	&MT019
&MT019	The initial investment required by high-efficiency lighting equipment is too great for our company.	&MT023
&MT023	(The standard operating procedures of our purchasing department do not accommodate the purchase of more costly high-efficiency lighting equipment.)	OL010

[OUTDOOR LIGHTING]

OL010. Is OUTDOOR lighting included on your facility's utility bill?

1	Yes		OL020
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL020. Since January 1995, have you made any changes in OUTDOOR lighting at your facility?

1	Yes		OL030
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL030. In what year did you make these changes?

1	1995		OL040
2	1996		OL040
3	1997		OL040
4	1998		OL040
88	Refused		OL040
99	Don't Know		OL040

OL040. Did you ADD, REPLACE, or REMOVE outdoor lighting?

1	Added lighting	CE080
2	Replaced lighting (Same as Added & Removed)	CE080
3	Removed	CE080
88	Refused	CE080
99	Don't Know	CE080

[COOLING AND HEATING CHANGES]

CE080. Since January 1995, have you ADDED, REMOVED, or REPLACED an older cooling system?

1	No Change		HE080
2	Added		CE090
3	Removed		CE090
4	Added and Removed		CE090
88	Refused		HE080
99	Don't Know		HE080

CE090. In what year did you make these changes?

1	1995		CE091
2	1996		CE091
3	1997		CE091
4	1998		CE091
88	Refused		CE110
99	Don't Know		CE110

CE091. And can you recall which month?

1	January		CE110
2	February		CE110
3	March		CE110
4	April		CE110
5	May		CE110
6	June		CE110
7	July		CE110
8	August		CE110
9	September		CE110
10	October		CE110
11	November		CE110
12	December		CE110
88	Refused		CE110
99	Don't Know		CE110

[ASK IF CE080 = 3 -OR- 4, ELSE SKIP TO CE120]
CE110. What fuel was used to power the old system?

1	Electricity		CE120
2	Natural Gas		CE120
3	Other	SPECIFY: &CE111	CE120
88	Refused		CE120
99	Don't Know		CE120

[ASK IF CE080 = 2 -OR- 4, ELSE SKIP TO HE080]
CE120. What fuel does the cooling system addition use?

1	Electricity		HE080
2	Natural Gas		HE080
3	Other	SPECIFY: &CE121	HE080
88	Refused		HE080
99	Don't Know		HE080

Read If Heat Pump:
Please bear with me. I have to code this as a heating change as well.

HE080. Since January 1995, have you ADDED, REPLACED, or REMOVED an older heating system?

1	No Change		OE010
2	Added		HE090
3	Removed		HE090
4	Added AND Removed		HE090
88	Refused		OE010
99	Don't Know		OE010

HE090. In what year did you make these changes?

1	1995		HE091
2	1996		HE091
3	1997		HE091
4	1998		HE091
88	Refused		HE110
99	Don't Know		HE110

HE091. And can you recall which month?

1	January		HE110
2	February		HE110
3	March		HE110
4	April		HE110
5	May		HE110
6	June		HE110
7	July		HE110
8	August		HE110
9	September		HE110
10	October		HE110
11	November		HE110
12	December		HE110
88	Refused		HE110
99	Don't Know		HE110

[ASK IF HE080 = 3 -OR- 4, ELSE SKIP TO HE120]
HE110. What fuel was used to power the old system?

1	Natural Gas		HE120
2	Propane or Bottled Gas		HE120
3	Oil		HE120
4	Steam		HE120
5	Electricity		HE120
6	Other	SPECIFY: &HE111	HE120
88	Refused		HE120
99	Don't Know		HE120

[ASK IF HE080 = 2 -OR- 4, ELSE SKIP TO OE010]
HE120. What fuel does the heating addition use?

1	Natural Gas		OE010
2	Propane or Bottled Gas		OE010
3	Oil		OE010
4	Steam		OE010
5	Electricity		OE010
6	Other	SPECIFY: &HE121	OE010
88	Refused		OE010
99	Don't Know		OE010

[OTHER EQUIPMENT CHANGES]

OE010. Since January 1995, have you changed any other equipment that makes up 10% or more of your facility's annual electric bill?

1	Yes		OE011
2	No		EM010
88	Refused		EM010
99	Don't Know		EM010

OE011. Which of the following types of equipment were affected?

(READ FIRST THREE THEN ASK FOR OTHER)
(READ LIST; SELECT ALL THAT APPLY)

&OE012	Water Heating		OE020
&OE013	Cooking		OE020
&OE014	Refrigeration		OE020
&OE015	Other (Please Specify)	SPECIFY: &EQUIP1	OE020
88	Refused		OE020
99	Don't Know		OE020

[ASK IF &OE012 = 1, ELSE SKIP TO OE050]
OE020. In what year did you change your water heating equipment?

1	1995		OE030
2	1996		OE030
3	1997		OE030
4	1998		OE030
88	Refused		OE030
99	Don't Know		OE030

OE030. Did you ADD or REMOVE water heating equipment?

1	Added		OE040
2	Removed		OE040
88	Refused		OE050
99	Don't Know		OE050

OE040. What fuel was used to power the &ADDED/&REMOVED water heating equipment?

1	Natural Gas		OE050
2	Propane or Bottled Gas		OE050
3	Oil		OE050
4	Electricity		OE050
5	Other	SPECIFY: &OE041	OE050
88	Refused		OE050
99	Don't Know		OE050

[ASK IF &OE013 = 1, ELSE SKIP TO OE080]
OE050. In what year did you change your cooking equipment?

1	1995		OE060

2	1996		OE060
3	1997		OE060
4	1998		OE060
88	Refused		OE060
99	Don't Know		OE060

OE060. Did you ADD or REMOVE cooking equipment?

1	Added		OE070
2	Removed		OE070
88	Refused		OE080
99	Don't Know		OE080

OE070. What fuel was used to power the &ADDED/&REMOVED cooking equipment?

1	Natural Gas		OE080
2	Propane or Bottled Gas		OE080
3	Oil		OE080
4	Electricity		OE080
5	Other	SPECIFY: &OE071	OE080
88	Refused		OE080
99	Don't Know		OE080

[ASK IF &OE014 = 1, ELSE SKIP TO OE110]
OE080. In what year did you change your refrigeration equipment?

1	1995		OE090
2	1996		OE090
3	1997		OE090
4	1998		OE090
88	Refused		OE090
99	Don't Know		OE090

OE090. Did you ADD or REMOVE refrigeration equipment?

1	Added		OE100
2	Removed		OE100
88	Refused		OE110
99	Don't Know		OE110

OE100. What fuel was used to power the &ADDED/&REMOVED refrigeration equipment?

1	Natural Gas		OE110
2	Propane or Bottled Gas		OE110
3	Oil		OE110
4	Electricity		OE110
5	Other	SPECIFY: &OE101	OE110
88	Refused		OE110
99	Don't Know		OE110

[ASK IF &OE015 = 1, ELSE SKIP TO EM010]
OE110. In what year did you change your &EQUIP1_______________?

1	1995		OE120
2	1996		OE120
3	1997		OE120
4	1998		OE120
88	Refused		OE120
99	Don't Know		OE120

OE120. Did you ADD or REMOVE &EQUIP1__________?

1	Added		OE130
2	Removed		OE130
88	Refused		EM010
99	Don't Know		EM010

OE130. What fuel was used to power the &ADDED/&REMOVED &EQUIP1__________?

1	Natural Gas		EM010
2	Propane or Bottled Gas		EM010
3	Oil		EM010
4	Electricity		EM010
5	Other	SPECIFY: &OE131	EM010
88	Refused		EM010
99	Don't Know		EM010

[ASK ONLY IF ASK_EMS=1, ELSE SKIP TO CP010]
EM010. Do you have an in-house Energy Management System at this facility?

Read If Prompted:
Typically installed at larger facilities, an EMS electronically controls the lighting and heating / cooling requirements of a building, based on the outside ambient air temperature and amount of available light. This requires the users to program the device, and is a sophisticated means of controlling energy usage.

1	Yes		EM020
0	No		CP010
88	Refused		CP010
99	Don't Know		CP010

EM020. In what year was the Energy Management System installed?

1	1995		CP010
2	1996		CP010
3	1997		CP010
4	1998		CP010
88	Refused		CP010
99	Don't Know		CP010

[ASK ONLY IF ASK_COGN=1, ELSE SKIP TO GOODBYE]
CP010. Do you have a cogeneration plant at this facility?

Read If Prompted:
Refers to co-generation, or facilities that produce some, if not all, of their own power. This typically is done at colleges or universities, or similarly large complexes (such as industrial plants).

1	Yes		CP020
0	No		GOODBYE
88	Refused		GOODBYE
99	Don't Know		GOODBYE

CP020. In what year did the cogeneration plant begin operation?

1	1995		CP010
2	1996		CP010
3	1997		CP010
4	1998		CP010
88	Refused		GOODBYE
99	Don't Know		GOODBYE

GOODBYE. Those are all the questions I have for you today. On behalf of Pacific Gas and Electric Company, thank you very much for your time and cooperation.

Appendix B

1994 Nonparticipant Survey Instrument

MYBS 1994 NONPARTICIPATION CONTACT &DNAME______________________
(&D1) &D2 - &D3_ Ext. &DEXT_
CALLBACK DATE &DCBD___ CALLBACK TIME &DCBT_______ Def: &DDEF_
FIRM: &BILLNAME____________________ (1=def callback 0=general)
&NOTED1____
&NOTED2____
&NOTED3____
&NOTED4____
&NOTED5____

[INTRODUCTION]

Hello. This is &INTERVIEWER____. I'm with Quantum Consulting, a management consulting firm in Berkeley, California. We are calling on behalf of Pacific Gas & Electric Company. Your firm should have received a letter several weeks ago regarding your participation in a study that Pacific Gas & Electric Company is conducting. In &SURVDATE___ our firm conducted an interview with &CONTACT___ to discuss &BILLNAME___ 's perceptions of energy efficient lighting. We would like to conduct a follow-up interview with you. Your participation in this survey is very important.

READ IF REFUSE:
Or with someone knowledgeable about the lighting decisions made at your company.

READ ONLY IF PROMPTED:
Why are you doing a survey?
This is NOT a sales call. Pacific Gas & Electric is interested in how lighting decisions are made at &BILLNAME____ as a result of PG&E's Commercial Programs. This information will be used to determine the effectiveness of these programs. This is proprietary information, and will not be used for any marketing purposes.

Who are you trying to reach?
We'd like to speak with the person most knowledgeable about recent changes of lighting equipment at &SERVADDR_____ in &SERVCITY_______.

1	Continue	Person Answering phone is the best contact	SC010
2	Continue	Transferred to Technical Contact	SC010
3	Arrange a Callback	Given Technical Contact Name and Telephone	1ST SCREEN AND EITHER SET AN APPOINTMENT FOR A CALLBACK OR NOTE AS REFUSAL IF APPROPRIATE
88	Refused	Thank and Term.	GOODBYE

SC010. This survey is designed to take approximately 8 minutes. Is now a good time?

1	Continue		SC020

SC020. Pacific Gas and Electric's Retrofit Express Program provides rebates to encourage customers to install energy-efficient lighting. Do you recall &BUSINESS__________ having lighting installed as part of PG&E's 1994 program?

1	Yes		GOODBYE
2	No		MN001
88	Refused		MN001
99	Don't Know		MN001

MN001. I would like to inform you that for quality control purposes, this call may be monitored by my supervisor. Would this be OK with you?

1	OK		BC011
2	Not OK	IF NECESSARY, ASK YOUR SUPERVISOR TO STEP AWAY	BC011

I'm going to be asking you a number of questions regarding your "FACILITY," which means ALL of the buildings and tenants SERVICED BY PG&E UNDER THE FOLLOWING billing name: &BILLNAME____________ at this address: &SERVADDR_______________

[FIRMOGRAPHICS]

[ASK ALL]
BC011. What is the main business ACTIVITY at the facility?

1	Office		FC080
2	Retail		FC080
3	College/University		FC080
4	K-12 School		FC080
5	Grocery (Food Store)		FC080
6	Restaurant		FC080
7	Health Care (Hospital)		FC080
8	Hotel/Motel		FC080
9	Warehouse		FC080
10	Personal Service (Includes beauty salons, dentists, doctors office etc.)		FC080
11	Community Service (such as fire dept., police station)		FC080
12	Misc	SPECIFY: &BC012________	FC080
88	Refused		FC080
99	Don't Know		FC080

FC080. What is the total square feet of the facility?

&FC080	Square Feet		FC110

88	Refused		FC081
99	Don't Know		FC081

FC081. Can you estimate the total square footage to be ...

1	Less than 1,000 sq ft		FC110
2	Less than 10,000 sq ft		FC110
3	Less than 100,000 sq ft		FC110
4	Less than 1,000,000 sq ft		FC110
5	Over 1,000,000 sq ft		FC110
88	Refused		FC110
99	Don't Know		FC110

FC110. Since January 1995, has the square footage of the facility increased, decreased, or stayed the same?

1	Increased floor space		FC115
2	Decreased floor space		FC120
3	Stayed the same		EI010
88	Refused		EI010
99	Don't Know		EI010

FC115. How many square feet was added?

&FC115	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC120. How many square feet was the facility reduced?

&FC120	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC130. In what year did this change in floor space occur?

1	1995		FC131
2	1996		FC131
3	1997		FC131
4	1998		FC131
88	Refused		EI010
99	Don't Know		EI010

FC131. And can you recall which month?

1	January		EI010
2	February		EI010
3	March		EI010
4	April		EI010
5	May		EI010
6	June		EI010

7	July		EI010
8	August		EI010
9	September		EI010
10	October		EI010
11	November		EI010
12	December		EI010
88	Refused		EI010
99	Don't Know		EI010

EI010. Approximately how many people are currently employed at the facility, including both full- and part-time employees?

&EI010	Number of Employees		EI020
88	Refused		EI020
99	Don't Know		EI020

EI020. Since January 1995, has the number of people employed at this facility changed by more than 10 percent?

1	Yes		EI030
2	No		AG010
88	Refused		AG010
99	Don't Know		AG010

EI030. In what year did this change in the number of employees occur?

1	1995		EI031
2	1996		EI031
3	1997		EI031
4	1998		EI031
88	Refused		EI040
99	Don't Know		EI040

EI031. And can you recall which month?

1	January		EI040
2	February		EI040
3	March		EI040
4	April		EI040
5	May		EI040
6	June		EI040
7	July		EI040
8	August		EI040
9	September		EI040
10	October		EI040
11	November		EI040
12	December		EI040
88	Refused		EI040
99	Don't Know		EI040

EI040. Approximately how many people were employed at this facility before the change occurred, including both full and part-time employees?

&EI040	Number of Employees		AG010
77	Seasonal Workforce	Enter Comments	AG010
88	Refused		AG010
99	Don't Know		AG010

Comment1 &EI0401____
Comment2 &EI0402____

AG010. Do you know in what year your facility was built?

&AG010	YYYY e.g. 1973		FM010
88	Refused		AG020
99	Don't Know		AG020

AG020. Would you say it was …(READ LIST)

1	Before 1978		FM010
2	Between 1978 and 1988		FM010
3	After 1988		FM010
88	Refused		FM010
99	Don't Know		FM010

[ASK ALL]
FM010. Has your organization assigned responsibility for controlling energy usage and costs to a specific staff person, group of staff, or contractor?

1	Yes		FM020
2	No		FM020
8	Refused		FM020
9	Don't Know		FM020

FM020. Has your organization developed a policy or standard specification for selection of fluorescent lighting equipment?

1	Yes		FI110
2	No		FI110
8	Refused		FI110
9	Don't Know		FI110

[ASK IF NONPRT95 = 1, ELSE SKIP TO GL010]
FI110. What is the length of the current lease at &SERVADDR______?

&FI110	Number of years		FI115
66	One Year		GL010
77	Month to Month		GL010
88	Refused		FI115
99	Don't Know		FI115

FI115. How many years are left on the lease?

&FI115	Number of years		GL010
88	Refused		GL010
99	Don't Know		GL010

[GENERAL LIGHTING]

GL010. What is the primary type of lighting currently in use at your facility?

(READ LIST IF NECESSARY, SELECT ONLY ONE)

1	T8 Fluorescent	GL020
2	T10 Fluorescent	GL020
3	T12 Fluorescent	GL020
4	HID (High Intensity Discharge)	GL020
5	Halogen	GL020
6	Incandescent	GL020
7	Compact Fluorescent	GL020
8	Other Fluorescent	GL020
9	Other (Please Specify)	GL020
71	SKINNY (THIN) TUBES	GL020
72	FAT (THICKER) TUBES	GL020
88	Refused	GL020
99	Don't Know	GL020

GL020. And what was it 5 years ago?

1	T8 Fluorescent	GL030A
2	T10 Fluorescent	GL030A
3	T12 Fluorescent	GL030A
4	HID (High Intensity Discharge)	GL030A
5	Halogen	GL030A
6	Incandescent	GL030A
7	Compact Fluorescent	GL030A
8	Other Fluorescent	GL030A
9	Other (Please Specify)	GL030A
71	SKINNY (THIN) TUBES	GL030A
72	FAT (THICKER) TUBES	GL030A
88	Refused	GL030A
99	Don't Know	GL030A

GL030A. **Roughly what percentage of fluorescent fixtures in your facility use electronic ballasts?**

&GL030A	Percentage		GL030B
88	Refused		GL030B
99	Don't Know		GL030B

GL030B. What would you say that percentage was 5 years ago?

&GL030B	Percentage		GL040A
88	Refused		GL040A
99	Don't Know		GL040A

[ASK ONLY IF GL030A > GL030B, ELSE SKIP TO IL010]

GL040A. What is the main reason that your organization increased its use of electronic ballasts over the past five years?

DO NOT READ

1	Lower energy (operating) cost	GL040B
2	Longer useful life	GL040B
3	Less hum	GL040B
4	Better quality / More light	GL040B
5	New equipment looks better	GL040B
6	Better light promotes productivity / Cuts down on complaints	GL040B
7	More flexibility in installation	GL040B
8	More readily available from distributors	GL040B
9	Promoted by utilities	GL040B
10	Promoted by distributors, contractors, or designers	GL040B
11	Prices have come down	GL040B
12	Other (specify)	GL040B
88	Refused	GL040B
99	Don't Know	GL040B

GL040B. Are there other reasons?

1	Lower energy (operating) cost	IL010
2	Longer useful life	IL010
3	Less hum	IL010
4	Better quality / More light	IL010
5	New equipment looks better	IL010
6	Better light promotes productivity / Cuts down on complaints	IL010
7	More flexibility in installation	IL010
8	More readily available from distributors	IL010
9	Promoted by utilities	IL010
10	Promoted by distributors, contractors, or designers	IL010
11	Prices have come down	IL010
12	Other (specify)	IL010
13	No Other Reasons	IL010
88	Refused	IL010
99	Don't Know	IL010

[SPILLOVER]

IL010. Since January 1995, have you made any changes in indoor lighting at your facility other than routine replacement of burned out bulbs?

1	No Change		MT010
2	Added	&ADDED	IL020
3	Removed	&REMOVED	IL020
4	Added & Removed	&ADDREM	IL020
88	Refused		MT010
99	Don't Know		MT010

IL020. In what year did you make these changes?

1	1995		IL030
2	1996		IL030
3	1997		IL030
4	1998		IL030
88	Refused		IL030
99	Don't Know		IL030

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO IL040]
IL030. Was your firm paid a rebate by PG&E for these changes in your lighting?

1	Yes		IL040
2	No		SP060
88	Refused		SP060
99	Don't Know		SP060

SP060. Did you become aware of PG&E's Lighting Program BEFORE or AFTER you made the decision to purchase your new lighting?

1	Before		IL040
2	After		IL040
88	Refused		IL040
99	Don't Know		IL040

IL040. What type of fixtures were &ADDED/&REMOVED/&ADDREM?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&IL041	2' T8 Fixtures	IL070
&IL042	4' T8 Fixtures	IL070
&IL043	8' T8 Fixtures	IL070
&IL044	2' T10 Fixtures	IL070
&IL045	4' T10 Fixtures	IL070
&IL046	8' T10 Fixtures	IL070
&IL047	2' T12 Fixtures	IL070
&IL048	4' T12 Fixtures	IL070
&IL049	8' T12 Fixtures	IL070
&IL050	Standard HID (High Intensity Discharge) Fixtures	IL070

&IL051	Compact HID (High Intensity Discharge) Fixtures	IL070
&IL052	Compact Fluorescents (Screw-In Modular)	IL070
&IL053	Compact Fluorescents (Hardwire)	IL070
&IL054	Incandescents	IL070
&IL055	Exit Signs (Compact Fluorescent)	IL070
&IL056	Exit Signs (LED)	IL070
&IL057	Install Reflectors	IL070
&IL058	Electronic Ballasts	IL070
&IL059	Magnetic Ballasts	IL070
&IL060	Time Clocks	IL070
&IL061	Occupancy Sensors	IL070
&IL062	Bypass/Delay Timers	IL070
&IL063	Photocells	IL070
&IL064	OTHER FLUORESCENTS	IL070
&IL065	Other - SPECIFY: &IL065	IL070
88	Refused	SP080
99	Don't Know	SP080

[Cycle through for all technologies selected]
IL070. How many &IL041-&IL065 did you &ADD/&REMOVE/&ADDREM?

&IL041N	2' T8 Fixtures	IL080
&IL042N	4' T8 Fixtures	IL080
&IL043N	8' T8 Fixtures	IL080
&IL044N	2' T10 Fixtures	IL080
&IL045N	4' T10 Fixtures	IL080
&IL046N	8' T10 Fixtures	IL080
&IL047N	2' T12 Fixtures	IL080
&IL048N	4' T12 Fixtures	IL080
&IL049N	8' T12 Fixtures	IL080
&IL050N	Standard HID (High Intensity Discharge) Fixtures	IL080
&IL051N	Compact HID (High Intensity Discharge) Fixtures	IL080
&IL052N	Compact Fluorescents (Screw-In Modular)	IL080
&IL053N	Compact Fluorescents (Hardwire)	IL080
&IL054N	Incandescents	IL080
&IL055N	Exit Signs (Compact Fluorescent)	IL080
&IL056N	Exit Signs (LED)	IL080
&IL057N	Install Reflectors	IL080
&IL058N	Electronic Ballasts	IL080
&IL059N	Magnetic Ballasts	IL080
&IL060N	Time Clocks	IL080
&IL061N	Occupancy Sensors	IL080
&IL062N	Bypass/Delay Timers	IL080
&IL063N	Photocells	IL080
&IL064N	OTHER FLUORESCENTS	IL080
&IL065N	Other - SPECIFY: &IL065	IL080

[ASK IF &IL064 -OR- &IL065 = 1, ELSE SKIP TO IL090]
IL080. Just to confirm, is the additional lighting Standard Efficiency, or did you pay extra for a High Efficiency technology?

1	High Efficiency		IL090
2	Standard Efficiency		IL090
88	Refused		IL090
99	Don't Know		IL090

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO SP090]
IL090. Please tell me if you used the following components in all, some, or none of the remodeling or renovation projects at this facility?

IL090A. Electronic Ballasts?

1	All		IL090B
2	Some		IL090B
3	None		IL090B
8	Refused		IL090B
9	Don't Know		IL090B

IL090B. T8 Lamps?

1	All		IL090C
2	Some		IL090C
3	None		IL090C
8	Refused		IL090C
9	Don't Know		IL090C

IL090C. Two Lamp Fixtures?

1	All		IL100A
2	Some		IL100A
3	None		IL100A
8	Refused		IL100A
9	Don't Know		IL100A

[ASK IF (IL090A = 3) -AND- (IL090B = 3), ELSE SKIP TO SP080]
IL100A. What was your most important reason for not using electronic ballasts or T-8s in your renovation or remodeling projects?

DO NOT READ

1	Not aware of electronic ballasts or T-8s at the time	IL100B
2	Too expensive compared to other models	IL100B
3	Not enough construction budget for electronic ballasts	IL100B
4	Electronic ballasts not reliable	IL100B
5	Not sure about using in the particular project	IL100B
6	Designer or contractor recommended NOT to use	IL100B
7	Not readily available from	IL100B

	distributors	
8	Energy savings not adequate to justify extra cost	IL100B
9	Company policy to use magnetic ballasts	IL100B
10	Didn't really make a formal comparison w/magnetics	IL100B
11	Rest of facility(ies) use standard equipment	IL100B
12	We lease the space; not worth the extra expense	IL100B
13	Don't pay electric bills; therefore not worth the investment	IL100B
14	Color of light not appropriate for intended application	IL100B
16	Other (specify)	IL100B
88	Refused	IL100B
99	Don't Know	IL100B

IL100B. Were there other reasons?

1	Not aware of electronic ballasts or T-8s at the time	SP080
2	Too expensive compared to other models	SP080
3	Not enough construction budget for electronic ballasts	SP080
4	Electronic ballasts not reliable	SP080
5	Not sure about using in the particular project	SP080
6	Designer or contractor recommended NOT to use	SP080
7	Not readily available from distributors	SP080
8	Energy savings not adequate to justify extra cost	SP080
9	Company policy to use magnetic ballasts	SP080
10	Didn't really make a formal comparison w/magnetics	SP080
11	Rest of facility(ies) use standard equipment	SP080
12	We lease the space; not worth the extra expense	SP080
13	Don't pay electric bills; therefore not worth the investment	SP080
14	Color of light not appropriate for intended application	SP080
15	No Other Reasons	SP080
16	Other (specify)	SP080
88	Refused	SP080
99	Don't Know	SP080

[ASK IF RESPONSES INCLUDE {(IL041-IL046) -OR- (IL050-IL053) -OR- (IL055-IL058) -OR- (IL060-IL063) -OR- ((IL064 -OR- IL065) -AND- IL080=1)} -AND- IL030 <> 1 -AND- SP060 <> 2, ELSE SKIP TO SP090]

SP080. To what extent did your knowledge of PG&E's Program influence your lighting equipment selection? (READ LIST)

1	Not at all Influential		SP090
2	Slightly Influential		SP090
3	Somewhat Influential		SP090
4	Moderately Influential		SP090
5	Very Influential		SP090
88	Refused		SP090
99	Don't Know		SP090

[ASK IF SPILL94 = 1, ELSE SKIP TO MT010]

SP090. When you were originally contacted in 1995, you firm indicated it had installed energy-efficient lighting at the facility, but did not receive a rebate. Do you remember this being the case?

1	Yes		SP100
2	No		MT010
88	Refused		MT010
99	Don't Know		MT010

SP100. How would you rate the Program's influence on your decision to install those additional lighting measures? [Read List]

1	Not at all Influential		MT010
2	Slightly Influential		MT010
3	Somewhat Influential		MT010
4	Moderately Influential		MT010
5	Very Influential		MT010
88	Refused		MT010
99	Don't Know		MT010

[MARKET EFFECTS]

[ASK ALL]

MT010. Next, I am going to read a list of statements which may or may not apply to your experiences when you were shopping for your new lighting equipment. Please indicate, on a scale of 1 to 10, whether you agree or disagree with each statement, where 1 means you strongly disagree with the statement and 10 means you strongly agree with the statement and you can use any number between 1 and 10. The first statement is…

&MT011	Overall, I am quite familiar with high efficiency fluorescent lighting technologies.	&MT013
&MT013	It is very difficult to find high-efficiency lighting equipment in this area.	&MT015

&MT015	Acquiring high efficiency lighting equipment is more of a hassle than for standard efficiency units.	&MT017
&MT017	High-efficiency lighting equipment has performance problems.	&MT019
&MT019	The initial investment required by high-efficiency lighting equipment is too great for our company.	&MT023
&MT023	(The standard operating procedures of our purchasing department do not accommodate the purchase of more costly high-efficiency lighting equipment.)	OL010

[OUTDOOR LIGHTING]

OL010. Is OUTDOOR lighting included on your facility's utility bill?

1	Yes		OL020
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL020. Since January 1995, have you made any changes in OUTDOOR lighting at your facility?

1	Yes		OL030
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL030. In what year did you make these changes?

1	1995		OL040
2	1996		OL040
3	1997		OL040
4	1998		OL040
88	Refused		OL040
99	Don't Know		OL040

OL040. Did you ADD, REPLACE, or REMOVE outdoor lighting?

1	Added lighting	CE080
2	Replaced lighting	CE080
3	Removed	CE080
88	Refused	CE080
99	Don't Know	CE080

[COOLING AND HEATING CHANGES]

CE080. Since January 1995, have you ADDED, REMOVED, or REPLACED an older cooling system?

1	No Change		HE080
2	Added		CE090
3	Removed		CE090
4	Added and Removed		CE090
88	Refused		HE080
99	Don't Know		HE080

CE090. In what year did you make these changes?

1	1995		CE091
2	1996		CE091
3	1997		CE091
4	1998		CE091
88	Refused		CE110
99	Don't Know		CE110

CE091. And can you recall which month?

1	January		CE110
2	February		CE110
3	March		CE110
4	April		CE110
5	May		CE110
6	June		CE110
7	July		CE110
8	August		CE110
9	September		CE110
10	October		CE110
11	November		CE110
12	December		CE110
88	Refused		CE110
99	Don't Know		CE110

[ASK IF CE080 = 3 -OR- 4, ELSE SKIP TO CE120]
CE110. What fuel was used to power the old system?

1	Electricity		CE120
2	Natural Gas		CE120
3	Other	SPECIFY: &CE111	CE120
88	Refused		CE120
99	Don't Know		CE120

[ASK IF CE080 = 2 -OR- 4, ELSE SKIP TO HE080]
CE120. What fuel does the cooling system addition use?

1	Electricity		HE080
2	Natural Gas		HE080
3	Other	SPECIFY: &CE121	HE080
88	Refused		HE080
99	Don't Know		HE080

HE080. Since January 1995, have you ADDED, REPLACED, or REMOVED an older heating system?

1	No Change		OE010
2	Added		HE090
3	Removed		HE090
4	Added AND Removed		HE090
88	Refused		OE010
99	Don't Know		OE010

HE090. In what year did you make these changes?

1	1995		HE091
2	1996		HE091
3	1997		HE091
4	1998		HE091
88	Refused		HE110
99	Don't Know		HE110

HE091. And can you recall which month?

1	January		HE110
2	February		HE110
3	March		HE110
4	April		HE110
5	May		HE110
6	June		HE110
7	July		HE110
8	August		HE110
9	September		HE110
10	October		HE110
11	November		HE110
12	December		HE110
88	Refused		HE110
99	Don't Know		HE110

[ASK IF HE080 = 3 -OR- 4, ELSE SKIP TO HE120]
HE110. What fuel was used to power the old system?

1	Natural Gas		HE120
2	Propane or Bottled Gas		HE120
3	Oil		HE120
4	Steam		HE120
5	Electricity		HE120
6	Other	SPECIFY: &HE111	HE120
88	Refused		HE120
99	Don't Know		HE120

[ASK IF HE080 = 2 -OR- 4, ELSE SKIP TO OE010]
HE120. What fuel does the heating addition use?

1	Natural Gas		OE010
2	Propane or Bottled Gas		OE010
3	Oil		OE010

4	Steam		OE010
5	Electricity		OE010
6	Other	SPECIFY: &HE121	OE010
88	Refused		OE010
99	Don't Know		OE010

[OTHER EQUIPMENT CHANGES]

OE010. Since January 1995, have you changed any other equipment that makes up 10% or more of your facility's annual electric bill?

1	Yes		OE011
2	No		EM010
88	Refused		EM010
99	Don't Know		EM010

OE011. Which of the following types of equipment were affected?

(READ FIRST THREE THEN ASK FOR OTHER)
(READ LIST; SELECT ALL THAT APPLY)

&OE012	Water Heating		OE020
&OE013	Cooking		OE020
&OE014	Refrigeration		OE020
&OE015	Other (Please Specify)	SPECIFY: &EQUIP1	OE020
88	Refused		OE020
99	Don't Know		OE020

[ASK IF &OE012 = 1, ELSE SKIP TO OE050]
OE020. In what year did you change your water heating equipment?

1	1995		OE030
2	1996		OE030
3	1997		OE030
4	1998		OE030
88	Refused		OE030
99	Don't Know		OE030

OE030. Did you ADD or REMOVE water heating equipment?

1	Added		OE040
2	Removed		OE040
88	Refused		OE050
99	Don't Know		OE050

OE040. What fuel was used to power the &ADDED/&REMOVED water heating equipment?

1	Natural Gas		OE050
2	Propane or Bottled Gas		OE050
3	Oil		OE050

4	Electricity		OE050
5	Other	SPECIFY: &OE041	OE050
88	Refused		OE050
99	Don't Know		OE050

[ASK IF &OE013 = 1, ELSE SKIP TO OE080]
OE050. In what year did you change your cooking equipment?

1	1995		OE060
2	1996		OE060
3	1997		OE060
4	1998		OE060
88	Refused		OE060
99	Don't Know		OE060

OE060. Did you ADD or REMOVE cooking equipment?

1	Added		OE070
2	Removed		OE070
88	Refused		OE080
99	Don't Know		OE080

OE070. What fuel was used to power the &ADDED/&REMOVED cooking equipment?

1	Natural Gas		OE080
2	Propane or Bottled Gas		OE080
3	Oil		OE080
4	Electricity		OE080
5	Other	SPECIFY: &OE071	OE080
88	Refused		OE080
99	Don't Know		OE080

[ASK IF &OE014 = 1, ELSE SKIP TO OE110]
OE080. In what year did you change your refrigeration equipment?

1	1995		OE090
2	1996		OE090
3	1997		OE090
4	1998		OE090
88	Refused		OE090
99	Don't Know		OE090

OE090. Did you ADD or REMOVE refrigeration equipment?

1	Added		OE100
2	Removed		OE100
88	Refused		OE110
99	Don't Know		OE110

OE100. What fuel was used to power the &ADDED/&REMOVED refrigeration equipment?

1	Natural Gas		OE110
2	Propane or Bottled Gas		OE110
3	Oil		OE110
4	Electricity		OE110
5	Other	SPECIFY: &OE101 ________	OE110
88	Refused		OE110
99	Don't Know		OE110

[ASK IF &OE015 = 1, ELSE SKIP TO EM010]

OE110. In what year did you change your &EQUIP1________________?

1	1995		OE120
2	1996		OE120
3	1997		OE120
4	1998		OE120
88	Refused		OE120
99	Don't Know		OE120

OE120. Did you ADD or REMOVE &EQUIP1__________?

1	Added		OE130
2	Removed		OE130
88	Refused		EM010
99	Don't Know		EM010

OE130. What fuel was used to power the &ADDED/&REMOVED &EQUIP1__________?

1	Natural Gas		EM010
2	Propane or Bottled Gas		EM010
3	Oil		EM010
4	Electricity		EM010
5	Other	SPECIFY: &OE131 ________	EM010
88	Refused		EM010
99	Don't Know		EM010

[ASK ONLY IF ASK_EMS=1, ELSE SKIP TO CP010]

EM010. Do you have an in-house Energy Management System at this facility?

1	Yes		EM020
0	No		CP010
88	Refused		CP010
99	Don't Know		CP010

EM020. In what year was the Energy Management System installed?

1	1995		CP010
2	1996		CP010

3	1997		CP010
4	1998		CP010
88	Refused		CP010
99	Don't Know		CP010

[ASK ONLY IF ASK_COGN=1, ELSE SKIP TO GOODBYE]
CP010. Do you have a cogeneration plant at this facility?

1	Yes		CP020
0	No		GOODBYE
88	Refused		GOODBYE
99	Don't Know		GOODBYE

CP020. In what year did the cogeneration plant begin operation?

1	1995		GOODBYE
2	1996		GOODBYE
3	1997		GOODBYE
4	1998		GOODBYE
88	Refused		GOODBYE
99	Don't Know		GOODBYE

GOODBYE. Those are all the questions I have for you today. On behalf of Pacific Gas and Electric Company, thank you very much for your time and cooperation.

Appendix C

1995 Nonparticipant Survey Instrument

MYBS 1995 NONPARTICIPATION CONTACT &DNAME________________________
(&D1)   &D2 - &D3_   Ext. &DEXT_
CALLBACK DATE &DCBD___   CALLBACK TIME &DCBT_______   Def: &DDEF_
FIRM: &BILLNAME____________________   (1=def callback 0=general)
&NOTED1____
&NOTED2____
&NOTED3____
&NOTED4____
&NOTED5____

[INTRODUCTION]

Hello. This is &INTERVIEWER____. I'm with Quantum Consulting, a management consulting firm in Berkeley, California. We are calling on behalf of Pacific Gas & Electric Company. Your firm should have received a letter several weeks ago regarding your participation in a study that Pacific Gas & Electric Company is conducting. In &SURVDATE___ our firm conducted an interview with &CONTACT___ to discuss &BILLNAME___ 's perceptions of energy efficient lighting. We would like to conduct a follow-up interview with you. Your participation in this survey is very important.

READ IF REFUSE:
Or with someone knowledgeable about the lighting decisions made at your company.

READ ONLY IF PROMPTED:
Why are you doing a survey?
This is NOT a sales call. Pacific Gas & Electric is interested in how lighting decisions are made at &BILLNAME____ as a result of PG&E's Commercial Programs. This information will be used to determine the effectiveness of these programs. This is proprietary information, and will not be used for any marketing purposes.

Who are you trying to reach?
We'd like to speak with the person most knowledgeable about recent changes of lighting equipment at &SERVADDR_____ in &SERVCITY_______.

1	Continue	Person Answering phone is the best contact	SC010
2	Continue	Transferred to Technical Contact	SC010
3	Arrange a Callback	Given Technical Contact Name and Telephone	1ST SCREEN AND EITHER SET AN APPOINTMENT FOR A CALLBACK OR NOTE AS REFUSAL IF APPROPRIATE
88	Refused	Thank and Term.	GOODBYE

SC010. This survey is designed to take approximately 8 minutes.

1	Continue		SC020

SC020. Pacific Gas and Electric's Retrofit Express Program provides rebates to encourage customers to install energy-efficient lighting. Do you recall &BUSINESS__________ having lighting installed as part of PG&E's 1994 program?

1	Yes		GOODBYE
2	No		MN001
88	Refused		MN001
99	Don't Know		MN001

MN001. I would like to inform you that for quality control purposes, this call may be monitored by my supervisor. Would this be OK with you?

1	OK		BC011
2	Not OK	IF NECESSARY, ASK YOUR SUPERVISOR TO STEP AWAY	BC011

I'm going to be asking you a number of questions regarding your "FACILITY," which means ALL of the buildings and tenants SERVICED BY PG&E UNDER THE FOLLOWING billing name: &BILLNAME____________ at this address: &SERVADDR_______________

[FIRMOGRAPHICS]

[ASK ALL]
BC011. What is the main business ACTIVITY at the facility?

1	Office		FC080
2	Retail		FC080
3	College/University		FC080
4	K-12 School		FC080
5	Grocery (Food Store)		FC080
6	Restaurant		FC080
7	Health Care (Hospital)		FC080
8	Hotel/Motel		FC080
9	Warehouse		FC080
10	Personal Service (Includes beauty salons, dentists, doctors office etc.)		FC080
11	Community Service (such as fire dept., police station)		FC080
12	Misc	SPECIFY: &BC012__________	FC080
88	Refused		FC080
99	Don't Know		FC080

FC080. What is the total square feet of the facility?

&FC080	Square Feet		FC110
88	Refused		FC081

99	Don't Know		FC081

FC081. Can you estimate the total square footage to be ...

1	Less than 1,000 sq ft		FC110
2	Less than 10,000 sq ft		FC110
3	Less than 100,000 sq ft		FC110
4	Less than 1,000,000 sq ft		FC110
5	Over 1,000,000 sq ft		FC110
88	Refused		FC110
99	Don't Know		FC110

FC110. Since January 1996, has the square footage of the facility increased, decreased, or stayed the same?

1	Increased floor space		FC115
2	Decreased floor space		FC120
3	Stayed the same		EI010
88	Refused		EI010
99	Don't Know		EI010

FC115. How many square feet was added?

&FC115	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC120. How many square feet was the facility reduced?

&FC120	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC130. In what year did this change in floor space occur?

1	1996		FC131
2	1997		FC131
3	1998		FC131
88	Refused		EI010
99	Don't Know		EI010

FC131. And can you recall which month?

1	January		EI010
2	February		EI010
3	March		EI010
4	April		EI010
5	May		EI010
6	June		EI010
7	July		EI010
8	August		EI010

9	September		EI010
10	October		EI010
11	November		EI010
12	December		EI010
88	Refused		EI010
99	Don't Know		EI010

EI010. Approximately how many people are currently employed at the facility, including both full- and part-time employees?

&EI010	Number of Employees		EI020
88	Refused		EI020
99	Don't Know		EI020

EI020. Since January 1996, has the number of people employed at this facility changed by more than 10 percent?

1	Yes		EI030
2	No		AG010
88	Refused		AG010
99	Don't Know		AG010

EI030. In what year did this change in the number of employees occur?

1	1996		EI031
2	1997		EI031
3	1998		EI031
88	Refused		EI040
99	Don't Know		EI040

EI031. And can you recall which month?

1	January		EI040
2	February		EI040
3	March		EI040
4	April		EI040
5	May		EI040
6	June		EI040
7	July		EI040
8	August		EI040
9	September		EI040
10	October		EI040
11	November		EI040
12	December		EI040
88	Refused		EI040
99	Don't Know		EI040

EI040. Approximately how many people were employed at this facility before the change occurred, including both full and part-time employees?

&EI040	Number of Employees		AG010
77	Seasonal Workforce	Enter Comments	AG010
88	Refused		AG010

99	Don't Know		AG010

Comment1 &EI0401____
Comment2 &EI0402____

AG010. Do you know in what year your facility was built?

&AG010	YYYY e.g. 1973		FM010
88	Refused		AG020
99	Don't Know		AG020

AG020. Would you say it was …(READ LIST)

1	Before 1978		FM010
2	Between 1978 and 1988		FM010
3	After 1988		FM010
88	Refused		FM010
99	Don't Know		FM010

[ASK ALL]
FM010. Has your organization assigned responsibility for controlling energy usage and costs to a specific staff person, group of staff, or contractor?

1	Yes		FM020
2	No		FM020
8	Refused		FM020
9	Don't Know		FM020

FM020. Has your organization developed a policy or standard specification for selection of fluorescent lighting equipment?

1	Yes		FI110
2	No		FI110
8	Refused		FI110
9	Don't Know		FI110

[ASK IF NONPRT95 = 1, ELSE SKIP TO GL010]

FI100. Does your firm own or lease the facility at &SERVADDR_____?

1	Own		GL010
2	Lease		FI110
88	Refused		GL010
99	Don't Know		GL010

FI110. What is the length of the current lease at &SERVADDR______?

&FI110	Number of years		FI115
66	One Year		GL010
77	Month to Month		GL010
88	Refused		FI115
99	Don't Know		FI115

FI115. How many years are left on the lease?

&FI115	Number of years		GL010
88	Refused		GL010
99	Don't Know		GL010

[GENERAL LIGHTING]

GL010. What is the primary type of lighting currently in use at your facility?

(READ LIST IF NECESSARY, SELECT ONLY ONE)

1	T8 Fluorescent	GL020
2	T10 Fluorescent	GL020
3	T12 Fluorescent	GL020
4	HID (High Intensity Discharge)	GL020
5	Halogen	GL020
6	Incandescent	GL020
7	Compact Fluorescent	GL020
8	Other Fluorescent	GL020
9	Other (Please Specify)	GL020
71	SKINNY (THIN) TUBES	GL020
72	FAT (THICKER) TUBES	GL020
88	Refused	GL020
99	Don't Know	GL020

GL020. And what was it 5 years ago?

1	T8 Fluorescent	GL030A
2	T10 Fluorescent	GL030A
3	T12 Fluorescent	GL030A
4	HID (High Intensity Discharge)	GL030A
5	Halogen	GL030A
6	Incandescent	GL030A
7	Compact Fluorescent	GL030A
8	Other Fluorescent	GL030A
9	Other (Please Specify)	GL030A
71	SKINNY (THIN) TUBES	GL030A
72	FAT (THICKER) TUBES	GL030A
88	Refused	GL030A
99	Don't Know	GL030A

GL030A. Roughly what percentage of fluorescent fixtures in your facility use electronic ballasts?

&GL030A	Percentage		GL030B
88	Refused		GL030B
99	Don't Know		GL030B

GL030B. What would you say that percentage was 5 years ago?

&GL030B	Percentage		GL040A

88	Refused		GL040A
99	Don't Know		GL040A

[ASK ONLY IF GL030A > GL030B, ELSE SKIP TO IL010]
GL040A. What is the main reason that your organization increased its use of electronic ballasts over the past five years?

DO NOT READ

1	Lower energy (operating) cost	GL040B
2	Longer useful life	GL040B
3	Less hum	GL040B
4	Better quality / More light	GL040B
5	New equipment looks better	GL040B
6	Better light promotes productivity / Cuts down on complaints	GL040B
7	More flexibility in installation	GL040B
8	More readily available from distributors	GL040B
9	Promoted by utilities	GL040B
10	Promoted by distributors, contractors, or designers	GL040B
11	Prices have come down	GL040B
12	Other (specify)	GL040B
88	Refused	GL040B
99	Don't Know	GL040B

GL040B. Are there other reasons?

1	Lower energy (operating) cost	IL010
2	Longer useful life	IL010
3	Less hum	IL010
4	Better quality / More light	IL010
5	New equipment looks better	IL010
6	Better light promotes productivity / Cuts down on complaints	IL010
7	More flexibility in installation	IL010
8	More readily available from distributors	IL010
9	Promoted by utilities	IL010
10	Promoted by distributors, contractors, or designers	IL010
11	Prices have come down	IL010
12	Other (specify)	IL010
13	No Other Reasons	IL010
88	Refused	IL010
99	Don't Know	IL010

[SPILLOVER]

IL010. Since January 1996, have you made any changes in indoor lighting at your facility other than routine replacement of burned out bulbs?

1	No Change		MT010
2	Added	&ADDED	IL020

3	Removed	&REMOVED	IL020
4	Added & Removed	&ADDREM	IL020
88	Refused		MT010
99	Don't Know		MT010

IL020. In what year did you make these changes?

1	1996		IL030
2	1997		IL030
3	1998		IL030
88	Refused		IL030
99	Don't Know		IL030

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO IL040]
IL030. Was your firm paid a rebate by PG&E for these changes in your lighting?

1	Yes		IL040
2	No		SP060
88	Refused		SP060
99	Don't Know		SP060

SP060. Did you become aware of PG&E's Lighting Program BEFORE or AFTER you made the decision to purchase your new lighting?

1	Before		IL040
2	After		IL040
88	Refused		IL040
99	Don't Know		IL040

IL040. What type of fixtures were &ADDED/&REMOVED/&ADDREM?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&IL041	2' T8 Fixtures	IL070
&IL042	4' T8 Fixtures	IL070
&IL043	8' T8 Fixtures	IL070
&IL044	2' T10 Fixtures	IL070
&IL045	4' T10 Fixtures	IL070
&IL046	8' T10 Fixtures	IL070
&IL047	2' T12 Fixtures	IL070
&IL048	4' T12 Fixtures	IL070
&IL049	8' T12 Fixtures	IL070
&IL050	Standard HID (High Intensity Discharge) Fixtures	IL070
&IL051	Compact HID (High Intensity Discharge) Fixtures	IL070
&IL052	Compact Fluorescents (Screw-In Modular)	IL070
&IL053	Compact Fluorescents (Hardwire)	IL070
&IL054	Incandescents	IL070
&IL055	Exit Signs (Compact Fluorescent)	IL070
&IL056	Exit Signs (LED)	IL070
&IL057	Install Reflectors	IL070
&IL058	Electronic Ballasts	IL070

&IL059	Magnetic Ballasts	IL070
&IL060	Time Clocks	IL070
&IL061	Occupancy Sensors	IL070
&IL062	Bypass/Delay Timers	IL070
&IL063	Photocells	IL070
&IL064	OTHER FLUORESCENTS	IL070
&IL065	Other - SPECIFY: &IL065__________	IL070
88	Refused	SP080
99	Don't Know	SP080

[Cycle through for all technologies selected]
IL070. How many &IL041-&IL065 did you &ADD/&REMOVE/&ADDREM?

&IL041N	2' T8 Fixtures	IL080
&IL042N	4' T8 Fixtures	IL080
&IL043N	8' T8 Fixtures	IL080
&IL044N	2' T10 Fixtures	IL080
&IL045N	4' T10 Fixtures	IL080
&IL046N	8' T10 Fixtures	IL080
&IL047N	2' T12 Fixtures	IL080
&IL048N	4' T12 Fixtures	IL080
&IL049N	8' T12 Fixtures	IL080
&IL050N	Standard HID (High Intensity Discharge) Fixtures	IL080
&IL051N	Compact HID (High Intensity Discharge) Fixtures	IL080
&IL052N	Compact Fluorescents (Screw-In Modular)	IL080
&IL053N	Compact Fluorescents (Hardwire)	IL080
&IL054N	Incandescents	IL080
&IL055N	Exit Signs (Compact Fluorescent)	IL080
&IL056N	Exit Signs (LED)	IL080
&IL057N	Install Reflectors	IL080
&IL058N	Electronic Ballasts	IL080
&IL059N	Magnetic Ballasts	IL080
&IL060N	Time Clocks	IL080
&IL061N	Occupancy Sensors	IL080
&IL062N	Bypass/Delay Timers	IL080
&IL063N	Photocells	IL080
&IL064N	OTHER FLUORESCENTS	IL080
&IL065N	Other - SPECIFY: &IL065__________	IL080

[ASK IF &IL064 -OR- &IL065 = 1, ELSE SKIP TO IL090]
IL080. Just to confirm, is the additional lighting Standard Efficiency, or did you pay extra for a High Efficiency technology?

1	High Efficiency		IL090
2	Standard Efficiency		IL090
88	Refused		IL090
99	Don't Know		IL090

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO SP090]
IL090. Please tell me if you used the following components in all, some, or none of the remodeling or renovation projects at this facility?

IL090A. Electronic Ballasts?

1	All		IL090B
2	Some		IL090B
3	None		IL090B
8	Refused		IL090B
9	Don't Know		IL090B

IL090B. T8 Lamps?

1	All		IL090C
2	Some		IL090C
3	None		IL090C
8	Refused		IL090C
9	Don't Know		IL090C

IL090C. Two Lamp Fixtures?

1	All		IL100A
2	Some		IL100A
3	None		IL100A
8	Refused		IL100A
9	Don't Know		IL100A

[ASK IF (IL090A = 3) -AND- (IL090B = 3), ELSE SKIP TO SP080]
IL100A. What was your most important reason for not using electronic ballasts or T-8s in your renovation or remodeling projects?

DO NOT READ

1	Not aware of electronic ballasts or T-8s at the time	IL100B
2	Too expensive compared to other models	IL100B
3	Not enough construction budget for electronic ballasts	IL100B
4	Electronic ballasts not reliable	IL100B
5	Not sure about using in the particular project	IL100B
6	Designer or contractor recommended NOT to use	IL100B
7	Not readily available from distributors	IL100B
8	Energy savings not adequate to justify extra cost	IL100B
9	Company policy to use magnetic ballasts	IL100B
10	Didn't really make a formal comparison w/magnetics	IL100B
11	Rest of facility(ies) use standard equipment	IL100B
12	We lease the space; not worth the extra expense	IL100B
13	Don't pay electric bills; therefore not worth the investment	IL100B
14	Color of light not appropriate for intended application	IL100B

16	Other (specify)	IL100B
88	Refused	IL100B
99	Don't Know	IL100B

IL100B. Were there other reasons?

1	Not aware of electronic ballasts or T-8s at the time	SP080
2	Too expensive compared to other models	SP080
3	Not enough construction budget for electronic ballasts	SP080
4	Electronic ballasts not reliable	SP080
5	Not sure about using in the particular project	SP080
6	Designer or contractor recommended NOT to use	SP080
7	Not readily available from distributors	SP080
8	Energy savings not adequate to justify extra cost	SP080
9	Company policy to use magnetic ballasts	SP080
10	Didn't really make a formal comparison w/magnetics	SP080
11	Rest of facility(ies) use standard equipment	SP080
12	We lease the space; not worth the extra expense	SP080
13	Don't pay electric bills; therefore not worth the investment	SP080
14	Color of light not appropriate for intended application	SP080
15	No Other Reasons	SP080
16	Other (specify)	SP080
88	Refused	SP080
99	Don't Know	SP080

[ASK IF RESPONSES INCLUDE {(IL041-IL046) -OR- (IL050-IL053) -OR- (IL055-IL058) -OR- (IL060-IL063) -OR- ((IL064 -OR- IL065) -AND- IL080=1)} -AND- IL030 <> 1 -AND- SP060 <> 2, ELSE SKIP TO SP090]

SP080. To what extent did your knowledge of PG&E's Program influence your lighting equipment selection? (READ LIST)

1	Not at all Influential		SP090
2	Slightly Influential		SP090
3	Somewhat Influential		SP090
4	Moderately Influential		SP090
5	Very Influential		SP090
88	Refused		SP090
99	Don't Know		SP090

[ASK IF SPILL94 = 1, ELSE SKIP TO MT010]

SP090. When you were originally contacted in 1996, you firm indicated it had installed energy-efficient lighting at the facility, but did not receive a rebate. Do you remember this being the case?

1	Yes		SP100
2	No		MT010
88	Refused		MT010
99	Don't Know		MT010

SP100. How would you rate the Program's influence on your decision to install those additional lighting measures? [Read List]

1	Not at all Influential		MT010
2	Slightly Influential		MT010
3	Somewhat Influential		MT010
4	Moderately Influential		MT010
5	Very Influential		MT010
88	Refused		MT010
99	Don't Know		MT010

[MARKET EFFECTS]

[ASK ALL]

MT010. Next, I am going to read a list of statements which may or may not apply to your experiences when you were shopping for your new lighting equipment. Please indicate, on a scale of 1 to 10, whether you agree or disagree with each statement, where 1 means you strongly disagree with the statement and 10 means you strongly agree with the statement and you can use any number between 1 and 10. The first statement is…

&MT011	Overall, I am quite familiar with high efficiency fluorescent lighting technologies.	&MT013
&MT013	It is very difficult to find high-efficiency lighting equipment in this area.	&MT015
&MT015	Acquiring high efficiency lighting equipment is more of a hassle than for standard efficiency units.	&MT017
&MT017	High-efficiency lighting equipment has performance problems.	&MT019
&MT019	The initial investment required by high-efficiency lighting equipment is too great for our company.	&MT023
&MT023	(The standard operating procedures of our purchasing department do not accommodate the purchase of more costly high-efficiency lighting equipment.)	OL010

[OUTDOOR LIGHTING]

OL010. Is OUTDOOR lighting included on your facility's utility bill?

1	Yes		OL020
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL020. Since January 1996, have you made any changes in OUTDOOR lighting at your facility?

1	Yes		OL030
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL030. In what year did you make these changes?

1	1996		OL040
2	1997		OL040
3	1998		OL040
88	Refused		OL040
99	Don't Know		OL040

OL040. Did you ADD, REPLACE, or REMOVE outdoor lighting?

1	Added lighting	CE080
2	Replaced lighting	CE080
3	Removed	CE080
88	Refused	CE080
99	Don't Know	CE080

[COOLING AND HEATING CHANGES]

CE080. Since January 1996, have you ADDED, REMOVED, or REPLACED an older cooling system?

1	No Change		HE080
2	Added		CE090
3	Removed		CE090
4	Added and Removed		CE090
88	Refused		HE080
99	Don't Know		HE080

CE090. In what year did you make these changes?

1	1996		CE091
2	1997		CE091
3	1998		CE091
88	Refused		CE110
99	Don't Know		CE110

CE091. And can you recall which month?

1	January		CE110
2	February		CE110
3	March		CE110
4	April		CE110
5	May		CE110
6	June		CE110
7	July		CE110
8	August		CE110
9	September		CE110
10	October		CE110
11	November		CE110
12	December		CE110
88	Refused		CE110
99	Don't Know		CE110

[ASK IF CE080 = 3 -OR- 4, ELSE SKIP TO CE120]
CE110. What fuel was used to power the old system?

1	Electricity		CE120
2	Natural Gas		CE120
3	Other	SPECIFY: &CE111____________	CE120
88	Refused		CE120
99	Don't Know		CE120

[ASK IF CE080 = 2 -OR- 4, ELSE SKIP TO HE080]
CE120. What fuel does the cooling system addition use?

1	Electricity		HE080
2	Natural Gas		HE080
3	Other	SPECIFY: &CE121____________	HE080
88	Refused		HE080
99	Don't Know		HE080

HE080. Since January 1996, have you ADDED, REPLACED, or REMOVED an older heating system?

1	No Change		OE010
2	Added		HE090
3	Removed		HE090
4	Added AND Removed		HE090
88	Refused		OE010
99	Don't Know		OE010

HE090. In what year did you make these changes?

1	1996		HE091
2	1997		HE091
3	1998		HE091
88	Refused		HE110
99	Don't Know		HE110

HE091. And can you recall which month?

1	January		HE110
2	February		HE110
3	March		HE110
4	April		HE110
5	May		HE110
6	June		HE110
7	July		HE110
8	August		HE110
9	September		HE110
10	October		HE110
11	November		HE110
12	December		HE110
88	Refused		HE110
99	Don't Know		HE110

[ASK IF HE080 = 3 -OR- 4, ELSE SKIP TO HE120]
HE110. What fuel was used to power the old system?

1	Natural Gas		HE120
2	Propane or Bottled Gas		HE120
3	Oil		HE120
4	Steam		HE120
5	Electricity		HE120
6	Other	SPECIFY: &HE111__________	HE120
88	Refused		HE120
99	Don't Know		HE120

[ASK IF HE080 = 2 -OR- 4, ELSE SKIP TO OE010]
HE120. What fuel does the heating addition use?

1	Natural Gas		OE010
2	Propane or Bottled Gas		OE010
3	Oil		OE010
4	Steam		OE010
5	Electricity		OE010
6	Other	SPECIFY: &HE121__________	OE010
88	Refused		OE010
99	Don't Know		OE010

[OTHER EQUIPMENT CHANGES]

OE010. Since January 1996, have you changed any other equipment that makes up 10% or more of your facility's annual electric bill?

1	Yes		OE011
2	No		EM010
88	Refused		EM010
99	Don't Know		EM010

OE011. Which of the following types of equipment were affected?

(READ FIRST THREE THEN ASK FOR OTHER)
(READ LIST; SELECT ALL THAT APPLY)

&OE012	Water Heating		OE020
&OE013	Cooking		OE020
&OE014	Refrigeration		OE020
&OE015	Other (Please Specify)	SPECIFY: &EQUIP1_________	OE020
88	Refused		OE020
99	Don't Know		OE020

[ASK IF &OE012 = 1, ELSE SKIP TO OE050]
OE020. In what year did you change your water heating equipment?

1	1996		OE030
2	1997		OE030
3	1998		OE030
88	Refused		OE030
99	Don't Know		OE030

OE030. Did you ADD or REMOVE water heating equipment?

1	Added		OE040
2	Removed		OE040
88	Refused		OE050
99	Don't Know		OE050

OE040. What fuel was used to power the &ADDED/&REMOVED water heating equipment?

1	Natural Gas		OE050
2	Propane or Bottled Gas		OE050
3	Oil		OE050
4	Electricity		OE050
5	Other	SPECIFY: &OE041_____	OE050
88	Refused		OE050
99	Don't Know		OE050

[ASK IF &OE013 = 1, ELSE SKIP TO OE080]
OE050. In what year did you change your cooking equipment?

1	1996		OE060
2	1997		OE060
3	1998		OE060
88	Refused		OE060
99	Don't Know		OE060

OE060. Did you ADD or REMOVE cooking equipment?

1	Added		OE070
2	Removed		OE070
88	Refused		OE080
99	Don't Know		OE080

OE070. What fuel was used to power the &ADDED/&REMOVED cooking equipment?

1	Natural Gas		OE080
2	Propane or Bottled Gas		OE080
3	Oil		OE080
4	Electricity		OE080
5	Other	SPECIFY: &OE071_____	OE080
88	Refused		OE080
99	Don't Know		OE080

[ASK IF &OE014 = 1, ELSE SKIP TO OE110]
OE080. In what year did you change your refrigeration equipment?

1	1996		OE090
2	1997		OE090
3	1998		OE090
88	Refused		OE090
99	Don't Know		OE090

OE090. Did you ADD or REMOVE refrigeration equipment?

1	Added		OE100
2	Removed		OE100
88	Refused		OE110
99	Don't Know		OE110

OE100. What fuel was used to power the &ADDED/&REMOVED refrigeration equipment?

1	Natural Gas		OE110
2	Propane or Bottled Gas		OE110
3	Oil		OE110
4	Electricity		OE110
5	Other	SPECIFY: &OE101______	OE110
88	Refused		OE110
99	Don't Know		OE110

[ASK IF &OE015 = 1, ELSE SKIP TO EM010]
OE110. In what year did you change your &EQUIP1________________?

1	1996		OE120
2	1997		OE120
3	1998		OE120
88	Refused		OE120
99	Don't Know		OE120

OE120. Did you ADD or REMOVE &EQUIP1__________?

1	Added		OE130

2	Removed		OE130
88	Refused		EM010
99	Don't Know		EM010

OE130. What fuel was used to power the &ADDED/&REMOVED &EQUIP1__________?

1	Natural Gas		EM010
2	Propane or Bottled Gas		EM010
3	Oil		EM010
4	Electricity		EM010
5	Other	SPECIFY: &OE131_____	EM010
88	Refused		EM010
99	Don't Know		EM010

[ASK ONLY IF ASK_EMS=1, ELSE SKIP TO CP010]

EM010. Do you have an in-house Energy Management System at this facility?

1	Yes		EM020
0	No		CP010
88	Refused		CP010
99	Don't Know		CP010

EM020. In what year was the Energy Management System installed?

1	1995		CP010
2	1996		CP010
3	1997		CP010
4	1998		CP010
5	Other		CP010
88	Refused		CP010
99	Don't Know		CP010

[ASK ONLY IF ASK_COGN=1, ELSE SKIP TO GOODBYE]

CP010. Do you have a cogeneration plant at this facility?

1	Yes		CP020
0	No		GOODBYE
88	Refused		GOODBYE
99	Don't Know		GOODBYE

CP020. In what year did the cogeneration plant begin operation?

1	1995		GOODBYE
2	1996		GOODBYE
3	1997		GOODBYE
4	1998		GOODBYE
5	Other		GOODBYE
88	Refused		GOODBYE
99	Don't Know		GOODBYE

GOODBYE. Those are all the questions I have for you today. On behalf of Pacific Gas and Electric Company, thank you very much for your time and cooperation.

Appendix D

Previously Uncontacted Nonparticipant Survey Instrument

MYBS UNCONTACTED NONPARTICIPATION CONTACT &DNAME________________
(&D1) &D2 - &D3_ Ext. &DEXT_
CALLBACK DATE &DCBD___ CALLBACK TIME &DCBT_______ Def: &DDEF_
FIRM: &BILLNAME____________________ (1=def callback 0=general)
&NOTED1____
&NOTED2____
&NOTED3____
&NOTED4____
&NOTED5____

[INTRODUCTION]

Hello. This is &INTERVIEWER____. I'm with Quantum Consulting, calling on behalf of Pacific Gas & Electric Company. We'd like to conduct a telephone survey with the person most knowledgeable about your firm's lighting characteristics, such as a facilities manager.

READ ONLY IF PROMPTED:
Why are you doing a survey?
This is NOT a sales call. Pacific Gas & Electric is interested in how lighting decisions are made at &BILLNAME____ as a result of PG&E's Commercial Programs. This information will be used to determine the effectiveness of these programs. This is proprietary information, and will not be used for any marketing purposes.

Who are you trying to reach?
We'd like to speak with the person most knowledgeable about recent changes of lighting equipment at &SERVADDR_____ in &SERVCITY_______.

1	Continue	Person Answering phone is the best contact	SC010
2	Continue	Transferred to Technical Contact	SC010
3	Arrange a Callback	Given Technical Contact Name and Telephone	1ST SCREEN AND EITHER SET AN APPOINTMENT FOR A CALLBACK OR NOTE AS REFUSAL IF APPROPRIATE
88	Refused	Thank and Term.	GOODBYE

SC010. Hi. I'm &INTERVIEWER____ with Quantum Consulting, a management consulting firm in Berkeley, California. We are helping Pacific Gas & Electric Company improve its energy efficiency programs to make them more attractive to businesses like yours. We'd like to ask you some general questions about your firm's characteristics, and then gather information about your firm's energy related decisions, particularly in regards to indoor lighting. This survey is designed to take approximately 10 minutes.

1	Continue		MN001

MN001. I would like to inform you that for quality control purposes, this call may be monitored by my supervisor.

1	Continue		BC011

I'm going to be asking you a number of questions regarding your "FACILITY," which means ALL of the buildings and tenants SERVICED BY PG&E UNDER THE FOLLOWING billing name: &BILLNAME____________ at this address: &SERVADDR_______________. To begin, I am going to ask you a series fo questions about your firm's general characteristics.

[FIRMOGRAPHICS]

[ASK ALL]
BC011. What is the main business ACTIVITY at the facility?

1	Office		FC080
2	Retail		FC080
3	College/University		FC080
4	K-12 School		FC080
5	Grocery (Food Store)		FC080
6	Restaurant		FC080
7	Health Care (Hospital)		FC080
8	Hotel/Motel		FC080
9	Warehouse		FC080
10	Personal Service (Includes beauty salons, dentists, doctors office etc.)		FC080
11	Community Service (such as fire dept., police station)		FC080
12	Misc	SPECIFY: &BC012	FC080
88	Refused		FC080
99	Don't Know		FC080

FC080. What is the total square feet of the facility?

&FC080	Square Feet		FC110
88	Refused		FC081
99	Don't Know		FC081

FC081. Can you estimate the total square footage to be ...

1	Less than 1,000 sq ft		FC110
2	Less than 10,000 sq ft		FC110
3	Less than 100,000 sq ft		FC110
4	Less than 1,000,000 sq ft		FC110
5	Over 1,000,000 sq ft		FC110
88	Refused		FC110
99	Don't Know		FC110

FC110. Since January 1994, has the square footage of the facility increased, decreased, or stayed the same?

1	Increased floor space		FC115
2	Decreased floor space		FC120
3	Stayed the same		BC140
88	Refused		BC140
99	Don't Know		BC140

FC115. How many square feet was added?

&FC115	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC120. How many square feet was the facility reduced?

&FC120	Square Feet		FC130
88	Refused		FC130
99	Don't Know		FC130

FC130. In what year did this change in floor space occur?

1	1994		FC131
2	1995		FC131
3	1996		FC131
4	1997		FC131
5	1998		FC131
88	Refused		BC140
99	Don't Know		BC140

FC131. And can you recall which month?

1	January		BC140
2	February		BC140
3	March		BC140
4	April		BC140
5	May		BC140
6	June		BC140
7	July		BC140
8	August		BC140
9	September		BC140
10	October		BC140
11	November		BC140
12	December		BC140
88	Refused		BC140
99	Don't Know		BC140

BC140. When was your last major space remodel?

&BC140	YYYY E.G. 1994		EI010
77	Never Remodeled		EI010

88	Refused		EI010
99	Don't Know		EI010

EI010. Approximately how many people are currently employed at the facility, including both full- and part-time employees?

&EI010	Number of Employees		EI020
88	Refused		EI020
99	Don't Know		EI020

EI020. Since January 1994, has the number of people employed at this facility changed by more than 10 percent?

1	Yes		EI030
2	No		AG010
88	Refused		AG010
99	Don't Know		AG010

EI030. In what year did this change in the number of employees occur?

1	1994		EI031
2	1995		EI031
3	1996		EI031
4	1997		EI031
5	1998		EI031
88	Refused		EI040
99	Don't Know		EI040

EI031. And can you recall which month?

1	January		EI040
2	February		EI040
3	March		EI040
4	April		EI040
5	May		EI040
6	June		EI040
7	July		EI040
8	August		EI040
9	September		EI040
10	October		EI040
11	November		EI040
12	December		EI040
88	Refused		EI040
99	Don't Know		EI040

EI040. Approximately how many people were employed at this facility before the change occurred, including both full and part-time employees?

&EI040	Number of Employees		AG010
77	Seasonal Workforce	Enter Comments	AG010
88	Refused		AG010
99	Don't Know		AG010

Comment1 &EI0401 ____
Comment2 &EI0402 ____

AG010. Do you know in what year your facility was built?

&AG010	YYYY e.g. 1973		SC001
88	Refused		AG020
99	Don't Know		AG020

AG020. Would you say it was …(READ LIST)

1	Before 1978		SC001
2	Between 1978 and 1988		SC001
3	After 1988		SC001
88	Refused		SC001
99	Don't Know		SC001

SC001. Does your firm own or lease the facility at &SERVADDR___?

1	Own		FI001
2	Lease		FI001
88	Refused		FI001
99	Don't Know		FI001

FI001. Does your firm occupy the space at &SERVADDR__________?

1	Yes		FI110
2	No		FI110
88	Refused		FI110
99	Don't Know		FI110

[ASK IF SC001 = 2, ELSE SKIP TO IS005]

FI110. What is the length of the current lease at &SERVADDR______?

&FI110	Number of years		FI115
66	One year		FI080
77	Month to Month		FI080
88	Refused		FI115
99	Don't Know		FI115

FI115. How many years are left on the lease?

&FI115	Number of years		FI080
88	Refused		FI080
99	Don't Know		FI080

FI080. Do you pay all, none, or a portion of the electric utility bill for your facility?

1	Pay NO electric utilities (e.g. ALL utilities INCLUDED in lease	FI065

2	Pay PORTION of elecrtic utilities (e.g. Pay some utilities through lease and others directly) to PG&E	FI065
3	Pay ALL utilities to PG&E	FI065
88	Refused	FI065
99	Don't Know	FI065

FI065. How active a role do tenants take in making equipment purchase decisions for the property at &SERVADDR?

1	Very Active: Involved in every aspect of the purchase decision and possess the power to veto	IS005
2	Somewhat Active: Approve all decisions	IS005
3	Slight Role: vote	IS005
4	None	IS005
88	Refused	IS005
99	Don't Know	IS005

Now I'd like to ask you a few question about your awareness of PG&E programs.

IS005. Have you heard of the PG&E Retrofit Express or Customized Incentives programs?

1	Yes		IS050
2	No		IS010
88	Refused		IS010
99	Don't Know		IS010

IS050. Are you aware that energy efficient lighting is covered by the Retrofit Program?

1	Yes		IS010
2	No		IS010
88	Refused		IS010
99	Don't Know		IS010

IS010. Do you have a lighting contractor that you regularly use or rely on?

1	Yes		IS015
2	No		IS030
88	Refused		IS030
99	Don't Know		IS030

[ASK IF IS005 = 1, ELSE SKIP TO IS030]
IS015. Did this person tell you about the Retrofit Program?

1	Yes		IS030
2	No		IS030
88	Refused		IS030

99	Don't Know		IS030

IS030. How frequently do you have contact with your PG&E account representative?

&IS030	Number of Times	IS030a
7777	Never	FM010
8888	Refused	IS030a
9999	Don't Know	IS030a

IS030a. (Is that per day, week, month or year?)

1	Day	IS035
2	Week	IS035
3	Month	IS035
4	Year	IS035
88	Refused	IS035
99	Don't Know	IS035

[ASK IF IS005 = 1, ELSE SKIP TO FM010]

IS035. Did your PG&E account representative tell you about the Retrofit Program?

1	Yes		FM010
2	No		FM010
88	Refused		FM010
99	Don't Know		FM010

[ASK ALL]

FM010. Has your organization assigned responsibility for controlling energy usage and costs to a specific staff person, group of staff, or contractor?

1	Yes		FM020
2	No		FM020
8	Refused		FM020
9	Don't Know		FM020

FM020. Has your organization developed a policy or standard specification for selection of fluorescent lighting equipment?

1	Yes		FI110
2	No		FI110
8	Refused		FI110
9	Don't Know		FI110

[GENERAL LIGHTING]

GL010. What is the primary type of lighting currently in use at your facility?

(READ LIST IF NECESSARY, SELECT ONLY ONE)

1	T8 Fluorescent	GL020
2	T10 Fluorescent	GL020
3	T12 Fluorescent	GL020
4	HID (High Intensity Discharge)	GL020
5	Halogen	GL020
6	Incandescent	GL020
7	Compact Fluorescent	GL020
8	Other Fluorescent	GL020
9	Other (Please Specify)	GL020
71	SKINNY (THIN) TUBES	GL020
72	FAT (THICKER) TUBES	GL020
88	Refused	GL020
99	Don't Know	GL020

GL020. And what was it 5 years ago?

1	T8 Fluorescent	GL030A
2	T10 Fluorescent	GL030A
3	T12 Fluorescent	GL030A
4	HID (High Intensity Discharge)	GL030A
5	Halogen	GL030A
6	Incandescent	GL030A
7	Compact Fluorescent	GL030A
8	Other Fluorescent	GL030A
9	Other (Please Specify)	GL030A
71	SKINNY (THIN) TUBES	GL030A
72	FAT (THICKER) TUBES	GL030A
88	Refused	GL030A
99	Don't Know	GL030A

GL030A. Roughly what percentage of fluorescent fixtures in your facility use electronic ballasts?

&GL030A	Percentage		GL030B
88	Refused		GL030B
99	Don't Know		GL030B

GL030B. What would you say that percentage was 5 years ago?

&GL030B	Percentage		GL040A
88	Refused		GL040A
99	Don't Know		GL040A

[ASK ONLY IF GL030A > GL030B, ELSE SKIP TO IL010]
GL040A. What is the main reason that your organization increased its use of electronic ballasts over the past five years?

DO NOT READ

1	Lower energy (operating) cost	GL040B
2	Longer useful life	GL040B

3	Less hum	GL040B
4	Better quality / More light	GL040B
5	New equipment looks better	GL040B
6	Better light promotes productivity / Cuts down on complaints	GL040B
7	More flexibility in installation	GL040B
8	More readily available from distributors	GL040B
9	Promoted by utilities	GL040B
10	Promoted by distributors, contractors, or designers	GL040B
11	Prices have come down	GL040B
12	Other (specify)	GL040B
88	Refused	GL040B
99	Don't Know	GL040B

GL040B. Are there other reasons?

1	Lower energy (operating) cost	IL010
2	Longer useful life	IL010
3	Less hum	IL010
4	Better quality / More light	IL010
5	New equipment looks better	IL010
6	Better light promotes productivity / Cuts down on complaints	IL010
7	More flexibility in installation	IL010
8	More readily available from distributors	IL010
9	Promoted by utilities	IL010
10	Promoted by distributors, contractors, or designers	IL010
11	Prices have come down	IL010
12	Other (specify)	IL010
13	No Other Reasons	IL010
88	Refused	IL010
99	Don't Know	IL010

[SPILLOVER]

IL010. Since January 1994, have you made any changes in indoor lighting at your facility other than routine replacement of burned out bulbs?

1	No Change		MT010
2	Added	&ADDED	IL020
3	Removed	&REMOVED	IL020
4	Added & Removed (Replaced)	&ADDREM	IL020
88	Refused		MT010
99	Don't Know		MT010

IL020. In what year did you make these changes?

1	1994		IL030

2	1995		IL030
3	1996		IL030
4	1997		IL030
5	1998		IL030
88	Refused		IL030
99	Don't Know		IL030

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO IL040]

IL030. Was your firm paid a rebate by PG&E for these changes in your lighting?

1	Yes		IL040
2	No		SP060
88	Refused		SP060
99	Don't Know		SP060

SP060. Did you become aware of PG&E's Lighting Program BEFORE or AFTER you made the decision to purchase your new lighting?

1	Before		IL040
2	After		IL040
88	Refused		IL040
99	Don't Know		IL040

IL040. What type of fixtures were &ADDED/&REMOVED/&ADDREM?

(READ LIST IF NECESSARY, SELECT ALL THAT APPLY)

&IL041	2' T8 Fixtures	IL070
&IL042	4' T8 Fixtures	IL070
&IL043	8' T8 Fixtures	IL070
&IL044	2' T10 Fixtures	IL070
&IL045	4' T10 Fixtures	IL070
&IL046	8' T10 Fixtures	IL070
&IL047	2' T12 Fixtures	IL070
&IL048	4' T12 Fixtures	IL070
&IL049	8' T12 Fixtures	IL070
&IL050	Standard HID (High Intensity Discharge) Fixtures	IL070
&IL051	Compact HID (High Intensity Discharge) Fixtures	IL070
&IL052	Compact Fluorescents (Screw-In Modular)	IL070
&IL053	Compact Fluorescents (Hardwire)	IL070
&IL054	Incandescents	IL070
&IL055	Exit Signs (Compact Fluorescent)	IL070
&IL056	Exit Signs (LED)	IL070
&IL057	Install Reflectors	IL070
&IL058	Electronic Ballasts	IL070
&IL059	Magnetic Ballasts	IL070
&IL060	Time Clocks	IL070
&IL061	Occupancy Sensors	IL070
&IL062	Bypass/Delay Timers	IL070
&IL063	Photocells	IL070
&IL064	OTHER FLUORESCENTS	IL070
&IL065	Other - SPECIFY: &IL065	IL070

88	Refused	SP080
99	Don't Know	SP080

[Cycle through for all technologies selected]
IL070. How many &IL041-&IL065 did you &ADD/&REMOVE/&ADDREM?

&IL041N	2' T8 Fixtures	IL080
&IL042N	4' T8 Fixtures	IL080
&IL043N	8' T8 Fixtures	IL080
&IL044N	2' T10 Fixtures	IL080
&IL045N	4' T10 Fixtures	IL080
&IL046N	8' T10 Fixtures	IL080
&IL047N	2' T12 Fixtures	IL080
&IL048N	4' T12 Fixtures	IL080
&IL049N	8' T12 Fixtures	IL080
&IL050N	Standard HID (High Intensity Discharge) Fixtures	IL080
&IL051N	Compact HID (High Intensity Discharge) Fixtures	IL080
&IL052N	Compact Fluorescents (Screw-In Modular)	IL080
&IL053N	Compact Fluorescents (Hardwire)	IL080
&IL054N	Incandescents	IL080
&IL055N	Exit Signs (Compact Fluorescent)	IL080
&IL056N	Exit Signs (LED)	IL080
&IL057N	Install Reflectors	IL080
&IL058N	Electronic Ballasts	IL080
&IL059N	Magnetic Ballasts	IL080
&IL060N	Time Clocks	IL080
&IL061N	Occupancy Sensors	IL080
&IL062N	Bypass/Delay Timers	IL080
&IL063N	Photocells	IL080
&IL064N	OTHER FLUORESCENTS	IL080
&IL065N	Other - SPECIFY: &IL065	IL080

[ASK IF &IL064 -OR- &IL065 = 1, ELSE SKIP TO IL090]
IL080. Just to confirm, is the additional lighting Standard Efficiency, or did you pay extra for a High Efficiency technology?

1	High Efficiency		IL090
2	Standard Efficiency		IL090
88	Refused		IL090
99	Don't Know		IL090

[ASK IF IL010 = 2 -OR- 4, ELSE SKIP TO MT010]
IL090. Please tell me if you used the following components in all, some, or none of the remodeling or renovation projects at this facility?

IL090A. Electronic Ballasts?

1	All		IL090B
2	Some		IL090B
3	None		IL090B

8	Refused		IL090B
9	Don't Know		IL090B

IL090B. T8 Lamps?

1	All		IL090C
2	Some		IL090C
3	None		IL090C
8	Refused		IL090C
9	Don't Know		IL090C

IL090C. Two Lamp Fixtures?

1	All		IL100A
2	Some		IL100A
3	None		IL100A
8	Refused		IL100A
9	Don't Know		IL100A

[ASK IF (IL090A = 3) -AND- (IL090B = 3), ELSE SKIP TO SP080]
IL100A. What was your most important reason for not using electronic ballasts or T-8s in your renovation or remodeling projects?

DO NOT READ

1	Not aware of electronic ballasts or T-8s at the time	IL100B
2	Too expensive compared to other models	IL100B
3	Not enough construction budget for electronic ballasts	IL100B
4	Electronic ballasts not reliable	IL100B
5	Not sure about using in the particular project	IL100B
6	Designer or contractor recommended NOT to use	IL100B
7	Not readily available from distributors	IL100B
8	Energy savings not adequate to justify extra cost	IL100B
9	Company policy to use magnetic ballasts	IL100B
10	Didn't really make a formal comparison w/magnetics	IL100B
11	Rest of facility(ies) use standard equipment	IL100B
12	We lease the space; not worth the extra expense	IL100B
13	Don't pay electric bills; therefore not worth the investment	IL100B
14	Color of light not appropriate for intended application	IL100B
16	Other (specify)	IL100B

88	Refused	IL100B
99	Don't Know	IL100B

IL100B. Were there other reasons?

1	Not aware of electronic ballasts or T-8s at the time	SP080
2	Too expensive compared to other models	SP080
3	Not enough construction budget for electronic ballasts	SP080
4	Electronic ballasts not reliable	SP080
5	Not sure about using in the particular project	SP080
6	Designer or contractor recommended NOT to use	SP080
7	Not readily available from distributors	SP080
8	Energy savings not adequate to justify extra cost	SP080
9	Company policy to use magnetic ballasts	SP080
10	Didn't really make a formal comparison w/magnetics	SP080
11	Rest of facility(ies) use standard equipment	SP080
12	We lease the space; not worth the extra expense	SP080
13	Don't pay electric bills; therefore not worth the investment	SP080
14	Color of light not appropriate for intended application	SP080
15	No Other Reasons	SP080
16	Other (specify)	SP080
88	Refused	SP080
99	Don't Know	SP080

[ASK IF RESPONSES INCLUDE {(IL041-IL046) -OR- (IL050-IL053) -OR- (IL055-IL058) -OR- (IL060-IL063) -OR- ((IL064 -OR- IL065) -AND- IL080=1)} -AND- IL030 <> 1 -AND- SP060 <> 2, ELSE SKIP TO MT010]

SP080. To what extent did your knowledge of PG&E's Program influence your lighting equipment selection? (READ LIST)

1	Not at all Influential		SP100
2	Slightly Influential		SP100
3	Somewhat Influential		SP100
4	Moderately Influential		SP100
5	Very Influential		SP100
88	Refused		SP100
99	Don't Know		SP100

[MARKET EFFECTS]

[ASK ALL]

MT010. Next, I am going to read a list of statements which may or may not apply to your experiences when you were shopping for your new lighting equipment. Please indicate, on a scale of 1 to 10, whether you agree or disagree with each statement, where 1 means you strongly disagree with the statement and 10 means you strongly agree with the statement and you can use any number between 1 and 10. The first statement is…

&MT011	Overall, I am quite familiar with high efficiency fluorescent lighting technologies.	&MT013
&MT013	It is very difficult to find high-efficiency lighting equipment in this area.	&MT015
&MT015	Acquiring high efficiency lighting equipment is more of a hassle than for standard efficiency units.	&MT017
&MT017	High-efficiency lighting equipment has performance problems.	&MT019
&MT019	The initial investment required by high-efficiency lighting equipment is too great for our company.	&MT023
&MT023	(The standard operating procedures of our purchasing department do not accommodate the purchase of more costly high-efficiency lighting equipment.)	OL010

[OUTDOOR LIGHTING]

OL010. Is OUTDOOR lighting included on your facility's utility bill?

1	Yes		OL020
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL020. Since January 1994, have you made any changes in OUTDOOR lighting at your facility?

1	Yes		OL030
2	No		CE080
88	Refused		CE080
99	Don't Know		CE080

OL030. In what year did you make these changes?

1	1994		OL040
2	1995		OL040
3	1996		OL040
4	1997		OL040
5	1998		OL040
88	Refused		OL040

99	Don't Know		OL040

OL040. Did you ADD, REPLACE, or REMOVE outdoor lighting?

1	Added lighting	CE080
2	Replaced lighting	CE080
3	Removed	CE080
88	Refused	CE080
99	Don't Know	CE080

[COOLING AND HEATING CHANGES]

CE080. Since January 1994, have you ADDED, REMOVED, or REPLACED an older cooling system?

1	No Change		HE080
2	Added		CE090
3	Removed		CE090
4	Added and Removed		CE090
88	Refused		HE080
99	Don't Know		HE080

CE090. In what year did you make these changes?

1	1994		CE091
2	1995		CE091
3	1996		CE091
4	1997		CE091
5	1998		CE091
88	Refused		CE110
99	Don't Know		CE110

CE091. And can you recall which month?

1	January		CE110
2	February		CE110
3	March		CE110
4	April		CE110
5	May		CE110
6	June		CE110
7	July		CE110
8	August		CE110
9	September		CE110
10	October		CE110
11	November		CE110
12	December		CE110
88	Refused		CE110
99	Don't Know		CE110

[ASK IF CE080 = 3 -OR- 4, ELSE SKIP TO CE120]
CE110. What fuel was used to power the old system?

1	Electricity		CE120

2	Natural Gas		CE120
3	Other	SPECIFY: &CE111	CE120
88	Refused		CE120
99	Don't Know		CE120

[ASK IF CE080 = 2 -OR- 4, ELSE SKIP TO HE080]
CE120. What fuel does the cooling system addition use?

1	Electricity		HE080
2	Natural Gas		HE080
3	Other	SPECIFY: &CE121	HE080
88	Refused		HE080
99	Don't Know		HE080

HE080. Since January 1994, have you ADDED, REPLACED, or REMOVED an older heating system?

1	No Change		OE010
2	Added		HE090
3	Removed		HE090
4	Added AND Removed		HE090
88	Refused		OE010
99	Don't Know		OE010

HE090. In what year did you make these changes?

1	1994		HE091
2	1995		HE091
3	1996		HE091
4	1997		HE091
5	1998		HE091
88	Refused		HE110
99	Don't Know		HE110

HE091. And can you recall which month?

1	January		HE110
2	February		HE110
3	March		HE110
4	April		HE110
5	May		HE110
6	June		HE110
7	July		HE110
8	August		HE110
9	September		HE110
10	October		HE110
11	November		HE110
12	December		HE110
88	Refused		HE110
99	Don't Know		HE110

[ASK IF HE080 = 3 -OR- 4, ELSE SKIP TO HE120]

HE110. What fuel was used to power the old system?

1	Natural Gas		HE120
2	Propane or Bottled Gas		HE120
3	Oil		HE120
4	Steam		HE120
5	Electricity		HE120
6	Other	SPECIFY: &HE111	HE120
88	Refused		HE120
99	Don't Know		HE120

[ASK IF HE080 = 2 -OR- 4, ELSE SKIP TO OE010]
HE120. What fuel does the heating addition use?

1	Natural Gas		OE010
2	Propane or Bottled Gas		OE010
3	Oil		OE010
4	Steam		OE010
5	Electricity		OE010
6	Other	SPECIFY: &HE121	OE010
88	Refused		OE010
99	Don't Know		OE010

[OTHER EQUIPMENT CHANGES]

OE010. Since January 1994, have you changed any other equipment that makes up 10% or more of your facility's annual electric bill?

1	Yes		OE011
2	No		EM010
88	Refused		EM010
99	Don't Know		EM010

OE011. Which of the following types of equipment were affected?

(READ FIRST THREE THEN ASK FOR OTHER)
(READ LIST; SELECT ALL THAT APPLY)

&OE012	Water Heating		OE020
&OE013	Cooking		OE020
&OE014	Refrigeration		OE020
&OE015	Other (Please Specify)	SPECIFY: &EQUIP1	OE020
88	Refused		OE020
99	Don't Know		OE020

[ASK IF &OE012 = 1, ELSE SKIP TO OE050]
OE020. In what year did you change your water heating equipment?

1	1994		OE030
2	1995		OE030
3	1996		OE030

4	1997		OE030
5	1998		OE030
88	Refused		OE030
99	Don't Know		OE030

OE030. Did you ADD or REMOVE water heating equipment?

1	Added		OE040
2	Removed		OE040
88	Refused		OE050
99	Don't Know		OE050

OE040. What fuel was used to power the &ADDED/&REMOVED water heating equipment?

1	Natural Gas		OE050
2	Propane or Bottled Gas		OE050
3	Oil		OE050
4	Electricity		OE050
5	Other	SPECIFY: &OE041	OE050
88	Refused		OE050
99	Don't Know		OE050

[ASK IF &OE013 = 1, ELSE SKIP TO OE080]
OE050. In what year did you change your cooking equipment?

1	1994		OE060
2	1995		OE060
3	1996		OE060
4	1997		OE060
5	1998		OE060
88	Refused		OE060
99	Don't Know		OE060

OE060. Did you ADD or REMOVE cooking equipment?

1	Added		OE070
2	Removed		OE070
88	Refused		OE080
99	Don't Know		OE080

OE070. What fuel was used to power the &ADDED/&REMOVED cooking equipment?

1	Natural Gas		OE080
2	Propane or Bottled Gas		OE080
3	Oil		OE080
4	Electricity		OE080
5	Other	SPECIFY: &OE071	OE080
88	Refused		OE080
99	Don't Know		OE080