Customer Energy Efficiency Program
Measurement and Evaluation Program

IMPACT EVALUATION OF PACIFIC GAS AND ELECTRIC COMPANY'S 1997 RESIDENTIAL ENERGY MANAGEMENT SERVICES PROGRAMS

PG&E Study ID number: 397

MARCH 1, 1999

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IMPACT EVALUATION OF PACIFIC GAS AND ELECTRIC COMPANY'S 1997 RESIDENTIAL ENERGY MANAGEMENT SERVICES PROGRAM
[PG&E Study ID 397]

Purpose of Study

This study was conducted in compliance with the requirements specified in "Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs," as adopted by California Public Utilities Commission Decision 93-05-063, revised March 1998 pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, 96-12-079, D.98-03-063.

This study measures the first year load impacts of PG&E's 1997 Residential Energy Management Services Program. The program had two components: Single Family Energy Management Services and Multifamily Property Energy Management Services.

Methodology

Savings from the Single Family component were evaluated primarily through a billing analysis supported by a telephone survey of program participants and nonparticipants. The Multifamily Property component was evaluated using "take rates" for the audit recommendations in conjunction with calibrated savings estimates from the audit to develop savings-weighted gross impacts. Net savings were developed by adjusting the gross estimates for self-reported free-ridership using data collected via a telephone survey of participants conducted to support the evaluation. A billing analysis was also conducted.

Study Results

Summary of First Year Load Impact Results
Residential Energy Management Services Program

	Gross Savings	Gross Realization Rate	Net-To-Gross Components		Net Savings	Net Realization Rate
			1-Free Rider	Spillover		
EX ANTE†						
kW	2,267	NA	0.84	NA	1,909	NA
kWh	12,523,490	NA	0.84	NA	10,549,426	NA
Therms	1,724,063	NA	0.84	NA	1,444,714	NA
EX POST						
kW	8,051	3.55	0.63	NA	5,075	2.66
kWh	44,298,592	3.54	0.63	NA	27,955,119	2.65
Therms	††	††	††	NA	1,527,868	1.06

† Ex ante gross savings estimates are from PG&E program planning documents. Ex ante net savings estimates are from PG&E's Annual Summary Report on Demand Side Management Programs in 1997, Technical Appendix, April 1998.

†† In the case of Single Family Residential Energy Management Services, the analysis of gas consumption produces an estimate of gross change that is positive, representing an increase in gas consumption. The Protocols equate gross change with gross savings. However, in cases where the gross change is an increase in consumption, this change cannot be reasonably interpreted as gross savings. Consequently, a gross savings estimate for therms is not reported and, therefore, a gross realization rate and a net-to-gross ratio for therms are also not reported.

Regulatory Waivers and Filing Variances

No regulatory waivers filed.
No E-Table variance.

IMPACT EVALUATION OF PACIFIC GAS & ELECTRIC COMPANY'S 1997 RESIDENTIAL ENERGY MANAGEMENT SERVICES PROGRAM

PG&E STUDY ID #397

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TABLE OF CONTENTS

Chapter 1: Executive Summary

1.1 Program Description 1-1
1.2 Evaluation Methodology 1-1
1.3 Results 1-4
1.4 Organization of the Report 1-4

Chapter 2: Program Description

Chapter 3: Single Family REMS

3.1 Overview 3-1
3.2 Summary of Results for Single Family REMS 3-1
3.3 Evaluation Methodology for Single Family REMS 3-1
3.3.1 Data Sources 3-2
3.3.2 Screening Procedures 3-3
3.3.3 The Billing Analysis Regression Model 3-6
3.3.4 Demand Impact 3-10
3.4 Single Family REMS Impacts 3-11
3.4.1 Net Electricity Impact 3-11
3.4.2 Net Gas Impact 3-12
3.4.3 Gross Impacts 3-14
3.5 Discussion of Single Family REMS Impacts 3-15
3.5.1 Weather Issues 3-15
3.5.2 Pre- and Post- Program Average Consumption 3-17

Chapter 4: Multifamily Property REMS

4.1 Overview 4-1
4.2 Summary of Results 4-1
4.3 Evaluation Methodology 4-2
4.3.1 Overview 4-2
4.3.2 Take Rate and Net-to-Gross Methodology 4-3
4.3.3 Primary Data Sources 4-4
4.3.4 Gross Impact 4-8
4.3.5 Net Impact 4-13
4.4 Survey Response Rate 4-19
4.5 Gross Impact Results 4-20
4.5.1 Billing Analysis Results 4-20
4.5.2 Interpretation of Billing Analysis Results 4-22
4.5.3 Gross Impact Calculation 4-24
4.5.4 The Ex Post and The Ex Ante Gross Impacts Compared 4-25
4.6 Net Impact Results 4-26
4.6.1 The Ex Post and The Ex Ante Gross Impacts Compared 4-28
4.7 Results Per Multifamily Property and Per Dwelling Unit 4-28

Appendices

Appendix A: Protocol Table 6
Appendix B: Protocol Table 7
Appendix C: Single Family Phone Survey Instrument
Appendix D: Multifamily Phone Survey

CHAPTER 1
EXECUTIVE SUMMARY

This report presents results of the First Year Load Impact Evaluation of Pacific Gas & Electric Company's 1997 Residential Energy Management Services (REMS) Program. The program had two components: Single Family Energy Management Services and Multifamily Property Energy Management Services. For the evaluation, both gross and net impact estimates were developed for energy consumption (kWh), gas consumption (therms), and electric demand (kW).

1.1 PROGRAM DESCRIPTION

Pacific Gas and Electric Company's 1997 REMS Program included both Single Family and Multifamily Property Energy Management Site Surveys and the Smarter Energy Line (SEL).

Single Family REMS

The purpose of the program was to provide energy efficiency information to residential customers who live in single family dwellings. This program provided household-specific energy use information for appliances, systems, and building envelope. This program also funded customer representatives who answer residential customers' energy efficiency questions. In 1997 PG&E offered three options for home energy surveys: the onsite audit, direct mail audit, and phone audit.

Multifamily Property REMS

Through the Multifamily Property Residential Energy Management Services Program audits were performed on common-use areas of multifamily properties. The efficiencies of boilers (water and space heating), lighting and lighting controls, thermal envelopes, pools and spas, HVAC equipment, and motors were evaluated for each multifamily complex. Eligible complexes contained five or more dwelling units, and included apartments, condominiums, and mobile home parks (master or individually metered).

1.2 EVALUATION METHODOLOGY

This section provides an overview of the evaluation methods used in the analysis of both the single family and multifamily property components of the REMS program. The evaluations conform to the requirements listed in Tables 5, 6, 7, C-11 and other applicable portions of the

"Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs,"[1] revised March 1998.

Single Family REMS

A billing analysis was the primary basis of the evaluation. A participant group and a non-participant (comparison) group were employed in the evaluation. Pre- and post-consumption for electricity and gas and demand (for electricity) were estimated for both groups of customers using a time series, cross-section regression (TSCSREG) analysis. To support the billing analysis, a telephone survey of a sample of program participants and non-participants was conducted (see Appendix C for a copy of the survey). Gross impacts were calculated by including only participants in the regression analysis. Net impacts were calculated by including both participants and non-participants in the regression analysis.

Multifamily Property REMS

To evaluate the load impacts of the 1997 Multifamily Property REMS, the following steps were taken.

1. A telephone survey targeted to a census of all program participants collected data on recommendations implemented and the self-reported extent to which the implementation was attributable to PG&E's energy audit.

2. A billing analysis using participants only was conducted in an attempt to estimate the "implementation realization rate," that is, the ratio of achieved savings to the audit program's estimated savings for those recommendations reported to have been implemented. The billing analysis conducted meets the Protocols for the estimation of gross impacts; however, the analysis was unable to provide a meaningful estimate of the implementation realization rate. Consequently, the calibrated savings estimates from the audit program itself were assumed to be the best estimates available of the gross effect of each implemented measure.

3. Survey data were analyzed to determine the savings-weighted "take rate," that is, the ratio of implemented recommendations to all audit recommendations.

4. Survey data were also analyzed to determine the savings-weighted net-to-gross ratio.

[1] *Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs* as adopted by California Public Utilities Commission Decision 93-05-063, revised March 1998 pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, 96-12-079, D.98-03-063.

The audit estimates of savings (in terms of kW, kWh, or therms) for all audit recommendations together with the take rate provided the gross impact estimate. Applying the net-to-gross ratio to the gross impact yielded the net impact. Net impacts were estimated for electric demand (kW), electric energy (kWh), and gas (therms).

The primary data sources for the analysis of the Multifamily Property REMS were:

- the Multifamily Property REMS energy audit database (hereafter, audit database),
- participant billing data,
- weather data, and
- a telephone survey of participants designed and conducted for this study.

The billing analysis utilized all of these data sources. Both the take rate and net-to-gross analyses employed the audit database and the survey data.

1.3 RESULTS

The savings from the Residential Single Family and Multifamily Property REMS are summarized in Table 1-1. More details can be found in Appendices A and B.

Table 1-1. Summary of First Year Load Impact Results
Residential Energy Management Services Program

	Gross Savings	Gross Realization Rate	Net-To-Gross Components		Net Savings	Net Realization Rate
			1-Free Rider	Spillover		
EX ANTE†						
kW	2,267	NA	0.84	NA	1,909	NA
kWh	12,523,490	NA	0.84	NA	10,549,426	NA
Therms	1,724,063	NA	0.84	NA	1,444,714	NA
EX POST						
kW	8,051	3.55	0.63	NA	5,075	2.66
kWh	44,298,592	3.54	0.63	NA	27,955,119	2.65
Therms	††	††	††	NA	1,527,868	1.06

† Ex ante gross savings estimates are from PG&E program planning documents. Ex ante net savings estimates are from PG&E's Annual Summary Report on Demand Side Management Programs in 1997, Technical Appendix, April 1998.

†† In the case of Single Family Residential Energy Management Services, the analysis of gas consumption produces an estimate of gross change that is positive, representing an increase in gas consumption. The Protocols equate gross change with gross savings. However, in cases where the gross change is an increase in consumption, this change cannot be reasonably interpreted as gross savings. Consequently, a gross savings estimate for therms is not reported and, therefore, a gross realization rate and a net-to-gross ratio for therms are also not reported.

1.4 ORGANIZATION OF THE REPORT

Chapter 2 contains a description of the program. Chapter 3 presents the methods and results of the energy savings analysis for Single Family REMS. Chapter 3 presents the same information for the multifamily component. Appendix D contains information required for Table 6 of the Protocols. Appendix B contains information required for Table 7 of the Protocols. Appendix C contains the survey instrument for the evaluation of the Single Family REMS, and Appendix D contains the survey instruments for Multifamily Property REMS.

CHAPTER 2
PROGRAM DESCRIPTION

PG&E's 1997 Residential Energy Management Services Program was described as follows in the PG&E Annual Summary Report on Demand Side Management Programs[1]:

Energy Management Services

Residential Energy Management Services in 1997 included both Single Family Energy Surveys, Multifamily Property Energy Management Site Surveys and the Smarter Energy Line (SEL).

SINGLE FAMILY ENERGY MANAGEMENT SERVICES

The purpose of the program is to provide energy efficiency information to residential customers who live in single family dwellings. This program provides household-specific energy use information for appliances, systems , and building envelope. This program also funds customer representatives who answer residential customers' energy efficiency questions.

Implementation Strategy

In 1997, PG&E continued to provide three options for home energy surveys, the on-site checklist, direct mail, and phone surveys, The appliance end use analyses continued to be the standard energy survey during 1997. The goals were 10,130 on-site surveys and 100,000 direct mail/phone surveys.

Target Market

Single family residential dwelling units.

MULTIFAMILY PROPERTY ENERGY MANAGEMENT SERVICES

The Multifamily Property Energy Management Service (MFP EMS) assists residential customers in controlling their energy consumption and costs through education. Audits can be performed on all common-use areas of multifamily properties.

The efficiencies of boilers (water and space heating), lighting and lighting controls, thermal envelopes, pools and spas, HVAC equipment, and motors are evaluated for each complex.

Implementation Strategy

Contact building owners/property managers. Provide quality analysis and recommendations to customers. The 1997 goal was 33,874 multifamily units surveyed.

Target Market

The eligible multifamily complex contains five or more dwelling units and includes apartments, condominiums, and mobile home parks (master metered or individually metered).

[1] Pacific Gas and Electric company: Annual Summary Report on Demand Side Management Programs in 1997 and 1998, April 1998, Section, Residential C/EE: II/Res 10-11.

1997 PROGRAM ACCOMPLISHMENTS

Single Family EMS:

On-Site Survey	9,048
Mail/Phone Survey	100,376

Multifamily Property EMS:

On-Site Survey	41,385
Total Surveys	150,809

Net Energy Impacts (First Year)

kW	1,900
kWh	10,549,400
Therms	1,444,700

(Includes both Single Family and Multifamily EMS)

CHAPTER 3
SINGLE FAMILY REMS

3.1 OVERVIEW

This chapter of the report discusses the evaluation of the Single Family Portion of the REMS. The evaluation results are summarized first. Then the methodology of the evaluation is described. Details of the gross and net impacts are described at the end of the chapter.

3.2 SUMMARY OF RESULTS FOR SINGLE FAMILY REMS

This Chapter presents the results of the impact evaluation of Pacific Gas and Electric Company's 1997 Single Family (REMS).

Table 3-1. Summary of First Year Load Impact Results
Single-Family Residential Energy Management Services Program

	Gross Savings	Gross Realization Rate	Net-To-Gross Components		Net Savings	Net Realization Rate
			1-Free Rider	Spillover		
EX ANTE						
kW	1,473	NA	1.00	NA	1,473	NA
kWh	8,136,680	NA	1.00	NA	8,136,680	NA
Therm	1,103,288	NA	1.00	NA	1,103,288	NA
EX POST						
kW	7,531	5.11	0.63	NA	4,750	3.23
kWh	41,605,847	5.11	0.63	NA	26,241,601	3.23
Therm	‡	‡	‡	NA	1,110,174	1.01

† Savings estimates are from PG&E program planning documents.

‡ The gross change found by the model was 2,405,001 kWh per year, representing an increase in consumption. The protocols equate gross change with gross savings. However, in cases where the gross change is an increase in consumption this change cannot reasonably be interpreted as the gross savings. Thus for therms, the model does not provide an estimate of gross savings and therefore does not provide an estimate of the net-to-gross ratio or gross realization rate.

3.3 EVALUATION METHODOLOGY FOR SINGLE FAMILY REMS

A billing analysis was the primary basis of the evaluation. A participant group and a non-participant (comparison) group were employed in the evaluation. Pre- and post-consumption for

electricity and gas and demand (for electricity) were estimated for both groups of customers using a time series, cross-section regression (TSCSREG) analysis. To support the billing analysis, a telephone survey of a sample of program participants and nonparticipants was conducted (see Appendix C for a copy of the survey). Gross impacts were calculated by including only participants in the regression analysis. Net impacts were calculated by including both participants and nonparticipants in the regression analysis.

The model used annual electricity or gas usage as the dependent variable. It tested the correlation with consumption of the following types of independent variables: a participation variable indicating when the REMS audit was performed (for participants), heating degree days and cooling degree days, energy usage change variables that could be program related (such as replacing appliances or installing insulation), and household change variables unrelated to the energy audit (such as a change in family size or addition of new rooms). This analysis conformed to the requirements of the Protocols.[1]

3.3.1 Data Sources

The evaluation used data from four sources: the program tracking databases, billing records, weather data, and information from a telephone survey conducted to support the evaluation.

- **Program Tracking Data**

  The tracking data includes demographic and program implementation information. These data were used to inform the survey design, select the sample for the evaluation survey, and as the source of the audit date for the billing analysis.

- **Billing Records**

  The records for each customer included the beginning and ending of each meter-reading period, the number of days in the period, and the amount of energy consumed (gas and/or electricity). The billing data used in the analysis covered the period from January 1996 to September 1998.

- **Weather Data**

  Heating and cooling degree days were derived from temperature data from PG&E's weather stations. These data were included in the model to ensure that changes in consumption were controlled for weather-related factors.

[1] *Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs* as adopted by California Public Utilities Commission Decision 93-05-063, revised March 1998 pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, 96-12-079, D.98-03-063.

- **Customer Survey Data**

  A telephone survey of a sample of program participants and non-participants was conducted to support the billing analysis. A total of 1,912 surveys were completed (Table 3-2). The participant sample was stratified by type of participant (mail, phone, on-site) so that results could be calculated for individual program component for program planning purposes. The billing data was weighted to account for the stratified sample.

  Information collected in the survey included:

  - Major changes that had occurred over the study period and the dates of these changes.
  - Measures that were implemented and the timing of the installations.
  - Fuels used for end uses.

Table 3-2. Customer Surveys

Group	Number of Completed Surveys	Percent Of Total Surveys	Number of Participants	Percent Of Total Participants	Weight
Mail Audit participants	602	46%	99,081	91%	164.59
On-Site Audit participants	461	35%	9,048	8%	19.63
Phone Audit participants	239	18%	1,295	1%	5.42
Total Participants	1,302	100%	109,424	100%	
Nonparticipants	610				189.63
Total	1,912				

3.3.2 Screening Procedures

Billing records were examined for participants and nonparticipants prior to selecting the survey sample. The initial sample of billing records included only single-family houses. Households were then screened out if their billing records were incomplete or exhibited unusual patterns. Such records are normally screened out in billing analysis to minimize the likelihood that outliers will significantly alter the results.

The screening criteria for the billing analysis are presented in Table 3-3. Only those customers passing all the electricity screens were included in the survey sample frame. Many of the electricity screens are related to missing billing data. Since many of the homes in the target population had little or no gas consumption, these screens were not appropriate for the gas data. Additional screening applied after the billing screening included checking nonparticipants against the participant database to eliminate participants from the nonparticipant sample.

Table 3-3. Final Billing Screening Results

	Participant Electricity	Nonparticipant Electricity	Participant Gas	Nonparticipant Gas
Original number of homes subjected to billing screening	**11,050**	**7,000**	**11,050**	**7,000**
Primary screen: 2 or more consecutive months of missing electricity data	-737	-20	0	0
Subjected to other screens	**10,313**	**6,980**	**11,050**	**7,000**
Other Screens †	**Number of homes failing each screen**			
Meter installed after 3/31/96	701	0	1,350	0
Change from 1996 to 1998 is greater than 85% of 1996	447	137	649	170
Read dates are not sequential	237	25	3,922	1,830
Multiple missing consumption	115	76	4,009	1,885
Rate schedule wrong	79	0	34	6
Last reading of previous year did not match first reading of next year	65	2	3,458	1,779
Total consumption is in the 99.5 percentile	52	35	39	27
High variability in monthly readings ‡	27	95	11	46
First monthly reading is not January, February, or March	4	1	3,589	1,774
Missing demographics (name & address)	0	0	23	0
Passed other screens (electricity only)	**8,931**	**6,677**	**8,931**	**6,677**
Eliminate participants from nonparticipant pool		-238		-238
Survey sample	**8,931**	**6,439**	**8,931**	**6,439**

† A house failing any one of these screens (for electricity) was eliminated from the analysis. The counts shown for each screen are the number of households that fail this screen independent of the other screens. Thus the total numbers of houses screened out is *not* the sum of these screens.
‡ Consumers were defined as having excessive variability in their billing data if there was high variability in monthly readings with a standard deviation 4 times larger than the data set or if the change in consumption from 1996 to 1998 was greater than 85%.

After screening the billing data, data from the program tracking databases were matched to the billing records to create the survey sample. The survey sample disposition is presented in Table 3-4.

Table 3-4. Survey Sample Disposition

			Participants		
	Overall	Nonparticipants	Mail	Onsite	Phone
Total Sample	**15,360**	**6,439**	**4,501**	**3,311**	**1,109**
Wrong number	907	423	309	139	-36
Untouched sample	1,196	726	470	0	0
Valid cases[1]	**13,257**	**5,290**	**3,722**	**3,172**	**1,073**
Refusal	3,205	1,339	942	672	252
Language barrier	166	97	14	49	6
Terminate	164	47	49	46	22
Remaining cases	**9,722**	**3,807**	**2,717**	**2,405**	**793**
Unused sample[2]	7810	3197	2115	1944	554
Full Completes	1,912	610	602	461	239
Partial Completes (screened out)	568	163	108	254	43
Lived there <3 years	214	24	40	130	20
Place of business	100	39	22	31	8
Did not own (renters)	254	100	46	93	15
Was not a single family home	0	0	0	0	0
Total Completes (full + partial)	**2,480**	**773**	**710**	**715**	**282**
Response rate[3]	19%	15%	19%	23%	26%
Refusal rate	24%	25%	25%	21%	23%

[1] Total sample minus wrong number and untouched sample.

[2] Called at least once before the target number was reached.

[3] Total completes (full + partial) divided by valid sample.

Participants and nonparticipants were screened out at the beginning of the phone survey

- If customers had not lived in their home for at least 3 years.
- If a business, not a home, had been contacted.
- If customers did not own or were not buying the home (were renters).
- If the location was not a single family home (none were screened out on this criterion because the billing data included only homes defined as single family)

3.3.3 The Billing Analysis Regression Model

Overview

A regression analysis was implemented using billing and program tracking data. Three basic types of models were tested: 1) a monthly model using total consumption by month from January 1996 through September 1998. 2) an annual model with pre-program consumption being the average daily consumption for January 1996 through December 1996 and post-program consumption being the average daily consumption for January 1998 through September 1998 (October through December data were not available in time to be included in the analysis). 3) an annual model with pre-program consumption being the average daily consumption for January 1996 through September 1996 and post-program consumption being January 1998 through September 1998.

Each model was thoroughly examined and the third model was chosen as the most appropriate and accurate model. The results presented in this report are based on that annual model. A discussion of the reasons for choosing that model is included at the end of this chapter.

Each type of model included a participation indicator variable as an independent variable in the regression equation. The value of the variable changes from zero to one in the month of the audit in the monthly model. In the annual model the variable is zero in 1996 and one in 1998. The coefficient on that variable represents the electricity or gas saved by the program. (Variations on each of the models were also tested that used the natural log of consumption as the independent variable, where the coefficient approximates savings as a percent of total consumption.)

The econometric model included only program participants to estimate gross impacts. Nonparticipants were included in the model to calculate net impacts. The nonparticipants acted as a comparison group in the analysis to help explain changes in energy consumption caused by factors other than installing measures related to the program. In other words, the consumption of nonparticipant homes was assumed to represent, in part, participants' consumption over the same time period had the program not existed.

Gross Impacts

Gross impacts were calculated by including only participants in the regression analysis. The coefficient on the participation variable is the reduction (or increase) in energy used after the energy audit was completed. This is a basic pre- / post- model. Household change variables, such as a change in the size of the household, were included in the model. The impact of energy-related actions taken after the audit were captured in the program participation variable. In this type of model, any energy-related action that might be affected by the program is attributed to the influence of the program.

Net Impacts

Net impacts were calculated by including both participants and nonparticipants in the regression analysis. The coefficient on the participation variable is the reduction (or increase) in energy used after the energy audit was completed that has been adjusted for naturally occurring conservation and free riders. We included household change variables using the same set of variables for both participants and nonparticipants. The energy-related change variables were included using the same set of variables for both participants and nonparticipants. In the final annual model they change from 0 in 1996 to 1 in 1998 for nonparticipants if they implemented the measure during the last half of 1997 or in 1998. (In the monthly model they change from 0 to 1 in the month the measure was implemented. In one of the annual models tested participant actions post-audit are coded 1 in 1998.) For participants, these variables are always set to zero so that, as with the gross impacts, the impact of energy-related actions taken after the audit is captured in the program participation variable.

Model Description

For this analysis, data was available both across homes (i.e., cross-sectional) and over time (i.e., time-series). With this type of data, known as "panel" data, it becomes possible to control at once for differences across homes as well as differences across periods in time through the use of a time-series, cross-section regression (TSCSREG) model. Two variations of this model were tested, a monthly model with monthly energy readings from January 1996 through September 1998, and an annual model with average kWh per day and Therms per day for 1996 and 1998.

The consumption data in the model include months before and after the installation of measures through the program, which allows for the pre-installation months of consumption to act as controls for post-participation months.

TSCSREG analysis models pre- and post-program consumption of participants to estimate gross program impacts. To estimate net impacts, it models and compares the pre- and post-program energy consumption of nonparticipants and participants. TSCSREG models can control for outside influences on energy consumption that vary over time, such as heating degree days.

Billing data analysis must meet two criteria to be effective for measuring actual energy savings. First, the expected savings (the program measure impacts) must be large enough to be detected statistically from energy usage fluctuations due to other factors. Second, energy consumption must be stable over time, or at least well correlated with known and measurable factors such as heating degree days. For both these reasons, a time-series, cross-section regression model with monthly values for all variables is useful.

The time-series, cross-sectional regression procedure used in this analysis solves the following equation:

Y_{it}	=	α	+	x_{it}	β	+	ν_i	+	ε_{it}
Dependent variable (kWh or Therms)		Constant		Independent variable (Program participation variable and change variables)	Independent variable coefficient		Unit-specific residual		Residual

A wide range of independent variables were tested in the analysis. The complete list is shown in Table 3-5. The range of independent variables can be classified into the following four types:

- **Participation variable:** 1/0 program participation variable. The coefficient on this variable is the savings estimate when the dependent variable is kWh or therms. It approximates the percent savings when the dependent variable is the natural log of kWh or therms.

- **Weather–HDD and CDD:** Heating degree-days (63^o F) and cooling degree-days (72^o F).

- **Household change variables:** Energy-related household change variables unrelated to the energy audit such as change in family size or addition of new rooms. These are 1/0 variables indicating that the action was taken. (In the monthly model they change from 0 to 1 in the month the measure was implemented.) These variables apply to both participants and nonparticipants. They may improve the fit of the model – that is they may reduce the unexplained variance.

- **Energy-related change variables:** Energy-related change variables that may be program related, such as installing insulation, faucet aerators, or replacing refrigerators. These are 1/0 variables that indicate that the action was taken. These variables may improve the fit of the model – that is, they may reduce the unexplained variance.

Extensive data screening and outlier analysis was performed at several steps to ensure that outliers were not unduly affecting the results. The data screening done prior to implementing the customer survey controlled for some types of outliers. During modeling, individual readings with high studentized residuals (greater than 6 in absolute value) were excluded in the monthly models and individual households were excluded from the annual models if they had three or more months with high studentized residuals. Outliers were also examined with Dfits and DFBetas tests but no final screens included those values.

Table 3-5. Independent Variables Tested

- **Participation and weather**
  - Participant variable
  - Cooling degree days
  - Heating degree days
- **Actions that may be caused by program**

Heat, cooling, water heat

- Electric CAC †
- electric heat †
- Electric water heater †
- Gas CAC †
- Gas heat †
- Gas water heater †
- Window AC †

Appliances

- Large power tools †
- Clothes washer †
- Dehumidifier †
- Dishwasher †
- Electric clothes dryer †
- Electric oven †
- Electric range †
- Freezer †
- Gas clothes dryer †
- Gas oven †
- Gas range †
- Refrigerator †
- Sauna †
- Swimming pool †
- Whole house fan †

Other

- Close room in summer
- Close room in winter
- Have aerators
- Programmable thermostat
- Colder summer temperature
- Colder winter temperature
- Energy saving improvements
- installed a timer on your dehumidifier
- Purchased and used CFLs
- Warmer summer temperature
- Warmer winter temperature
- Air leakages sealed
- Attic insulated
- Weather-stripping and caulking added
- Turned down water heater temperature
- Insulated and sealed ducts
- Insulated floors
- Installed low-flow showerheads
- Installed new windows
- Installed pipe wrap
- Installed storm windows
- Insulated walls
- Installed water heater wrap

Count of actions

- Number of major electric appliances added
- Number of major electric appliances replaced
- Number of major gas appliances added
- Number of major gas appliances replaced

- **Actions that are probably not caused by program**

Other

- Added more living space to home
- Decrease in number of people
- Increase in number of people

- **Conditions (not actions) that are probably not caused by program**

Heat, cool, water heat

- Electric central air conditioning
- Electric heating fuel
- Electric room or window air conditioning
- Electric water heating fuel
- Gas central air
- Natural gas heating fuel
- Natural gas water heating fuel
- Other heating fuel

Appliances (not change; have or do not have)

- Have big tools
- Number of extra major electric appliances
- Number of extra major gas appliances
- Swimming pool
- Whole house fan
- Clothes washer
- Dehumidifier
- Dishwasher
- Electric clothes dryer
- Electric oven
- Electric range
- Freezer
- Gas dryer
- Gas oven
- Gas range
- Refrigerator
- Sauna

Demographics

- Attended at least some college, maybe more
- Estimated income
- Estimated number of people
- Estimated square footage
- Income
- Number people live in home
- Older than 65
- Square feet
- House detached from others
- Place is both home and work

† Each of these appliance change variables was included in three forms: add, remove, and replace.

Discussion of Tested Models

Most of the variables shown in Table 3-5 were 1/0 indicator variables, some, such as income or square feet, were discrete categories or continuous variables. The independent variables were tested in untransformed form and they were also interacted with heating and cooling degree days to test for weather sensitivity. Most of the independent variables included in the final model were interacted with cooling degree days.

A model was tested that interacted heating and cooling degree days with the 1/0 participation variable and with 1/0 variables indicating energy conservation actions taken by the participants. Including interacted and non-interacted participation variables in the model can help separate weather-dependent and weather-independent savings. This model usually found large electricity savings (indicating a realization rate between 2.5 and 4.0) but with inadequate t-values (usually between 0.2 and 0.6). In this model, few coefficients on interacted action variables were statistically significant and those that were often showed a sign opposite of expectations. Small changes in the variables included in this model produced large changes in the savings or caused the model to predict an increase in consumption.

The final model used to report results is an annual model with all variables except the participation variable interacted with heating or cooling degree days. In this model, the coefficient on the participation variable did not change in large increments when independent variables were added and subtracted to the model. The coefficients on the statistically significant variables generally had the expected sign. And the R-squared values were consistently high. The variables that proved to be reliably correlated with energy consumption and that were used in the final model will be presented in the results section.

3.3.4 Demand Impact

The evaluation estimate of kW demand savings was developed using the realization rate calculated from the kWh savings and the program planning estimates of kWh savings. The ratio of the evaluation savings estimate of kWh savings to the planning estimate is the realization rate. Multiplying the realization rate by the planning estimate of demand savings produces the evaluation estimate of demand savings, as illustrated in the following formulas.

$$\text{Net realization rate} = \frac{netkWh_{evaluation}}{netkWh_{planning}}$$

$$\text{Net kW}_{\text{evaluation}} = \text{net realization rate X net kW}_{\text{planning}}$$

3.4 SINGLE FAMILY REMS IMPACTS

3.4.1 Net Electricity Impact

Table 3-6 lists the variables included in the final electricity regression model. The dependent variable in this model was the electricity consumption per day of program participants and nonparticipants. As a result, the coefficient on the participation variable represents the net daily per-participant electricity savings attributable to the program. Since the coefficient on the participation variable is negative, this model finds net savings, that is program participation was correlated with a decrease in consumption of 0.66 kWh per day, or 240 kWh per year (Table 3-7). Since this model is estimated over both participants and nonparticipants, the savings rate calculated incorporates a net-to-gross adjustment.

The final phase of the analysis started by testing all of the variables shown in Table 3-5 in the regression model then, through several iterations, eliminated those that were not statistically significant, re-running the model each time after eliminating sets of variables. The column labeled "P>|t|" shows the probability associated with the given t value (the probability that a difference at least as large as the one observed would have arisen if the means were really equal). Thus, the independent variables included in the final model are all statistically significant at the 95% level. (A simple model including only heating and cooling degree days produced a coefficient on the participation variable of -0.58, and a t value of 1.949.) The 90% confidence interval for the coefficient extends from 0.16 to 1.15, which is 0.16 to 1.15 kWh per day or 58 to 421 kWh/year. (The confidence interval for the 1995 evaluation was from 39 to 150 kWh/year.) The R-squared value for the final electricity model was 0.9223.

The participation variable in the final electricity model was an un-transformed 1/0 variable. The remaining independent variables were action variables interacted with heating or cooling degree days. Models were tested that included demographic variables (e.g., income, house size) and status or inventory variables (e.g., presence of electric heat, presence of a free-standing freezer), both as 1/0 variables and interacted with heating or cooling degree days. None of the demographic or inventory variables proved to be useful for improving the fit of the model.

Table 3-6. Net Load Impact Regression Model -- Electricity

(kWh per day)

Description	Coef.	Robust Std. Err.	t	P>|t|	90% Conf. Interval	
Participation variable	-0.66	0.30	-2.17	0.030	-1.15	-0.16
Cooling degree days	0.53	0.24	2.24	0.025	0.14	0.92
Heating degree days	0.90	0.16	5.50	0.000	0.63	1.17
Replaced Electric CAC	-0.91	0.27	-3.31	0.001	-1.36	-0.46
Replaced Electric range	-1.16	0.41	-2.82	0.005	-1.83	-0.48
Replaced Gas oven	-0.97	0.17	-5.84	0.000	-1.25	-0.70
Number of major gas appliances added	0.98	0.45	2.16	0.031	0.23	1.72
Removed electric heat	-0.07	0.02	-4.03	0.000	-0.09	-0.04
Replaced electric heat	0.51	0.05	11.30	0.000	0.44	0.58
Removed Electric water heater	-0.56	0.05	-11.29	0.000	-0.64	-0.48
Constant	20.51	1.66	12.36	0.000	17.78	23.24

(1904 households, 3808 observations)

Table 3-7. Net Electricity Savings Summary

(kWh per year)

Method	Number of Households	Impact per Household (kWh)	Total Impact (kWh)
Planning Estimates (Net=Gross Savings Per Year)			
Mail	99,081	67	6,638,427
On-Site	9,048	156	1,411,488
Phone	1,295	67	86,765
Total	109,424	74	8,136,680
Evaluating Estimates: Net Savings per year			
Total	109,424	240	26,241,601
90% confidence interval		58 to 421	6,375,616 to 46,107,577

3.4.2 Net Gas Impact

Table 3-8 lists the variables included in the final gas regression model. The dependent variable in this model was the daily gas consumption of program participants and nonparticipants. And, as with the electricity model, the coefficient on the participation variable represents the net daily per-participant savings attributable to the program. This model found net savings of 0.0278 therms per day, or 10.1 therms per year (Table 3-9). The t value on the participation variable is 1.602, which is not quite statistically significant at the 95% level. The R-squared value for the

model as a whole was 0.9467, which is high for this kind of model. The independent variables included in the final model are all statistically significant at the 95% level. The 90% confidence interval for the participation variable coefficient includes zero. It extends from –0.056 to 0.001, which is a savings of 0.056 therms per day to an increase in consumption of 0.001 therms per day. This corresponds to a savings of 20.6 therms per year to an increase in consumption of 0.28 therms per year. (The confidence interval for the 1995 evaluation was from –3.3 to +10.45 therms/year.)

Several iterations of this model were run to attempt to improve the t-value on the participation variable. The model shown is the best one found. A simple model with only cooling and heating degree days produces a t-value of 1.05.

As with the final electricity model, the participation variable in the final gas model was an un-transformed 1/0 variable. The remaining independent variables were action variables interacted with heating or cooling degree days. None of the tested demographic or inventory variables proved to be useful for improving the fit of the model.

Table 3-8. Net Load Impact Regression Model – Gas

(Therms per day)

Description	Coef.	Robust Std. Err.	t	P>|t|	90% Conf. Interval	
Participation variable	-0.028	0.017	-1.602	0.109	-0.056	0.001
Cooling degree days	0.019	0.013	1.524	0.128	-0.002	0.041
Heating degree days	0.152	0.010	14.498	0.000	0.134	0.169
Replaced Electric oven	-0.045	0.011	-3.945	0.000	-0.064	-0.026
Removed Freezer	-0.149	0.008	-19.217	0.000	-0.162	-0.136
Removed electric heat	-0.010	0.001	-11.262	0.000	-0.012	-0.009
Replaced electric heat	-0.038	0.003	-15.074	0.000	-0.042	-0.034
Removed Gas heat	-0.042	0.018	-2.416	0.016	-0.071	-0.014
Installed low-flow showerheads	-0.015	0.007	-2.107	0.035	-0.026	-0.003
Installed storm windows	-0.034	0.008	-4.167	0.000	-0.048	-0.021
Replaced Electric water heater	-0.089	0.017	-5.267	0.000	-0.117	-0.061
Removed Gas water heater	-0.216	0.020	-10.974	0.000	-0.248	-0.183
Constant	0.350	0.098	3.560	0.000	0.188	0.512

(1907 households, 3814 observations)

Table 3-9. Net Gas Savings Summary

(Therms per year)

Method	Number of Households	Impact per Household (therms)	Total Impact (therms)
Planning Estimates (Net=Gross)			
Mail	99,081	10	990,810
On-Site	9,048	11	99,528
Phone	1,295	10	12,950
Total	109,424		1,103,288
Evaluating Estimates: Net Savings per year			
Total	109,424	10	1,110,174
90% Confidence Interval		20.6 savings to 0.28 increase	2,250,789 savings to 30,438 increase

3.4.3 Gross Impacts

We also ran separate models to estimate gross impacts, which allowed us to calculate a net-to-gross ratio. The results of the final electricity and gas gross impact models are shown in Table 3-10 and Table 3-11. The gross models are essentially the same specification as the net models. Since the action variables in the net model are only included for nonparticipants, they show no variation for participants and drop out of the model.

Table 3-10. Gross Load Impact Regression Model – Electricity

(kWh per day)

Description	Coef.	Robust Std. Err.	t	P>|t|	90% Conf. Interval	
Participation variable	-1.04	0.75	-1.39	0.164	-2.27	0.19
Cooling degree days	0.47	0.33	1.43	0.152	-0.07	1.02
Heating degree days	1.12	0.48	2.33	0.020	0.33	1.91
Constant	26.14	3.17	8.24	0.000	20.92	31.36

(1294 households, 2588 observations)

Table 3-11. Gross Load Impact Regression Model – Gas

(Therms per day)

Description	Coef.	Robust Std. Err.	t	P>|t|	90% Conf. Interval	
Participation variable	0.060	0.041	1.459	0.145	-0.008	0.128
Cooling degree days	0.025	0.019	1.321	0.187	-0.006	0.056
Heating degree days	0.097	0.026	3.683	0.000	0.054	0.140
Constant	0.573	0.176	3.260	0.001	0.283	0.862

(1297 households, 2594 observations)

The 90% confidence intervals around the coefficients in both the electricity and gas gross impact models include zero. The coefficient on the participation variable for electricity indicates that participation is correlated with a decrease in gross consumption of 1.04 kWh per day or 380 kWh per year with a 90% confidence interval from a savings of 830 kWh/year to an increase in consumption of 69 kWh/year. The net-to-gross ratio for electricity is 0.631.

The positive gas participation coefficient indicates an *increase* in gas consumption. However, since the 90% confidence interval includes zero this conclusion is not statistically significant. Weather issues that may help explain this result are discussed in the next section.

3.5 DISCUSSION OF SINGLE FAMILY REMS IMPACTS

Several methods that were expected to produce valid, stable models turned out to be neither valid nor stable. The final models are stable and fit the data reasonably well but the problems encountered with the data call for performing several other kinds of checks in addition to trying all of the standard modeling approaches. The key issue that appears to be affecting the models is weather. This section will examine weather and other modeling issues that can illuminate the results.

3.5.1 Weather Issues

As discussed above, two types of models were examined and rejected because of instability: a monthly model and an annual model with 12 months of pre-program consumption (1996) and 9 months of post program consumption (1998). Weather issues were possibly at the root of the problems with these models. In the annual model, the effect of including heating and cooling degree days and consumption from October through December 1996 but not from the corresponding dates of 1998, may have been to increase the variability of the data beyond the power of the model to resolve. This may have been exacerbated by the fact that, due to El Niño and La Niña, the weather during the three years under analysis varied more than usual.

Figure 3-1 shows the average monthly heating and cooling degree days for the months under analysis. As you would expect, cooling degree days drop off dramatically in the final three months of the year. As a result, average cooling degree days for the months of 1998 available for analysis (January-September) will be quite a bit higher than in the average for all of 1996. The significance of this difference is illustrated in Figure 3-2, which shows the change in the average daily energy use and change in average heating an cooling degree days for the months included in the final model (January through September of 1996 and 1998) compared to changes if all of 1996 is included.

Figure 3-1. Heating and Cooling Degree Days

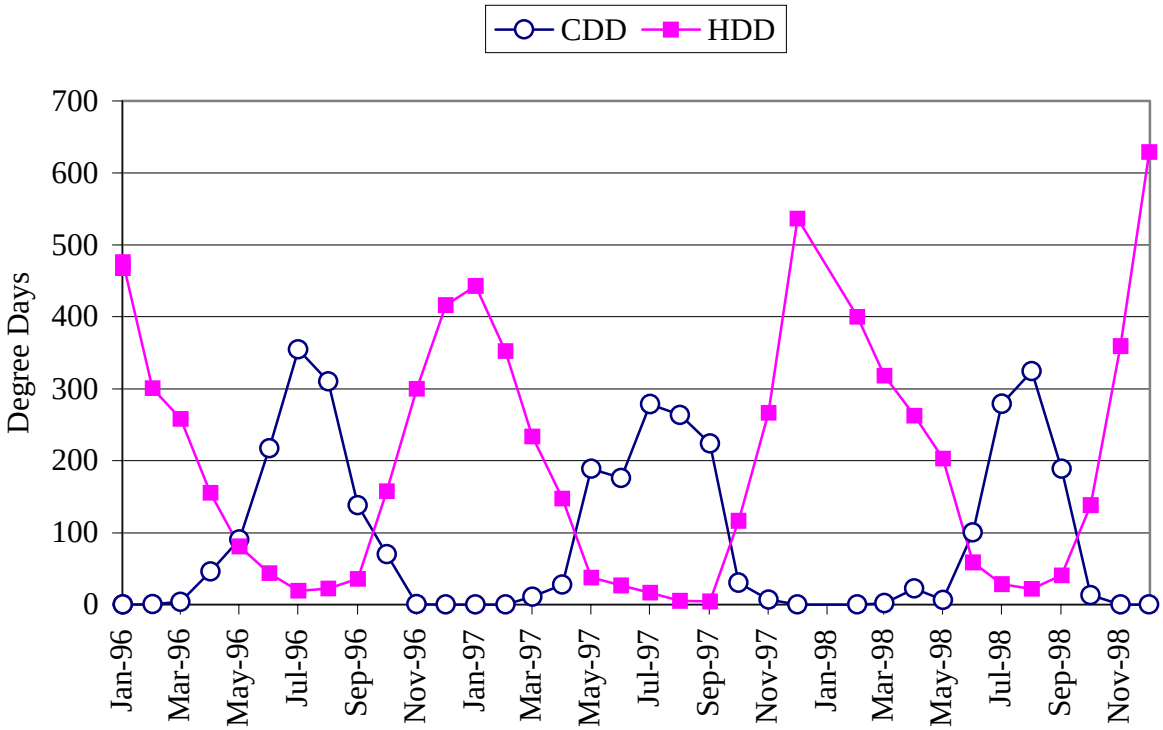
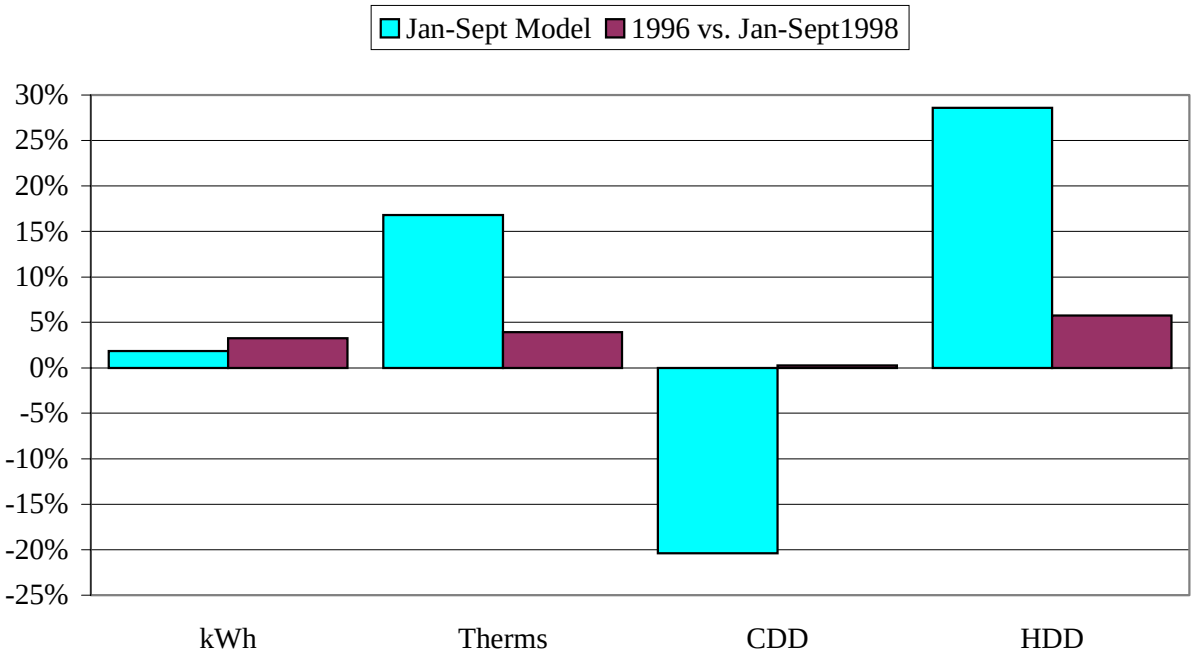


Figure 3-2. Change in Energy Use and Weather
January-September 1996 and 1998



Percent change in mean daily consumption (kWh and therms)
and in mean daily cooling and heating degree days.

3.5.2 Pre- and Post-Program Average Consumption

The results show a high realization rate on the electric side. Simple pre-post comparisons can provide evidence to support results obtained with more sophisticated models. Both participants and nonparticipants increased their gas and electricity consumption over the three years, however, nonparticipants saw larger increases than participants (Table 3-12).

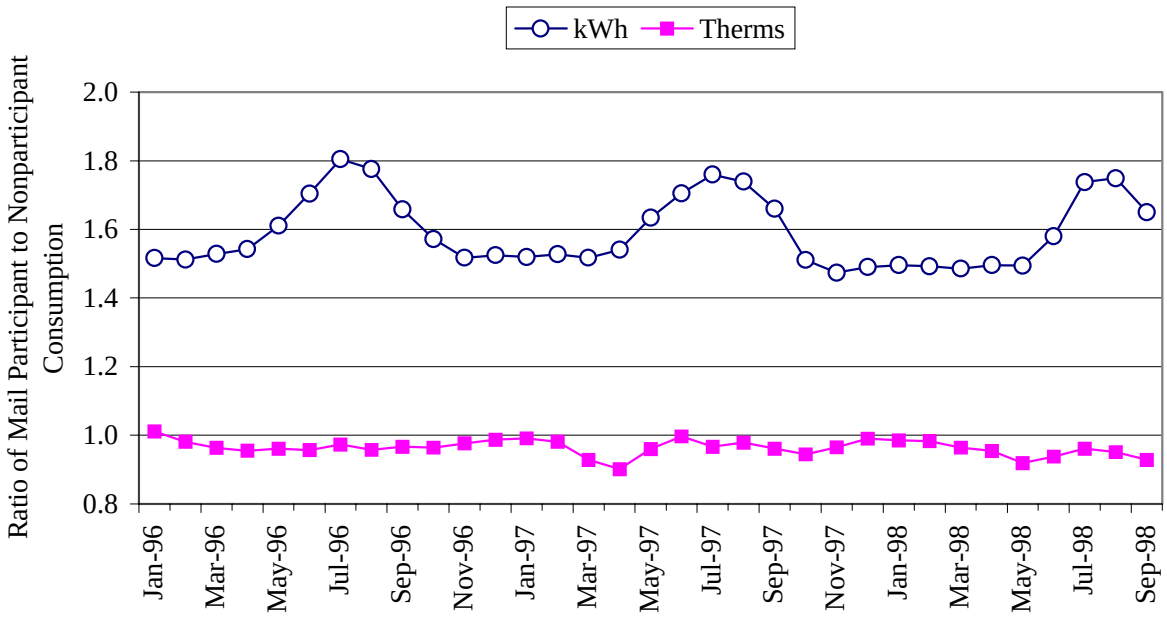
Table 3-12. Average Actual Energy Use by Year

	Electricity (kWh/Day)			Gas (Therms/Day)		
	1996	1998	% change	1996	1998	% change
Participant	33.9	34.1	0.5%	1.2	1.3	15.5%
Nonparticipant	21.1	21.9	3.9%	1.2	1.4	17.9%
Average	27.3	27.8	1.8%	1.2	1.4	16.8%

(Average use per day over January to September, 1996 and 1998)

A visual examination of the monthly billing data provides support to the conclusion that participants have been reducing their energy consumption relative to nonparticipants over time. This becomes particularly apparent when you examine the ratio of participants' to nonparticipants' monthly consumption in Figure 3-3 and see a slight, but clear downward trend in the ratio for electricity, and possibly also for gas.

Figure 3-3. Ratio of Participant to Nonparticipant Consumption



CHAPTER 4
MULTIFAMILY PROPERTY REMS

4.1 OVERVIEW

This section presents the evaluation of the 1997 Multifamily Property REMS. The discussion begins with a summary of the evaluation results. The evaluation methodology is then discussed. Finally, the gross and net impact results are described in more detail.

4.2 SUMMARY OF RESULTS

Table 4-1 summarizes the results of the evaluation.

Table 4-1. PG&E's 1997 Multifamily Property REMS, Summary of First Year Load Impact Evaluation Results

	Gross Savings	Gross Realization Rate	Net-To-Gross		Net Savings	Net Realization Rate
			1-FR	SO		
EX ANTE*						
kW	794	n.a.	0.55	0	437	n.a.
kWh	4,386,810	n.a.	0.55	0	2,412,746	n.a.
therms	620,775	n.a.	0.55	0	341,426	n.a.
EX POST						
kW	520	0.65	0.63	0	325	0.75
kWh	2,692,745	0.61	0.64	0	1,713,519	0.71
therms	468,220	0.75	0.89	0	417,695	1.22

* The ex ante savings estimates are from PG&E program planning documents.

4.3 EVALUATION METHODOLOGY

4.3.1 Overview

To evaluate the load impacts of the Multifamily Property REMS, the following analytic steps were used.

1. Audit estimates of the savings that would occur if a particular audit recommendation were implemented were taken as preliminary savings estimates for each recommendation. The audit savings estimates had been calibrated to customer billing data prior to being reported to the participants with the recommendations.

2. A billing analysis of participants attempted to develop an *implementation realization rate*, defined for purposes of this study as the ratio of realized savings to the audit estimate, for those recommendations that were implemented.

3. Analysis of survey data on the audit recommendations that were implemented by participants gave the *take rate*, defined in this study as the ratio of the total audit estimate of savings from implemented measures to the total audit estimate of savings for all recommended measures.

4. Analysis of self-reported survey data on the fraction of implemented recommendations that would have been implemented even without the audit provided a net-to-gross ratio. The net-to-gross ratio is the ratio of savings attributable to the program to the total gross savings from implemented recommendations.

These steps are combined in the following chain of estimates:

$$\begin{aligned} \begin{matrix} Gross \\ Savings \end{matrix} &= \begin{pmatrix} audit\ savings\ for\ all \\ \leq 4 year\ payback \\ recommendations \end{pmatrix}_{\substack{program \\ total}} \times \begin{pmatrix} realized \\ savings \\ \hline audit \\ estimated \\ savings \end{pmatrix}_{\substack{billing \\ analysis}} \times \begin{pmatrix} audit\ savings\ for \\ all\ implemented \\ recommendations \\ \hline audit\ savings\ for\ all \\ \leq 4 year\ payback \\ recommendations \end{pmatrix}_{survey} \\ &= \begin{pmatrix} total\ audit \\ savings\ estimate\ for \\ program \end{pmatrix} \times \begin{pmatrix} implementation \\ realization \\ rate \end{pmatrix} \times \left(Take\ Rate \right) \end{aligned}$$

$$\begin{aligned} \begin{pmatrix} Net \\ Savings \end{pmatrix} &= \begin{pmatrix} Gross \\ Savings \end{pmatrix} \times \left(\frac{\begin{pmatrix} program-attributable\ audit\ savings \\ for\ all\ implemented \\ recommendations \end{pmatrix}}{\begin{pmatrix} audit\ savings\ for \\ all\ implemented \\ recommendations \end{pmatrix}} \right)_{survey} \\ &= \begin{pmatrix} Gross \\ Savings \end{pmatrix} \times \left(NTG\ Ratio \right) \end{aligned}$$

As it turned out, the billing analysis was unable to provide a reliable estimate of the implementation realization rate (step 2). Therefore, the audit estimate of savings (step 1) was taken directly as a valid estimate of the gross impact of each implemented recommendation.

The audit estimate of the savings from implementing a recommendation is a customized output of the software associated with the audit database. The auditor enters into the audit database all of the information relevant to the current energy usage of the common areas of the multifamily property being audited. This information must produce an energy usage consist with the property's electric and gas consumption of the previous year. The auditor then enters the recommendations s/he is offering at the property being audited and the software associated with the database provides an estimate of the annual electric and/or gas savings and/or demand savings of implementing each recommendation offered at that property.

Both the gross and net impacts were estimated using data from participants only. In the attempted billing analysis, comparing savings for participant implementers with those from participants who did not implement recommendations limits the effects of self-selection bias, and would be expected to give more precise estimates of gross savings than would a billing analysis of participants and nonparticipants. The basis for using self-reported data for the take rate and net-to-gross analysis is discussed below.

4.3.2 Take Rate and Net-to-Gross Methodology

To complete the analysis of gross and net savings, methods of developing explicit take rates and net-to-gross adjustments were required. Methods considered for these components of the analysis were the following.

The theoretically superior method for the net-to-gross estimation would be a discrete choice analysis (DCA), using the nested logit approach developed in the context of an earlier PG&E program. However, there were not enough participants in the 1997 program to support this type of analysis. Thus, this approach was not pursued.

An alternative considered was to collect information from participants and from nonparticipants (customers who have never participated in the audit program) on what they actions they had taken. The difference between participant and nonparticipant "take rates" could then be interpreted as the program effect. However, this approach could leave substantial self-selection bias. That is, customers who choose to participate in (select themselves into) the program are likely to have different behavior than those who do not, even in the absence of the program. A method that does not account for this a priori difference results in a biased estimate of the effect of the program.

That bias would be corrected for by the DCA method. Without the discipline of DCA, the simple comparisons of nonparticipant and participant take rates would not be very meaningful. A further difficulty of this approach was that properties that never participated in the program in any year tended to have much lower energy consumption than the participants, making them generally unsuitable as a comparison group. This approach was therefore not pursued.

Another alternative would have been to use as nonparticipants prior year program participants, rather than customers who never participated in the program. Using previous participants would substantially mitigate the self-selection problem. However, it would be difficult to separate program effects from nonprogram effects among the "nonparticipants" so defined. That is, the confounding effects of the prior year program would make this approach also unsatisfactory.

The option adopted therefore was to ask participants a sequence of questions to identify the effect of the program on their decision to implement the measures they have. This self-report option was considered likely to give the best results given the limitations of the alternatives discussed above. The self-reported net-to-gross component of the study worked from attribution sequences used in previous studies, with appropriate classification rules for the assignment of free ridership.

Detailed descriptions of the data and analyses employed to estimate the gross and net impacts follow.

4.3.3 Primary Data Sources

The primary data sources for the analysis of the Multifamily Property REMS were:

- the Multifamily Property REMS energy audit database (audit database),
- participant billing data,
- weather data, and
- a telephone survey of participants designed and conducted for this study.

The billing analysis utilized all of these data sources. The take rates and net-to-gross analysis both employed the audit database and the survey data.

The 1997 Multifamily Property REMS Energy Audit Database

As described in Section 2 of this report, a primary component of the Multifamily Property REMS is an energy audit of the common areas of the multifamily property. This energy audit is followed by a report that discusses the resulting cost-effective energy saving recommendations.

For each of the multifamily properties, the audit database was the source for:

- the control numbers of the meters;
- the number of dwelling units in the property;
- the recommendations from the energy audit;
- the annual energy and/or demand savings associated with implementing each recommendation;
- property name, street address, and city;
- contact name and phone number; and
- auditor name and date of the audit.

There was one category of recommendations offered at multifamily properties that was generated by the audit database, but for which the audit database did not produce an estimate of savings These were recommendations regarding air conditioning system maintenance. Consequently, these recommendations were not included in any way in this study.

Based on a review of some of the reports provided to past participants in the Multifamily Property REMS, it appears a recommendation to replace electric clothes dryers with gas clothes dryers was sometimes offered. In these cases the auditor must have taken the initiative in offering the recommendation, because it is not an outcome of the audit database. Furthermore, the audit database does not produce an estimate of the savings of replacing an electric clothes dryer with a gas clothes dryer. Consequently, this potential recommendation was also not included in any way in this study.

Billing data

The billing data were used in the construction of the dependent variable and the heating and cooling degree-day variables employed in the billing analysis. For each meter read, the billing data provided the current and previous read date, the number of days in the period, and the amount consumed (kWh or therms) during the period. In the cases, of which there were many, where the participating multifamily property had more than one meter, these data were aggregated over all of the meters at the property. As required by the Protocols, the billing data were reviewed for errors.

The billing data employed in the evaluation were from the period January 1996 through September 1998. For a participating property to be included in the billing analysis, the Protocols

require twelve months of billing data before the audit and a minimum of nine months of billing data after the audit be included in the analysis. Because this is an evaluation of the 1997 Multifamily Property REMS, billing data from the period January 1996 through September 1998 meet these Protocol requirements for all participants during the program year. The latest billing data employed in the evaluation are from September 1998 because it was the latest month for which weather data were available at the time the analysis began.

Weather data

Weather data were needed for the evaluation in order to calculate the heating and cooling degree-day variables employed in the billing analysis. The weather data needed to calculate these variables were the average daily temperature for each day included in the billing analysis, from each of PG&E's 25 weather stations. The appropriate weather data for a multifamily property was determined by the weather station identification number embedded in the meter account number(s).

Survey data

In 1997, PG&E conducted an energy audit of the common areas of 393 multifamily properties. For these 393 properties, there were 285 unique contacts; some contacts were responsible for more than one participating property. An attempt was made to survey each of these contacts by telephone. The survey was conducted in January 1999.

Twelve percent of the potential respondents were the contact for at least two participating multifamily properties. If a potential respondent was the contact for three or fewer properties, an attempt was made to have the potential respondent complete the questionnaire for all of the properties for which s/he was the contact. If a potential respondent was the contact for more than three properties, an attempt was made to have the potential respondent complete the questionnaire for a sample of the properties for which s/he was the contact.

Sampling

Nine potential respondents were the contact for more than three participating multifamily properties. An attempt was made to have these potential respondents complete the questionnaire for three of the properties for which s/he was the contact. Although it was thought unlikely a respondent would complete the questionnaire for as many as three (even two) properties, the attempt was made. That is, a sample of even three properties was thought to be ambitious.

If a potential respondent was the contact for participating multifamily properties with substantially different numbers of dwelling units, the properties with the largest number of dwelling units tended to be selected to be in the sample. A large property is likely to have a wider variety of recommendations and, therefore, is more likely to provide data that informs the analysis beyond that property alone. The take rate and net-to-gross analyses assume that what is learned about the properties for which a respondent completes a questionnaire can also be

applied to the properties for which the respondent does not complete a questionnaire. Selecting the largest properties to be in the sample amounts to stratifying on the variable of interest.

If a potential respondent was the contact for participating multifamily properties with similar numbers of dwelling units, a simple random sample of properties was selected. A simple random sample is also consistent with the Protocols. Table 4-2 reports the number of properties in the population, in the sample frame, and in different components of the analysis data set.

Table 4-2. Properties in Population, Sample Frame, Analysis Data Set

	Number of premises
Population=Frame	393
Targeted for surveys	331
Analysis data set (completed surveys)	107
Electricity billing analysis	54
Gas billing analysis	61
Take Rate analyses	107
Net-to-gross analyses	51

Questionnaire Design

The questionnaire employed in the survey is included in Appendix D. The primary data obtained from the survey were:

- which of the audit recommendations were implemented, and when;
- the answers to a series of question designed to determine the fraction of recommendations implemented that would have been implemented even if PG&E had not done an energy audit of the multifamily property's common areas; and
- other changes that occurred that affected the electric or gas use covered by the property manager or owner's bill, and the month and year of such changes.

With respect to collecting data on the recommendations implemented, a respondent was asked whether or not a specific recommendation was implemented. For example, "In the carport, have any quartz lamps been replaced with high pressure sodium lamps?" If the recommendation was implemented, the respondent was also asked for the month and year it was implemented. A respondent was specifically asked, in this manner, about each of the recommendations with a payback of four years or less (primary recommendations) offered at the property. After the respondent had been asked about all of the primary recommendations, the respondent was also asked to describe any additional recommendations that had been implemented, and to give the month and year they were implemented.

There were a few recommendations with paybacks of four years or less for which a clear description of the recommendation could not be developed from the audit database information. Thus, it was not possible to ask specific questions about the implementation of these measures. This study handles these recommendations the same way it handles the other recommendations that were not specifically asked about — that is, the recommendations with paybacks of five or more years.

4.3.4 Gross Impact

Billing Analysis

The billing analysis utilized a pooled time-series/cross-sectional model (TSCSREG). This model is appropriate because the data being analyzed are daily kWh (or therms), which are time-series data, for a cross section of multifamily properties.

The primary data sources for the variables included in the model were:

- the audit database,
- billing data,
- weather data, and
- the telephone survey of participants.

.1 The Pooled Time-Series/Cross-Sectional Model

The following pooled time-series/cross-sectional model was fit separately for electric energy (kWh) and gas (therms):

$$Y_{jt} = \mu_j + \tau_t + \gamma_H HDD63_{jt} + \gamma_C CDD72_{jt} + \beta_L LSAV_{jt} + \beta_{NL} NLSAV_{jt} + \delta_O OCHNG_{jt} + e_{jt},$$

where j indexes multifamily properties 1, 2, …, J;

t indexes billing periods 1, 2, …, T;

Y_{jt} = kWh (therms) per day per dwelling unit for multifamily property j during billing period t;

μ_j = effect specific to multifamily property j;

τ_t = effect specific to billing period t (= 1 if billing period t and =0 otherwise);

γ_H, γ_C, β_L, β_{NL}, δ_O = coefficients estimated by the regression;

$HDD65_{jt}$ = heating degree-days per base 65°F per day during billing period t for multifamily property j;

$CDD70_{jt}$ = cooling degree-days per base 70°F per day during billing period t for multifamily property j;

$LSAV_{jt}$ = audit estimate of savings for all of the lighting recommendations implemented at property j by billing period t, in kWh per day per dwelling unit. (This variable is included only in the electric model, not in the gas model.);

$NLSAV_{jt}$ = audit estimate of savings for all of the non-lighting recommendations implemented at property j by billing period t, in kWh (therms) per day per dwelling unit;

$OCHNG_{jt}$ = 1 if there were any other changes that decreased the electric (gas) use covered by property j's manager or owner's bill by billing period t, = -1 if there was a change that increased this electric (gas) use, and = 0 otherwise; and

e_{jt} = random error for multifamily property j during billing period t.

This model specification meets the Protocols for the estimation of gross impacts. Certain components of the model are discussed further below.

The billing periods t are defined by a calendar month and a year. The calendar month associated with a billing period is the month of the end date of the meter reading period.

The dependent variable Y_{jt} is calculated by dividing property j's consumption for billing period t by the number of days in the billing period and by the number of dwelling units in the property. The normalization by number of dwelling units reduces the model heterogeneity. Similarly, the independent variables $LSAV_{jt}$, and $NLSAV_{jt}$ are calculated as the audit estimate of annual savings for all of the (lighting or non-lighting) recommendations implemented at property j by billing period t, divided by the number of days per year (365) and by the number of dwelling units.

The property- and billing period-specific effects (μ_j and τ_t, respectively) are included in the model because it is likely the other independent variables do not capture all of the systematic or non-random differences between multifamily properties and between billing periods. Including the multifamily property and billing period-specific effects helps to insure the remaining residual errors (e_{jt}) are uncorrelated.

As the subscripts j and t on the heating and cooling degree-day variables ($HDD63_{jt}$, C$DD72_{jt}$) indicate, these variables are specific to a multifamily property and to a billing period. The average daily temperatures employed in a degree-day calculation are from the appropriate PG&E weather station for a property, and the dates used in the calculation are specific to a property's billing periods. For example, suppose the appropriate PG&E weather station for multifamily property j is 6, and the property's meters were read August 20, 1998 and again September 20, 1998. Then the heating and cooling degree-day variables for that multifamily property for t = September, 1998 would be calculated using the average daily temperature from weather station 6 for the days August 20, 1998-September 19, 1998.

The coefficients on $LSAV_{jt}$ and $NLSAV_{jt}$, β_L and β_{NL}, are the lighting and non-lighting recommendation implementation realization rates, respectively. The independent variables $LSAV_{jt}$ and $NLSAV_{jt}$ are the audit estimated savings of the (lighting or non-lighting) recommendations implemented. The dependent variable is a measure of observed consumption. Consequently, the coefficients on $LSAV_{jt}$ and $NLSAV_{jt}$ indicate the fraction of the estimated savings of the recommendations implemented that in fact effect lower observed consumption, that is, are realized. Hence, this study refers to the coefficients β_L and β_{NL} as implementation realization rates.

The estimated savings of the lighting and non-lighting recommendations implemented enter the model separately to allow for the possibility that the fraction of the estimated savings realized is different for lighting than it is for non-lighting recommendations implemented. There may be enough observations on lighting recommendations implemented and non-lighting recommendations implemented to estimate separate coefficients on their estimated savings. It may be the case that the fraction of estimated savings realized is different for the various recommendations that comprise the non-lighting recommendations implemented. However, there are unlikely to be enough observations on any other type of recommendation implemented to estimate a separate coefficient on its estimated savings. Consequently, the non-lighting recommendations comprised recommendations with respect to the following: air conditioning

systems, boiler systems, building heat, motor systems, pipes, pools, showerheads, spas, and water heaters.

Take Rates

In this study, a take rate is the fraction of recommendations that were implemented. This fraction is calculated in terms of the estimated savings value of the recommendations. Five take rates were estimated. In the cases of electric demand and electric energy, a take rate was estimated for lighting recommendations and a take rate was estimated for non-lighting recommendations. For both lighting and non-lighting measures, separate take rates were calculated for energy and demand; the same set of recommendations implemented account for different fractions of estimated energy savings than of estimated demand savings. In the case of gas, a take rate was estimated only for non-lighting recommendations.

The data necessary to estimate the take rates were obtained from the audit database and the survey data. For each of the five savings categories (electric energy and demand savings from lighting and non-lighting measures, and gas savings from non-lighting measures), a take rate R was estimated as:

$$R = \frac{\sum_{i=1}^{I} \left(\frac{z_{is}}{x_{is}} \bullet x_{iU} \right)}{\sum_{i=1}^{I} x_{iU}},$$

where i indexes survey respondents 1, 2, …, I;

z_{is} = the audit estimate of savings for all of the lighting (non-lighting) recommendations respondent i indicated were *implemented* at any of the participating multifamily properties for which s/he completed a questionnaire;

x_{is} = the audit estimate of savings for the lighting (non-lighting) recommendations with a payback of four years or less *offered* at any of the multifamily properties for which respondent i completed a questionnaire; and

x_{iU} = the audit estimate of savings for the lighting (non-lighting) recommendations with a payback of four years or less *offered* at any of the participating multifamily properties for which respondent i is the *contact*.

The audit estimates of savings are in terms of kW, annual kWh, or annual therms depending on whether the take rate is for electric demand, electric energy, or gas, respectively.

There may be a difference between the two measures of total savings x_{is} and x_{iU}, because not all respondents completed a questionnaire for all of the properties for which they were the contact. The formula above for a take rate assumes that multifamily properties for which a respondent did not complete a questionnaire and properties for which the respondent did complete a questionnaire have the same relationship between the annual savings of recommendations implemented and the annual savings of recommendations offered.

Recall, if a potential respondent was the contact for three or fewer multifamily properties, an attempt was made to have the potential respondent complete the questionnaire for all of the properties for which s/he was the contact. However, such respondents may not have in fact completed the questionnaire for all of the properties attempted; in these cases, $x_{is} < x_{iU}$. A respondent who was the contact for more than three properties will complete the questionnaire for at most three of the properties for which s/he was the contact. In the case of these respondents, the savings total x_{is} for properties covered in the survey is always less than the savings total x_{iU} for all properties for which the respondent is the contact.

Gross Impact Calculation

The gross impact of the Multifamily Property REMS was estimated for electric demand, electric energy, and gas. In the cases of electric demand (kW) and electric energy (kWh), the gross impact was estimated as:

(the audit estimate of savings for all of the lighting recommendations offered with a payback of four years or less)

x

(the estimate of the lighting recommendation implementation realization rate from the electric TSCSREG model β_L^{elec})

x

(the lighting take rate R_L)

+

(the audit estimate of savings for all of the non-lighting recommendations offered with a payback of four years or less)

x

(the estimate of the non-lighting recommendation implementation realization rate from the electric TSCSREG model β_{NL}^{elec})

x

(the non-lighting take rate R_{NL}),

where the audit estimates of savings are in terms of kW or annual kWh and the takes rates are for electric demand or electric energy.

The gross impact for gas (therms) was estimated similarly:

(the audit estimate of savings (annual therms) for all of the non-lighting recommendations offered with a payback of four years or less)

x

(the estimate of the non-lighting recommendation implementation realization rate from the gas TSCSREG model β_{NL}^{gas})

x

(the non-lighting take rate R_{NL}^{gas}).

4.3.5 Net Impact

The final step in evaluating the load impacts of the Multifamily Property REMS was to use self-reported free ridership to estimate the net-to-gross ratio. Applying this factor to the estimated gross impact gives the net impact. It may be the case that only some of the recommendations implemented at a multifamily property were implemented because of PG&E's energy audit of its common areas. That is, some of the recommendations implemented at a multifamily property may have been implemented even if PG&E had not done an energy audit of its common areas. Only energy saving actions taken at a multifamily property that are a consequence of the Multifamily Property REMS should be included in the estimated impact of the program.

Self-Reported Free Ridership

This study's use of survey data to determine self-reported free ridership satisfies the Quality Assurance Guidelines of the Protocols for estimating net-to-gross ratios using participant self reports:

- the respondent was informed,

- more than one question was used to determine free ridership,
- instructions preceded the free ridership questions that attempted to make clear what was being asked, and
- the free ridership questions were measure specific.

The questionnaire (see Appendix D) began with a series of questions to insure the respondent was informed. At a minimum, the respondent had to be knowledgeable about the energy saving actions taken at the multifamily property. Furthermore, in order to be asked the free ridership questions, the respondent had to have recalled the energy audit or the report that followed.

The survey included a series of questions to determine free ridership, that is, the fraction of recommendations that would have been implemented at a multifamily property even if PG&E had not done an energy audit of its common areas. It is well understood that simply asking participants if they would have implemented a recommendation in the absence of a program can lead to an overstatement of free ridership. This is in part because respondents tend to give the "right" or socially desirable response. It is also because respondents tend to base their response on their current experience with the recommendation, rather than on their prior knowledge and understanding. Thus, customers who are satisfied with the recommendation will respond "yes" to indicate they would consider it worth doing without the program, not necessarily to indicate they would have done it without the program. The question sequence and associated classification rules were designed to avoid this type of bias.

The free ridership series of questions were measure specific. They were asked at most twice, once if any lighting recommendations were implemented (LR7-LR11) and once if any non-lighting recommendations were implemented (OR7-OR11).

In addition, the Quality Assurance Guidelines of the Protocols require set up questions for net-to-gross ratios based on self reports. The free ridership questions 7, 8, and 9 may also be viewed as set up questions.

The free ridership questions were:

7. Prior to the energy audit, were you or your organization aware of the likely energy savings for all, for some but not all, or for none of the lighting (non-lighting) recommendations implemented?

8. Prior to the energy audit, were you or your organization aware of the cost of doing all, some but not all, or none of the lighting (non-lighting) recommendations that were implemented?

9. Prior to the energy audit, did you or your organization already have specific plans to do all, some but not all, or none of the lighting (non-lighting) recommendations that were implemented?

10. If the energy audit had not been done, how many of the lighting (non-lighting) recommendations that were implemented, would most likely have been implemented anyway? All, some but not all, something similar but less extensive, or none?

If the response to question 10 was either "some but not all" or "something similar but less extensive," then the respondent was also asked question 11:

11. If the energy audit had not been done, approximately what percentage of the lighting (non-lighting) recommendations that were implemented would have been implemented anyway? Less than 25%, at least 25% but not more than 75%, or more than 75%?

The various response combinations to these questions and the corresponding free ridership and its converse, the fraction of the recommendations implemented that are attributable to the Multifamily Property REMS (a_{ij}), are given in Table 4-4.

Table 4-4. Attributable to the Multifamily Property REMS

Question	Response				
8. Prior to audit, aware of cost? AND	some or all	all	some	all	some
9. Prior to audit, had plans? AND	some or all	all	all	some	some
10. & 11. If no audit, fraction would have done anyway?, p_{ij}	< 1	< or = 1	=1	=1	=1
Free ridership	p_{ij}	p_{ij}	0.5		
Attributable to program, a_{ij}	$1 - p_{ij}$	$1 - p_{ij}$	0.5		

Table 4-4. Attributable to the Multifamily Property REMS Continued

Question	Response		
8. Prior to audit, aware of cost? AND	none	any response	any response
9. Prior to audit, had plans? AND	any response	none	any response
10. & 11. If no audit, fraction would have done anyway?, p_{ij}	< or = 1	< or = 1	=0
Free ridership	0		p_{ij} (= 0)
Attributable to program, a_{ij}	1		1

[a] "Any response" refers to the responses: none, some, all, or don't know.

As Table 4-4 indicates, in the cases of some response combinations to the free ridership series of questions, a respondent's answer to question 11 provided the respondent's free ridership. The three possible responses to question 11, "less than 25%" (1%-24%), "at least 25% but not more than 75%" (50%-75%), and "more than 75%" (76%-99%), corresponded to free ridership equal to 0.13, 0.50, and 0.88, respectively. That is, free ridership was set equal to the midpoint of the range of the response to question 11.

Table 4-4 also indicates, in the cases of most responses to questions 8-11, free ridership was equal to p_{ij}, the fraction the respondent indicated would have been implemented if the audit had been done. Free ridership was not equal to a respondent's answer to this question (p_{ij}) in only two situations:

1. A respondent said that if the audit had not been done, s/he would have implemented all of the recommendations that were implemented anyway (p_{ij} =1), but did not say that prior to the audit, s/he was aware of the cost of all and s/he had plans to do all of the recommendations that were implemented.
2. A respondent said that if the audit had not been done, s/he would have implemented at least some of the recommendations that were implemented anyway ($0 < p_{ij} < 1$), but said that prior to the audit, s/he was aware of the cost of none and/or s/he had plans to do none of the recommendations that were implemented.

It was possible to show in Table 4-4 how only some of the response combinations to the free ridership series of questions that included one or more "don't know" responses were handled. In the cases of all of the other response combinations to these questions that included at least one "don't know" response, free ridership was determined in the manner illustrated by the following example. Suppose a respondent said that prior to the audit, s/he was aware of the cost of some of the recommendations that were implemented (8.) and s/he had plans to do all of the recommendations that were implemented (9.), but s/he didn't know if the audit had not been done, how many of the recommendations that were implemented, would have been implemented anyway (10.). Given this respondent's answers to questions 8 and 9, if this respondent had instead answered question 10, none, some, or all, free ridership would have been 0; 0.13, 0.50, or 0.88; or 0.5, respectively. Consequently, in this case, free ridership was set equal to 0.44, the midpoint of the range of possible free ridership values, 0 to 0.88.

Net-to-Gross Ratios

The net-to-gross ratios calculated by this study satisfy the Protocols for estimating net-to-gross ratios using participant self reports:

- the net-to-gross ratios were savings-weighted and
- separate net-to-gross ratios were estimated for electric demand, electric energy, and gas.

Specifically, in this study, a net-to-gross ratio was the ratio of savings for program-attributable measures to the savings for all implemented recommendations. Five net-to-gross ratios were estimated. In the cases of electric demand and electric energy, a net-to-gross ratio was estimated for lighting recommendations and a net-to-gross ratio was estimated for non-lighting recommendations. In the case of gas, a net-to-gross ratio was estimated only for non-lighting recommendations.

The data necessary to estimate the net-to-gross ratios were obtained from the audit database and the survey data. A net-to-gross ratio ntg was estimated as:

$$ntg = \frac{\sum_{i=1}^{I}\left(\frac{w_{is}}{z_{is}} \bullet z_{iU}\right)}{\sum_{i=1}^{I} z_{iU}},$$

where i indexes survey respondents 1, 2, …, I;

w_{is} = the audit estimate of savings for the lighting (non-lighting) recommendations *implemented* at any of the multifamily properties for which respondent i completed a questionnaire, that are attributable to the Multifamily Property REMS;

z_{is} = (as defined earlier) the audit estimate of savings for the lighting (non-lighting) recommendations *implemented* at any of the multifamily properties for which respondent *i* completed a questionnaire; and

z_{iU} = the audit estimate of savings for the lighting (non-lighting) recommendations *implemented* at any of the multifamily properties for which respondent *i* is the *contact*.

The audit estimates of savings are in terms of kW, annual kWh, or annual therms depending on whether the take rate is for electric demand, electric energy, or gas, respectively.

For each respondent *i* the attributable audit estimate of savings w_{is} were estimated as:

$$w_{is} = \sum_{j}^{s} \left(z_{ij} \bullet a_{ij} \right),$$

where *j* indexes the multifamily properties for which respondent *i* is the contact;

z_{ij} = the audit estimate of savings for the lighting (non-lighting) recommendations respondent *i* indicated were implemented at multifamily property *j*; and

a_{ij} = the fraction of the lighting (non-lighting) recommendations respondent *i* indicated were implemented at multifamily property j, that are attributable to the Multifamily Property REMS. This fraction is determined as outlined in Table 4-4 above.

Recall, not all respondents completed a questionnaire for all of the properties for which they were the contact. If a respondent *i* did not complete a questionnaire for all of the properties for which s/he was the contact for, then it was necessary to estimate z_{iU}:

$$z_{iU} = \frac{z_{is}}{x_{is}} \bullet x_{iU} .$$

The definition of z_{is}, x_{is}, and x_{iU} are all given earlier in the discussion of take rates. Recall from that discussion, multifamily properties for which respondent *i* did not complete a questionnaire and properties for which the respondent did complete a questionnaire are assumed to have the same relationship between the audit estimate of savings for the recommendations implemented and the audit estimate of savings for the recommendations offered.

Net Impact Calculation

The net impact of the Multifamily Property REMS was estimated for electric demand, electric energy, and gas. In the case of electric demand and electric energy, the gross impact was estimated as:

(the gross impact for lighting)

x

(the lighting net-to-gross ratio ntg_L)

+

(the gross impact for non-lighting)

x

(the non-lighting net-to-gross ratio ntg_{NL}),

where the gross impacts and net-to-gross ratios are for electric demand or electric energy.

The net impact for gas was estimated similarly:

(the gross impact for non-lighting)

x

(the non-lighting net-to-gross ratio ntg_{NL}),

where the gross impact and net-to-gross ratio are for gas.

4.4 SURVEY RESPONSE RATE

Completed questionnaires were obtained from 106 of the 285 unique contacts, for a response rate of 37 percent. These 106 unique contacts completed questionnaires for 107 multifamily properties. Consequently, the analysis dataset consisted of data on these 107 properties. The 107 observations obtained in the case of the 1997 Multifamily Property REMS was the result of an attempted census of participants, consistent with Protocol requirements.

The status of all the contacts at the conclusion of the survey is given in Table 4-5.

Table 4-5. Survey Contact Results

Status	Contact Number	Contact Percentage
Completed questionnaire	106	37.19%
Terminated survey before providing any useable data	5	1.75%
Refused to participate	54	18.95%
Informed respondent unable to be identified	37	12.98%
Correct phone number unable to be determined	49	17.19%
Unable to complete contact during study period	34	11.93%
Total	285	100.00%

Each of the thirty-four contacts that could not be reached during the study period was called at least seven times. The result of each of these calls, however, was a busy signal, no answer, a message was left, or the potential respondent asked to be called back.

4.5 GROSS IMPACT RESULTS

4.5.1 Billing Analysis Results

The results of the billing analysis for electric energy and gas are given in Table 4-7 and Table 4-9. The attrition for these two analyses precede their respective results and are reported in Table 4-6 and Table 4-8, respectively.

Table 4-6. Billing Analysis Attrition for Electric Energy

	# Properties
Completed questionnaire	107
No billing data	-14
Multiple weather stations	-4
Problem with billing data	-5
Problem aggregating billing data	-11
Couldn't recall year of an other change	-4
%Change ave y_{jt} between '96 and '98 >= 0.5	-1
< 12 months billing data before audit	-9
< 9 months billing data after audit	-5
Included in billing analysis	54

Table 4-7. Billing Analysis Results for Electric Energy

Independent Variable	Coefficient Estimate	Standard Error	H_0: Coefficient = 0	
			t-Statistic	p-Value
$HDD65_{jt}$	-0.0200	0.0256	-0.78	0.44
$CDD70_{jt}$	0.1548	0.0184	8.39	0.00
$LSAV_{jt}$	-0.0396	0.2066	-0.19	0.85
$NLSAV_{jt}$	-1.1200	2.6972	-0.42	0.68
$OCHNG_{jt}$	0.3201	0.2385	1.34	0.18
R^2	0.9322			
# Observations	1719			

Table 4-8. Billing Analysis Attrition for Gas

	# Properties
Completed questionnaire	107
No billing data	-19
Multiple weather stations	-3
Problem with billing data	-5
Problem aggregating billing data	-9
Couldn't recall year of an other change	-1
%Change ave y_{jt} between '96 and '98 >= 0.5	-1
< 12 months billing data before audit	-8
< 9 months billing data after audit	0
Included in billing analysis	61

Table 4-9. Billing Analysis Results for Gas

Independent Variable	Coefficient Estimate	Standard Error	H_0: Coefficient = 0	
			t-Statistic	p-Value
$HDD65_{jt}$	0.0257	0.0052	4.89	0.00
$CDD70_{jt}$	0.0155	0.0040	3.87	0.00
$NLSAV_{jt}$	0.0317	0.1798	0.18	0.86
$OCHNG_{jt}$	-0.2197	0.8709	-0.25	0.80
R^2	0.7796			
# Observations	1931			

In the cases of both billing analyses, only the estimates of the coefficients on the degree-day variables were significantly different zero at the 10% level or better. In the billing analysis for electric energy, the estimated coefficient on the cooling degree-day variable $CDD70_{jt}$ was significant and had the expected sign. In the billing analysis for gas, the estimated coefficient on both the heating and cooling degree-day variables $HDD65_{jt}$ and $CDD70_{jt}$ were significant and had the expected sign.

$LSAV_{jt}$ and $NLSAV_{jt}$ are the audit estimates of the savings for the lighting and non-lighting recommendations implemented, respectively. In the billing analysis for electric energy, although the estimate of the coefficient on $LSAV_{jt}$ and the estimate of the coefficient on $NLSAV_{jt}$ both had the expected sign, neither was significant. In the billing analysis for gas, the estimate of the coefficient on $NLSAVj_t$ neither had the expected sign or was significant.

Thus, unfortunately, neither the billing analysis for electric energy nor the billing analysis for gas was able to provide a meaningful estimate of an implementation realization rate, that is, a meaningful estimate of a coefficient on an audit estimate of the savings for the recommendations implemented. This result is not surprising given the limited number of properties in the analysis, and the even more limited number where any recommendations were implemented. Further exploration of the reasons the billing analysis was unsuccessful follows.

4.5.2 Interpretation of Billing Analysis Results

If it were possible that the gross impact of the 1997 Multifamily Property REMS is zero, then a coefficient on $LSAV_{jt}$ or $NLSAV_{jt}$ not significantly different from zero could be considered a meaningful estimate of an implementation realization rate. However, it is not possible that the gross impact of the Multifamily Property REMS is zero. The survey data clearly indicate that recommendations were implemented.

It is possible, although unlikely, that the audit estimate of savings employed as predictors in the billing analysis were so poor that the billing analysis was unable to isolate the decrease in consumption caused by the implementation of recommendations. However, as discussed in Section 4.3, the audit estimate of savings was based on detailed site characteristics and calibrated to the premises energy consumption. Moreover, an alternative model specification using only 0/1 dummy variables, rather than audit-estimated savings, to indicate implementation performed no better. Thus, the lack of conclusive findings from the billing analysis should not be interpreted as an indication that the audit savings estimates are unreliable.

Rather, it is more likely the billing analyses were unable to isolate the decrease in consumption caused by the implementation of recommendations because of a combination of other factors. The primary factors are the following.

- Only a small number of properties were able to be included in the analysis (54 for electric, 61 for gas).
- The savings for the recommendations offered at a multifamily property tend to be small relative to the of consumption of the property's common areas, on the order of 6 percent on average.
- Other changes at each premise, including occupancy changes, may mask the effects of measure implementation. Information on such changes was collected on the surveys, and was included in the attempted models. However, with the small numbers of premises included in the analyses, the effects of these widely varying changes could not be estimated with sufficient accuracy to avoid their confounding with the savings effects of interest.

Additional noise in the model was also contributed by unavoidable limitations of the data quality.

- There were some errors in the billing records associated with the participating premises. Cases were found where the different account numbers recorded for a particular premise had different associated weather stations, or had very inconsistent meter reading dates. While such cases were eliminated from the analysis if the anomalous accounts represented a non-negligible fraction of consumption, these findings indicate that there may be other, less obvious, cases where the wrong account numbers were assigned.
- The dates when measures were implemented are likely to have been reported with some error. An attempt was made to circumvent this problem by eliminating from the analysis the three months from the month before through the month following each reported implementation date. Nonetheless, there may still have been observations in the TSCSREG model for which a particular measure was erroneously indicated as having been or not having been implemented at that time.

A sufficiently large analysis data set would have mitigated all of these problems. The analysis data sets used were as large as could be obtained from the 1997 participant population. As it is, the combination of these factors make it difficult for the billing analysis to provide a meaningful

estimate of the implementation realization rate, as evidenced by the poorly determined model coefficients. Given the checks an internal calibration used for the audit estimates of savings, these preliminary savings estimates are used without adjustment for those recommendations that were implemented. Implicitly then, the implementation realization rate is assumed to be one.

4.5.3 Gross Impact Calculation

The gross impact of the 1997 Multifamily Property REMS are the savings realized as a result of program participants implementing the recommendations that were offered. The ex post gross impacts were calculated as outlined in Table 4-10. The standard errors of the take rates were calculated using standard formulas for the standard error of a ratio estimator.

As explained in the discussion of the billing analysis above, the implementation realization rates, the coefficients on β_L and β_{NL}, were assumed to equal one, for both energy and demand.

**Table 4-10. 1997 Multifamily Property REMS Program,
Ex Post Gross Impact Calculation**

	Audit Estimate of Savings	x β_L or β_{NL}	x Take Rate (Standard Error)	= Gross Impact (Standard Error)
Lighting				
kW	1,399	1	0.36214 (0.13097)	507 (183.28)
kWh	5,673,781	1	0.43309 (0.075368)	2,457,258 (427,622)
Non-Lighting				
kW	120	1	0.10940 (0.013534)	13 (2)
kWh	509,249	1	0.46242 (0.04045)	235,487 (20,599)
therms	564,345	1	0.82967 (0.27481)	468,220 (155,088)
Total				
kW	1,519		0.34219 (0.12063)	520 (183)
kWh	6,183,030		0.43551 (0.06924)	2,692,745 (428,117)
therms	564,345		0.82967 (0.27481)	468,220 (155,088)

4.5.4 The Ex Post and The Ex Ante Gross Impacts Compared

The ex ante and ex post gross impact results are compared in Table 4-12. All three gross realization rates, for electric demand (kW), electric energy (kWh), and gas (therms), are between 0.65 and 0.75.

The ex ante estimate of gross savings was not developed from explicit estimates of the gross savings of particular recommendations together with explicit take rates, as were the ex post estimates. Rather, the ex ante estimate used an average overall savings per dwelling unit based on prior evaluation results, consistent with the Protocols. Thus, the only meaningful point of

comparison between the ex ante and ex post estimates is in the overall realization rates shown in Table 4-11, not in any components.

Table 4-11. 1997 Multifamily Property REMS Program, Ex Ante and Ex Post Gross Impact Results

	Ex Ante*	Ex Post		
	Gross Impact	Gross Impact	90% Confidence Interval	Gross Realization Rate
kW	794	520	214 - 826	0.65
kWh	4,386,810	2,692,745	1,982,926 - 3,402,563	0.61
therms	620,775	468,220	207,053 - 729,388	0.75

* The ex ante gross impact estimates are from PG&E program planning documents.

4.6 NET IMPACT RESULTS

The final step in evaluating the load impacts of the Multifamily Property REMS was to use self-reported free ridership to estimate the net-to-gross ratios. In the cases of 51 of the 107 completed questionnaires, at least one recommendation had been implemented at the property and the respondent either recalled the energy audit or the report that followed. The answers to the free ridership series of questions by these 51 respondents are the data on which the estimates of the savings-weighted net-to-gross ratios are based.

Recall, five net-to-gross ratios were estimated: two for lighting, for electric demand and electric energy, and three for non-lighting, for electric demand, electric energy, and gas. For a respondent's data to be included in the calculation of a given net-to-gross ratio, s/he had to have implemented at least one recommendation in the relevant category (lighting or non-lighting) and the recommendation(s) implemented had to affect the relevant measure of consumption (electric demand, electric energy, or gas).

The net-to-gross ratios and the resulting net impacts are reported in Table 4-12. The standard errors of the net-to-gross ratios and the net impacts were calculated using standard formulas for the standard error of a ratio estimator.

The relative standard errors of the five separate net impacts, on which the standard errors of the total net impacts are based, are an approximation. The formula employed to calculate the standard error of each of the five separate net impacts assumes its components, the relative standard error of the take rate and the relative standard error of the net-to-gross ratio, are independent of each other.

$$RSE(N_k) \cong \sqrt{RSE(ntg_k)^2 + RSE(R_k)^2} \ ,$$

where $RSE(N_k)$, $RSE(ntg_k)$, $RSE(R_k)$ are the relative standard errors of the net impact, the net-to-gross ratio, and the take rate, respectively, for k = lighting (non-lighting), kW (kWh, therms).

Table 4-12. 1997 Multifamily Property REMS Program, Ex Post Net Impact Calculation

	Gross Impact (Standard Error)	x Net-to-Gross Ratio (Standard Error)	= Net Impact (Standard Error)
Lighting			
kW	507	0.62752	318
	(183)	(0.16017)	(141)
kWh	2,457,258	0.64654	1,588,715
	(427,622)	(0.13744)	(436,459)
Non-Lighting			
kW	13	0.56513	7
	(2)	(0.044310)	(1)
kWh	235,487	0.52998	124,803
	(20,599)	(0.12895)	(32,269)
therms	468,220	0.89209	417,695
	(155,088)	(0.09018)	(144,652)
Total			
kW	520	0.62595	325
	(183)		(141)
kWh	2,692,745	0.63635	1,713,519
	(428,117)		(437,650)
therms	468,220	0.89209	417,695
	(155088)		(144,652)

4.6.1 The Ex Post and The Ex Ante Net Impacts Compared

The ex post and the ex ante net impact results are compared in Table 4-13. The net realization rate for electric demand (kW) and electric energy (kWh) are less than one, whereas the net realization rate for gas (therms) is greater than one. The net realization rate reflects both the gross realization rate and the net-to-gross ratio. In all three cases, electric demand, electric energy, and therms, the ex post net-to-gross ratio is larger than the ex ante net-to-gross ratio, but it is applied to a smaller gross impact. In the cases of both electric demand and electric energy, the larger ex post net-to-gross ratio offsets the smaller ex post gross impact somewhat, but still results in a net realization rate of less than one. In the case of gas, the larger ex post net-to-gross ratio more than offsets the smaller ex post gross impact, with the result that the net realization rate is larger than one.

Table 4-13. 1997 Multifamily Property REMS Program,
Ex Ante and The Ex Post Net Impact Results

	Gross Impact	Net-To-Gross Ratio	Net Impact	90% Confidence Interval	Net Realization Rate
	EX ANTE*				
kW	794	0.55	437		
kWh	4,386,810	0.55	2,412,746		
therms	620,775	0.55	341,426		
	EX POST				
kW	520	0.63	325	92 - 559	0.75
kWh	2,692,745	0.64	1,713,519	946,318 - 2,480,720	0.71
therms	468,220	0.89	417,695	174,101 - 661,289	1.22

* The ex ante gross impact estimates are from PG&E program planning documents.

4.7 RESULTS PER MULTIFAMILY PROPERTY AND PER DWELLING UNIT

Table 4-14 reports the gross and net impacts per multifamily property and per dwelling unit. Both the ex post and ex ante number of participating multifamily properties was 393; however, the ex post number of dwelling units was slightly higher than the ex ante number of dwelling units, 41,438 and 41,385, respectively.

Both the ex post and ex ante number of properties and number of dwelling units produce an average number of dwelling units of 105. Also in the cases of both the ex post and ex ante properties, the maximum number of dwelling units is 1,249.

Because the numbers of properties and units are nearly the same in the ex post and ex ante counts, the per-property and per-unit realization rates are essentially the same as those shown above for total program savings. For gross savings, the realization rates range from 0.61 for kWh to 0.75 for therms. For net savings, they were 0.71 for kWh and 1.22 for therms. The 90 percent confidence intervals on these realization rates all include one. That is, none of the ex ante estimates would be rejected by the ex post results, at the 10 percent significance level.

Table 4-14. Inputs Per Multifamily Property and Per Dwelling Unit

	Gross Impact		Gross	Net Impact		Net
	Per Property	Per Dwelling Unit	Realization Rate	Per Property	Per Dwelling Unit	Realization Rate
EX ANTE*						
393 properties 41,385 dwelling units						
kW	2	0.02		1	0.01	
kWh	11,162	106.00		6,139	58.30	
therms	1,580	15.00		869	8.25	
EX POST						
393 properties 41,438 dwelling units						
kW	1	0.01	0.65	1	0.01	0.75
kWh	6,852	64.98	0.61	4,360	41.35	0.71
therms	1,191	11.30	0.75	1,063	10.08	1.22

* The ex ante impact estimates are from PG&E program planning documents.

APPENDIX A
PROTOCOL TABLE 6

M&E PROTOCOLS TABLE 6

Residential Energy Management Services Program

Designated Unit of Measurement: Partcipant
ENDUSE: Total Program

1. Average Participant Group and Average Comparison Group		Participant	Comparison								
A. Pre-install usage:	Pre-install kW	na*	na*								
	Pre-install kWh	na*	na*								
	Pre-install Therms	na*	na*								
	Base kW	na*	na*								
	Base kWh	na*	na*								
	Base Therms	na*	na*								
	Base kW/ designated unit of measurement	na*	na*								
	Base kWh/ designated unit of measurement	na*	na*								
	Base Therms/ designated unit of measurement	na*	na*								
B. Impact year usage:	Impact Yr kW	na*	na*								
	Impact Yr kWh	na*	na*								
	Impact Yr Therms	na*	na*								
	Impact Yr kW/designated unit	na*	na*								
	Impact Yr kWh/designated unit	na*	na*	5. A. 90% CONFIDENCE LEVEL				5. B. 80% CONFIDENCE LEVEL			
	Impact Yr Therms/designated unit	na*	na*	LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND
2. Average Net and Gross End Use Load Impacts		AVG GROSS	AVG NET	AVG GROSS	AVG GROSS	AVG NET	AVG NET	AVG GROSS	AVG GROSS	AVG NET	AVG NET
	A. i. Load Impacts - kW	8,051	5,075	-847	16,949	1,473	8,677	1,117	14,985	2,268	7,882
	A. ii. Load Impacts - kWh	44,298,592	27,955,119	-4,837,703	93,434,887	8,084,039	47,826,199	6,005,139	82,592,045	12,468,965	43,441,273
	A. iii. Load Impacts - Therms	na**	1,527,868	na**	na**	363,141	2,692,595	na**	na**	620,160	2,435,576
	B. i. Load Impacts/designated unit - kW	0.053	0.034	-0.006	0.112	0.010	0.058	0.007	0.099	0.015	0.052
	B. ii. Load Impacts/designated unit - kWh	294	185	-32	619	54	317	40	547	83	288
	B. iii. Load Impacts/designated unit - Therms	na**	10.13	na**	na**	2.41	17.85	na**	na**	4.11	16.14
	C. i. a. % change in usage - Part Grp - kW	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
	C. i. b. % change in usage - Part Grp - kWh	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
	C. i. c. % change in usage - Part Grp - Therms	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
	C. ii. a. % change in usage - Comp Grp - kW	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
	C. ii. b. % change in usage - Comp Grp - kWh	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
	C. ii. c. % change in usage - Comp Grp - Therms	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*
D. Realization Rate:	D.A. i. Load Impacts - kW, realization rate	3.55	2.66	-0.37	7.48	0.77	4.55	0.49	6.61	1.19	4.13
	D.A. ii. Load Impacts - kWh, realization rate	3.54	2.65	-0.39	7.46	0.77	4.53	0.48	6.59	1.18	4.12
	D.A. iii. Load Impacts - Therms, realization rate	na**	1.06	na**	na**	0.25	1.86	na**	na**	0.43	1.69
	D.B. i. Load Impacts/designated unit - kW, real rate	3.55	2.66	-0.37	7.48	0.77	4.55	0.49	6.61	1.19	4.13
	D.B. ii. Load Impacts/designated unit - kWh, real rate	3.54	2.65	-0.39	7.46	0.77	4.53	0.48	6.59	1.18	4.12
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na**	1.06	na**	na**	0.25	4.53	na**	na**	0.43	1.69
3. Net-to-Gross Ratios		RATIO		RATIO	RATIO			RATIO	RATIO		
	A. i. Average Load Impacts - kW	0.63		na	na			na	na		
	A. ii. Average Load Impacts - kWh	0.63		na	na			na	na		
	A. iii. Average Load Impacts - Therms	na**		na	na			na	na		
	B. i. Avg Load Impacts/designated unit of measurement - kW	0.63		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	0.63		na	na			na	na		
	B. iii. Avg Load Impacts/designated unit of measurement - Therms	na**		na	na			na	na		
	C. i. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - kW	na*		na*	na*			na*	na*		
	C. ii. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - kWh	na*		na*	na*			na*	na*		
	C. iii. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - Thms	na*		na	na			na	na		
4. Designated Unit Intermediate Data				PART GRP	PART GRP			PART GRP	PART GRP		
	A. Pre-install average value	na*		na*	na*			na	na		
	B. Post-install average value	na*		na*	na*			na	na		
6. Measure Count Data		NUMBER									
	A. Number of measures installed by participants in Part Group	14,245	Dwelling Units								
	B. Number of measures installed by all program participants in the 12 months of the program year	150,862	Dwelling Units								
	C. Number of measures installed by Comp Group	na*									
7. Market Segment Data											
	A. Distribution by CEC climate zone	na									

TABLE 7
SINGLE FAMILY REMS

APPENDIX B
SINGLE FAMILY REMS TABLE 7

A. OVERVIEW INFORMATION

A.1. STUDY TITLE AND STUDY ID NUMBER

Study title*: Impact Evaluation of Pacific Gas and Electric Company's 1997 Single Family REMS*

PG&E Study ID no.: 397

A.2. PROGRAM YEAR AND DESCRIPTION

Program year: 1997

Pacific Gas and Electric's 1997 REMS Program includes two components: Single Family REMS and the Multifamily Property REMS. This documentation refers only to Single Family REMS.

Single Family REMS: The purpose of this component of the REMS program is to provide energy efficiency information to residential customers who live in single family dwellings. The program provides household-specific energy use information for appliances, systems, and building envelope. This program also funds customer representatives who answer residential customers' energy efficiency questions. In 1997, PG&E continued to offer three options for home energy surveys: the onsite checklist, direct mail, and phone surveys.

A.3. END USES COVERED

The program provided energy audits to single-family households covering heating and cooling related issues.

A.4. METHODS AND MODELS USED

A billing analysis was the primary basis of the evaluation. A participant group and a non-participant (comparison) group were employed in the evaluation. Pre- and post-consumption for electricity and gas and demand (for electricity) were estimated for both groups of customers using a time series, cross-section regression (TSCSREG) analysis. To support the billing

analysis, a telephone survey of a sample of program participants and nonparticipants was conducted. Gross impacts were calculated by including only participants in the regression analysis. Net impacts were calculated by including both participants and nonparticipants in the regression analysis.

The model used annual electricity or gas usage as the dependent variable. It tested the correlation with consumption of the following types of independent variables: a participation variable set at one for participants and zero for nonparticipants, heating degree days and cooling degree days, energy usage change variables that could be program related (such as replacing appliances or installing insulation), and household change variables unrelated to the energy audit (such as a change in family size or addition of new rooms).

The model is discussed in detail in section 3.3.3, which includes a description of alternative models tested.

A.5. PARTICIPANT AND COMPARISON GROUP DEFINITION

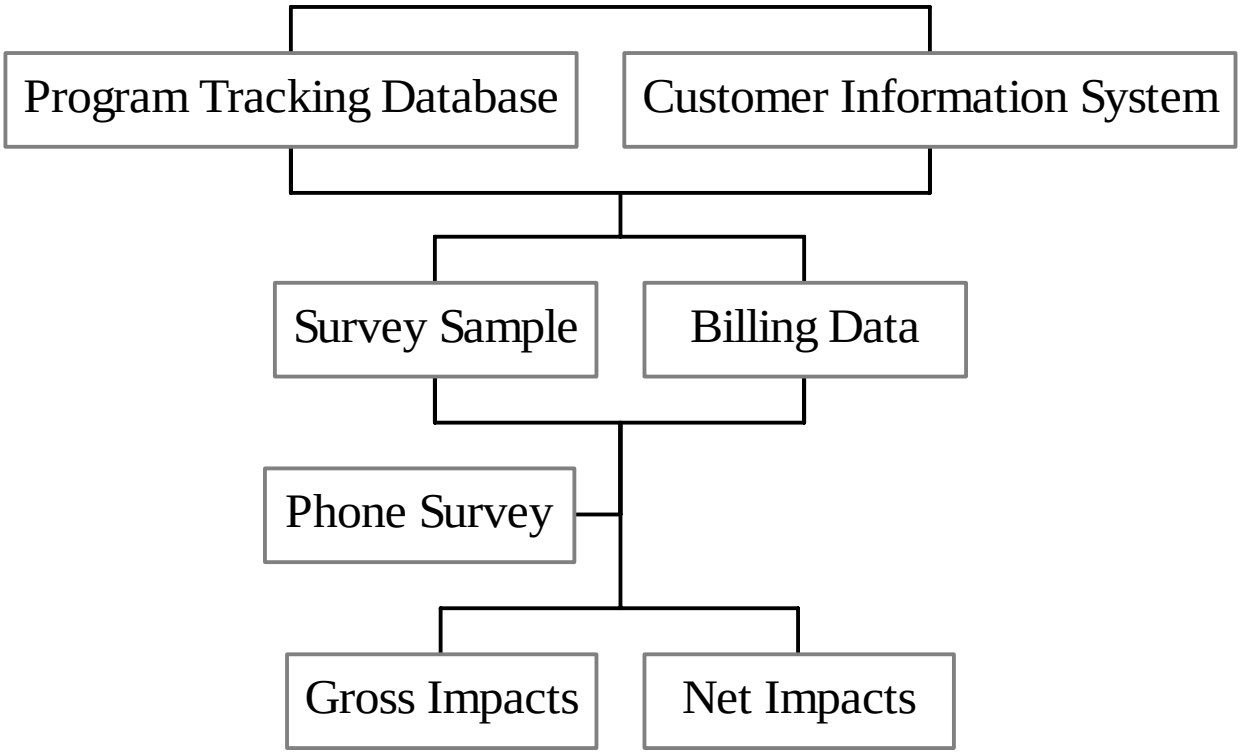
Program participants were defined as customers who had participated in an onsite audit, a direct mail audit, or a phone audit in 1997. The comparison group was defined as residential customers who had never participated in the Single Family REMS.

A.6. ANALYSIS SAMPLE SIZE

Group	Number of Completed Surveys	Percent Of Total Surveys	Number of Participants	Percent Of Total Participants	Weight
Mail Audit participants	602	46%	99,081	91%	164.59
On-Site Audit participants	461	35%	9,048	8%	19.63
Phone Audit participants	239	18%	1,295	1%	5.42
Total Participants	1,302	100%	109,424	100%	
Nonparticipants	610				189.63
Total	1,912				

B. DATABASE MANAGEMENT

B.1. FLOW CHART



B.2. SPECIFIC DATA SOURCES

The data in the impact models came from three sources:

- PG&E customer billing data (electricity and gas usage by month, customer name and phone number [for survey sample])
- Weather data from PG&E's weather stations (temperature data that was used to calculate heating and cooling degree days)
- Customer data from PG&E's program tracking databases (date of audit)
- Customer survey implemented by the evaluators (demographics and action variables). The survey variables are listed in the following table.

Independent Variables Tested

- **Participation and weather**
  - Participant variable
  - Cooling degree days
  - Heating degree days
- **Actions that may be caused by program**

Heat, cooling, water heat
- Electric CAC †
- electric heat †
- Electric water heater †
- Gas CAC †
- Gas heat †
- Gas water heater †
- Window AC †

Appliances
- Large power tools †
- Clothes washer †
- Dehumidifier †
- Dishwasher †
- Electric clothes dryer †
- Electric oven †
- Electric range †
- Freezer †
- Gas clothes dryer †
- Gas oven †
- Gas range †
- Refrigerator †
- Sauna †
- Swimming pool †
- Whole house fan †

Other
- Close room in summer
- Close room in winter
- Have aerators
- Programmable thermostat
- Colder summer temperature
- Colder winter temperature
- Energy saving improvements
- installed a timer on your dehumidifier
- Purchased and used CFLs
- Warmer summer temperature
- Warmer winter temperature
- Air leakages sealed
- Attic insulated
- Weather-stripping and caulking added
- Turned down water heater temperature
- Insulated and sealed ducts
- Insulated floors
- Installed low-flow showerheads
- Installed new windows
- Installed pipe wrap
- Installed storm windows
- Insulated walls
- Installed water heater wrap

Count of actions
- Number of major electric appliances added
- Number of major electric appliances replaced
- Number of major gas appliances added
- Number of major gas appliances replaced

- **Actions that are probably not caused by program**

Other
- Added more living space to home
- Decrease in number of people
- Increase in number of people

- **Conditions (not actions) that are probably not caused by program**

Heat, cool, water heat
- Electric central air conditioning
- Electric heating fuel
- Electric room or window air conditioning
- Electric water heating fuel
- Gas central air
- Natural gas heating fuel
- Natural gas water heating fuel
- Other heating fuel

Appliances (not change; have or do not have)
- Have big tools
- Number of extra major electric appliances
- Number of extra major gas appliances
- Swimming pool
- Whole house fan
- Clothes washer
- Dehumidifier
- Dishwasher
- Electric clothes dryer
- Electric oven
- Electric range
- Freezer
- Gas dryer
- Gas oven
- Gas range
- Refrigerator
- Sauna

Demographics
- Attended at least some college, maybe more
- Estimated income
- Estimated number of people
- Estimated square footage
- Income
- Number people live in home
- Older than 65
- Square feet
- House detached from others
- Place is both home and work

† Each of these appliance change variables was included in three forms: add, remove, and replace.

B.3. DATA ATTRITION

Final Billing Screening Results

	Participant Electricity	Nonparticipant Electricity	Participant Gas	Nonparticipant Gas
Original number of homes subjected to billing screening	**11,050**	**7,000**	**11,050**	**7,000**
Primary screen: 2 or more consecutive months of missing electricity data	-737	-20	0	0
Subjected to other screens	**10,313**	**6,980**	**11,050**	**7,000**
Other Screens †	**Number of homes failing each screen**			
Meter installed after 3/31/96	701	0	1,350	0
Change from 1996 to 1998 is greater than 85% of 1996	447	137	649	170
Read dates are not sequential	237	25	3,922	1,830
Multiple missing consumption	115	76	4,009	1,885
Rate schedule wrong	79	0	34	6
Last reading of previous year did not match first reading of next year	65	2	3,458	1,779
Total consumption is in the 99.5 percentile	52	35	39	27
High variability in monthly readings ‡	27	95	11	46
First monthly reading is not January, February, or March	4	1	3,589	1,774
Missing demographics (name & address)	0	0	23	0
Passed other screens (electricity only)	**8,931**	**6,677**	**8,931**	**6,677**
Eliminate participants from nonparticipant pool		-238		-238
Survey sample	**8,931**	**6,439**	**8,931**	**6,439**

Billing records were examined for participants and nonparticipants prior to selecting the survey sample. The initial sample of billing records included only single-family houses. Households were then screened out if their billing records were incomplete or exhibited unusual patterns. Such records are normally screened out in billing analysis to minimize the likelihood that outliers will significantly alter the results.

The screening criteria for the billing analysis are presented in the previous table. Only those customers passing all the electricity screens were included in the survey sample frame. Many of the electricity screens are related to missing billing data. Since many of the homes in the target population had little or no gas consumption, these screens were not appropriate for the gas data. Additional screening applied after the billing screening included checking nonparticipants against the participant database to eliminate participants from the nonparticipant sample.

After screening the billing data, data from the program tracking databases were matched to the billing records to create the survey sample. The survey sample disposition is presented in the following table.

Survey Sample Disposition

			Participants		
	Overall	Nonparticipants	Mail	Onsite	Phone
Total Sample	**15,360**	**6,439**	**4,501**	**3,311**	**1,109**
Wrong number	907	423	309	139	-36
Untouched sample	1,196	726	470	0	0
Valid cases[1]	**13,257**	**5,290**	**3,722**	**3,172**	**1,073**
Refusal	3,205	1,339	942	672	252
Language barrier	166	97	14	49	6
Terminate	164	47	49	46	22
Remaining cases	**9,722**	**3,807**	**2,717**	**2,405**	**793**
Unused sample[2]	7810	3197	2115	1944	554
Full Completes	1,912	610	602	461	239
Partial Completes (screened out)	568	163	108	254	43
Lived there <3 years	214	24	40	130	20
Place of business	100	39	22	31	8
Did not own (renters)	254	100	46	93	15
Was not a single family home	0	0	0	0	0
Total Completes (full + partial)	**2,480**	**773**	**710**	**715**	**282**
Response rate[3]	19%	15%	19%	23%	26%
Refusal rate	24%	25%	25%	21%	23%

[1] Total sample minus wrong number and untouched sample.

[2] Called at least once before the target number was reached.

[3] Total completes (full + partial) divided by valid sample.

Participants and nonparticipants were screened out at the beginning of the phone survey

- If customers had not lived in their home for at least 3 years.
- If a business, not a home, had been contacted.
- If customers did not own or were not buying the home (were renters).
- If the location was not a single family home (none were screened out on this criterion because the billing data included only homes defined as single family)

B.4. DATA QUALITY

See section 3.3.3 of the report.

B.5. DATA COLLECTED SPECIFICALLY FOR THE ANALYSIS BUT NOT USED

Not applicable.

C. SAMPLING

C.1. SAMPLING PROCEDURES AND PROTOCOLS

The participant sample was stratified by type of participant (mail, phone, on-site) so that results could be calculated for individual program component for program planning purposes. The billing data was weighted to account for the stratified sample. The nonparticipant sample was a random sample of single-family households from PG&E's customer database. Participants in the prior 5 years were culled from the nonparticipant sample.

The table below shows the weights that were applied to participants by audit type in the regression models to arrive at a representative sample of 1997 participants.

Customer Surveys

Group	Number of Completed Surveys	Percent Of Total Surveys	Number of Participants	Percent Of Total Participants	Weight
Mail Audit participants	602	46%	99,081	91%	164.59
On-Site Audit participants	461	35%	9,048	8%	19.63
Phone Audit participants	239	18%	1,295	1%	5.42
Total Participants	1,302	100%	109,424	100%	
Nonparticipants	610				189.63
Total	1,912				

C.2. SURVEY INFORMATION

Survey instruments for the Single Family REMS can be found in Appendix C. Response rates are provided below:

Response Rates to the Evaluation Survey

			Participants		
	Overall	Nonparticipants	Mail	Onsite	Phone
Total Sample	**15,360**	**6,439**	**4,501**	**3,311**	**1,109**
Wrong number	907	423	309	139	-36
Untouched sample	1,196	726	470	0	0
Valid cases[1]	**13,257**	**5,290**	**3,722**	**3,172**	**1,073**
Refusal	3,205	1,339	942	672	252
Language barrier	166	97	14	49	6
Terminate	164	47	49	46	22
Remaining cases	**9,722**	**3,807**	**2,717**	**2,405**	**793**
Unused sample[2]	7810	3197	2115	1944	554
Full Completes	1,912	610	602	461	239
Partial Completes (screened out)	568	163	108	254	43
Lived there <3 years	214	24	40	130	20
Place of business	100	39	22	31	8
Did not own (renters)	254	100	46	93	15
Was not a single family home	0	0	0	0	0
Total Completes (full + partial)	**2,480**	**773**	**710**	**715**	**282**
Response rate[3]	19%	15%	19%	23%	26%
Refusal rate	24%	25%	25%	21%	23%

[1] Total sample minus wrong number and untouched sample.

[2] Called at least once before the target number was reached.

[3] Total completes (full + partial) divided by valid sample.

C.3. STATISTICAL DESCRIPTIONS

Jeff, Here, they want for the key variables, descriptive statistics for both participants and comparison group.

Electricity Model Descriptive Statistics for Nonparticipants

Action	N	% Yes	Std. Dev	Minimum	Maximum
Replaced Electric CAC	610	1.0%	0.10	0	1
Replaced Electric range	610	1.0%	0.10	0	1
Replaced Gas oven	610	1.8%	0.13	0	1
Number of major gas appliances added	610	0.7%	0.08	0	1
Removed electric heat	610	0.2%	0.04	0	1
Replaced electric heat	610	0.2%	0.04	0	1
Removed Electric water heater	610	0.2%	0.04	0	1

Gas Model Descriptive Statistics for Nonparticipants

Action	N	% Yes	Std. Dev	Minimum	Maximum
Replaced Electric CAC	610	1.0%	0.10	0	1
Replaced Electric range	610	1.0%	0.10	0	1
Replaced Gas oven	610	1.8%	0.13	0	1
Number of major gas appliances added	610	0.7%	0.08	0	1
Removed electric heat	610	0.2%	0.04	0	1
Replaced electric heat	610	0.2%	0.04	0	1
Removed Electric water heater	610	0.2%	0.04	0	1

Average Energy Use by Year

	Electricity (kWh/Day)			Gas (Therms/Day)		
	1996	1998	% change	1996	1998	% change
Participant	33.9	34.1	0.5%	1.2	1.3	15.5%
Nonparticipant	21.1	21.9	3.9%	1.2	1.4	17.9%
Total	27.3	27.8	1.8%	1.2	1.4	16.8%

(Average use per day over January to September, 1996 and 1998)

D. DATA SCREENING AND ANALYSIS

See B.3. above and section 3.3.3 of the report for treatment of outliers, background variables, screening data, and specification.

See section 3.4 of the report for regression statistics.

E. DATA INTERPRETATION AND APPLICATION

See sections 3.3.3, 3.4, and 3.5 of the report.

TABLE 7
MULTIFAMILY PROPERTY REMS

Protocol Table 7 – All End Uses Combined (Total Program)

1997 Residential EMS Program Evaluation of All End Uses Combined (Total Program)

PG&E Study ID 397

The purpose of this section is to provide the documentation for data quality and processing as required in Table 7 of the California Public Utility Commission (CPUC) Evaluation and Measurement Protocols (the Protocols). Major topics are organized and presented in the same order as they are listed in Table 7 for ease of reference and review. When responses to the items are discussed in detail elsewhere in the report, only a brief summary will be given in this section to avoid redundancy.

A. Overview Information

0 Study Title and Study ID Number

Study Title: Impact Evaluation of Pacific Gas & Electric Company's 1997 Residential Energy Management Services Program

Study ID Number: 397

1 Program, Program Year and Program Description

Program: Residential Energy Management Services

Program Year: 1997

Program Description: Through the Multifamily Property Residential Energy Management Services Program, audits were performed on common areas of multifamily properties. The efficiencies of boilers (water and space heating), lighting and lighting controls, thermal envelopes, pools and spas, HVAC equipment, and motors were evaluated for each multifamily property. Eligible properties contained five or more dwelling units, and included apartments, condominiums, and mobile home parks (master or individually metered).

2 End Uses and/or Measures Covered

End Use Covered: All end uses combined (total program).

Measures Covered: Any change in behavior that affects energy use or investment in equipment or measures that affect energy use.

3 Methods and Models Use

To evaluate the load impacts of the 1997 Multifamily Property REMS, the following steps were taken.

1. A telephone survey targeted to a census of all program participants collected data on recommendations implemented and the self-reported extent to which the implementation was attributable to PG&E's energy audit.

2. A billing analysis using participants only was conducted in an attempt to estimate the "implementation realization rate," that is, the ratio of achieved savings to the audit program's estimated savings for those recommendations reported to have been implemented. The billing analysis conducted meets the Protocols for the estimation of gross impacts; however, the analysis was unable to provide a meaningful estimate of the implementation realization rate. Consequently, the calibrated savings estimates from the audit program itself were assumed to be the best estimates available of the gross effect of each implemented measure.

3. Survey data were analyzed to determine the savings-weighted "take rate," that is, the ratio of implemented recommendations to all audit recommendations.

4. Survey data were also analyzed to determine the savings-weighted net-to-gross ratio.

The audit estimates of savings (in terms of kW, kWh, or therms) for all audit recommendations together with the take rate provided the gross impact estimate. Applying the net-to-gross ratio to the gross impact yielded the net impact. Net impacts were estimated for electric demand (kW), electric energy (kWh), and gas (therms).

The primary data sources for the analysis of the Multifamily Property REMS were:

- the Multifamily Property REMS energy audit database (hereafter, audit database),
- participant billing data,
- weather data, and
- a telephone survey of participants designed and conducted for this study.

The billing analysis utilized all of these data sources. Both the take rate and net-to-gross analyses employed the audit database and the survey data.

4 Participant and Comparison Group Definition

A participant was any premise participating during program year 1997.

No comparison group was used.

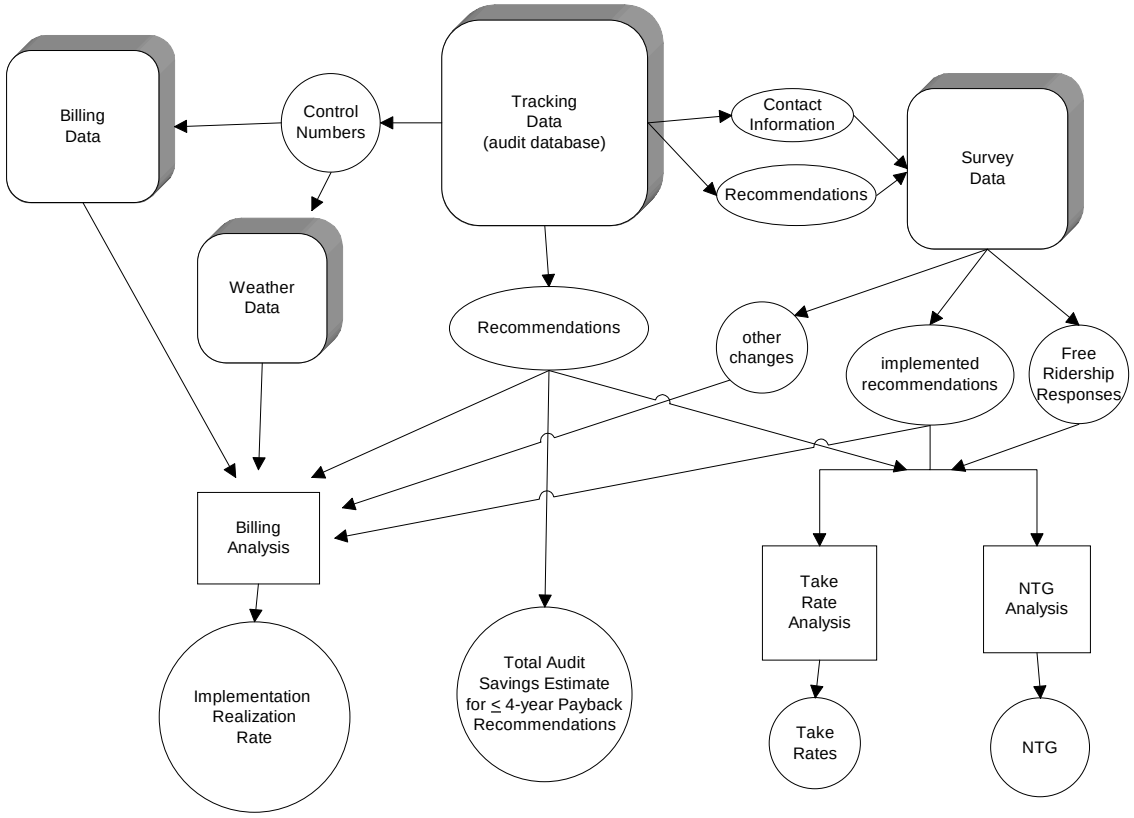
5 Analysis Sample Size

Table B-1. Properties in Population, Sample Frame Analysis Data

	Number of Premises
Population=Frame	393
Targeted for surveys	331
Analysis data set (completed surveys)	107
Electricity billing analysis	54
Gas billing analysis	61
Take Rate analyses	107
Net-to-gross analyses	51

A. Database Management

6 Data Description and Flow Chart



7 Data Description and Flow Chart

Data sets:

mfda_dat.mdb: 1997 Multifamily Property REMS Energy Audit Database.

mudele98.sd2, mudgas98.sd2 Electric and gas billing data, respectively.

weather.sd2: Weather data.

X144send.sd2: Survey data.

SAS Programs:

trackprep0: Miscellaneous data preparation of the four files generated from the audit database that are used in the analysis. Input data sets: cuaucor, nounits, alllask, alloask. Output data sets: cuaucorp, nounitsp, alllaskp, alloaskp.

Srvyprep0: Miscellaneous data preparation of the survey data. Input data sets: x144send, preopen. Output data set: srvydatp. Note: With respect to preopen, this code only does a PROC CONTENTS on this data set. Preopen is a preliminary data set containing the responses to the open survey questions. x144send contains the final data for these responses.

Srvyrslts1: Examines the survey data on

- recommendations that were not specifically asked about, but have been implemented, entirely or in part, and
- non-recommended lighting system or non-lighting system changes.

Input data sets: srvydatp, preopen (for purposes of this code, these preliminary data were identical to the final data).

Srvyprep1: Creates two data sets and revises one data set based on srvyrslts1. Input data sets: preopen (for purposes of this code, these preliminary data were identical to the final data), srvydatp. Output data sets:

- lrec5dn and orec5dn contain the necessary survey data for lighting and non-lighting recommendations, respectively, that were not specifically asked about, but have been implemented, entirely or in part; and
- srvydat1.

Recdat2: Attaches the recommendation data from the survey to the recommendation data in the allask files generated from the audit database. Input data sets: srvydat1, alllaskp, alloaskp. Output data sets: lrecdat, orecdat.

Trackrslts1: Generates the results that can be calculated from the files generated from the audit database alone. Input data sets: nounitsp, nounits, alllaskp, alloaskp.

Srvyplus1: Generates the results that can be calculated from the survey data and files generated from the audit database. Input files: srvydat1, nounitsp, cuaucorp.

Takerates2: Calculates the take rates and their standard error. Input data sets: lrecdat, orecdat, lrec5dn, orec5dn, cuaucorp.

Netogross3: Calculates the net-to-gross ratios and their standard error. Input data sets: srvydat1, data sets created by takerates2.

Billprep0: This code is run twice, once for the electric energy billing data and once for the gas billing data

- Miscellaneous data preparation of the billing data.
- Obtains the subset of the billing data for which there is a completed questionnaire.
- Attaches the weather station to the billing data.

Input data sets: mudele98 or mudgas98, srvydat1, muddem98, weathmap. Output data sets: ele1wea or gas1wea, elemtwea or gasmtwea.

Agmfmeters: This code is run twice, once for the electric energy billing data and once for the gas billing data.

- Flags billing data that contain errors.
- Keeps only the billing data for there are weather data.
- If possible, aggregates the multiple meters at a premise. If not possible, outputs all of the meters at a premise to an excel file.

Input data set: ele1wea or gas1wea. Output data sets: eleonem, eleagg3, eleflags.xls, and elebhand.xls, or gasonem, gasagg3, gasflags.xls, and gasbhand.xls.

Sav0: This code is run twice, once for electric energy and once for gas. It creates the independent variables $lsav_{jt}$ and $nlsav_{jt}$ employed in the billing analysis. Input data sets: nounitsp, cuaucorp, eleonem and eleagg3 or gasonem and gasagg3, lrecdnz (created by takerates2), orecdnz (created by takerates2). Output data sets: eleoblsv and eleobosv or gasobosv.

Ochng0: Creates the independent variable $ochng_{jt}$ employed in the billing analysis. Input data sets: srvydat1, orecdat. Output data set: eleobso, gasobso.

Bavars: This code is run twice, once for electric energy and once for gas.

- Creates the dependent variable employed in the billing analysis.

- Deletes premises for which the change in the average of the dependent variable between 1996 and 1998 is greater than 50%.

- Creates the heating and cooling degree-days independent variables employed in the billing analysis.

- Creates the time series dummy variables employed in the billing analysis.

- Merges all of the variables employed in the billing analysis into a single data set.

- Obtains the subset of data available to estimate the billing analysis pooled time-series/cross sectional models that satisfies the Protocols billing data requirements.

Input data sets: eleonem and eleagg3 or gasonem and gasagg3, cuaucorp, nounits, weather, eleoblsv and eleobosv or gasobosv, eleobso or gasobso. Output data set: eletsxs or gastsxs.

Tsxs: This code is run twice, once for electric energy and once for gas. Estimates the billing analysis pooled time-series/cross sectional models. Input data set: eletsxs or gastsxs.

8 Data Attrition Process

Table B-2. Billing Analysis Attrition for Electric Energy

	# Properties
Completed questionnaire	107
No billing data	-14
Multiple weather stations	-4
Problem with billing data	-5
Problem aggregating billing data	-11
Couldn't recall year of an other change	-4
%Change ave y_{jt} between '96 and '98 >= 0.5	-1
< 12 months billing data before audit	-9
< 9 months billing data after audit	-5
Included in billing analysis	54

Table B-3. Billing Analysis Attrition for Gas

	# Properties
Completed questionnaire	107
No billing data	-19
Multiple weather stations	-3
Problem with billing data	-5
Problem aggregating billing data	-9
Couldn't recall year of an other change	-1
%Change ave y_{jt} between '96 and '98 >= 0.5	-1
< 12 months billing data before audit	-8
< 9 months billing data after audit	0
Included in billing analysis	61

9 Internal Data Quality Procedures

The audit database provided: a unique premise identification number, control numbers for the electric and gas meters at the premises, and customer contact information. Consequently, the audit database, the billing data, and the survey data are all linked via the unique premise identification numbers.

The appropriate weather data for a premise was determined by the weather station identification number (id) embedded in its meter account number(s). The meter account numbers for the meter control numbers were identified via the file muddem98.sd2.

Premises for which there were discrepancies in weather station id among different accounts recorded for the premise were deleted from the analysis.

The billing data were reviewed for errors. If the billing data for the meters at a premise that were identified as having errors accounted for more than five percent of the most recent total annual consumption at that premise, the premise was not included in the analysis. If the billing data for these meters accounted for five percent or less, then only the billing data for the meters at the premise that were identified as having no errors were included in the billing analysis.

If there was a problem aggregating the billing data for multiple meters at a premise, the premise was not included in the analysis.

10 Unused Data Elements

None

A. Sampling

11 Sampling Procedures and Protocols

For the surveys, a census of contacts for all participating premises was attempted. For any contact who represented three or fewer participating properties, an attempt was made to collect information on all of those properties.

Nine potential respondents were the contact for more than three participating multifamily properties. An attempt was made to have these potential respondents complete the questionnaire for three of the properties for which s/he was the contact. Although it was thought unlikely a respondent would complete the questionnaire for as many as three (even two) properties, the attempt was made. That is, a sample of even three properties was thought to be ambitious.

If a potential respondent was the contact for participating multifamily properties with substantially different numbers of dwelling units, the properties with the largest number of dwelling units tended to be selected to be in the sample. A large property is likely to have a wider variety of recommendations and, therefore, is more likely to provide data that informs the analysis beyond that property alone. The take rate and net-to-gross analyses assume that what is learned about the properties for which a respondent completes a questionnaire can also be applied to the properties for which the respondent does not complete a questionnaire. Selecting the largest properties to be in the sample amounts to stratifying on the variable of interest.

If a potential respondent was the contact for participating multifamily properties with similar numbers of dwelling units, a simple random sample of properties was selected. A simple random sample is also consistent with the Protocols. Table 4-2 reports the number of properties in the population, in the sample frame, and in different components of the analysis data set.

12 Survey Information

Survey instruments are in Appendix D. Survey dispositions are shown below.

Table B-4. Survey Contact Results

Status	Contact Number	Contact Percentage
Completed questionnaire	106	37.19%
Terminated survey before providing any useable data	5	1.75%
Refused to participate	54	18.95%
Informed respondent unable to be identified	37	12.98%
Correct phone number unable to be determined	49	17.19%
Unable to complete contact during study period	34	11.93%
Total	285	100.00%

13 Statistical Descriptions

Table B-5. Descriptive Statistics

Mean consumption kWh/unit-day	4.922
Mean consumption therms/unit-day	0.654
Mean lighting kWh savings	
with lighting recommendations only	0.412
all premises in model	0.038
Mean nonlighting kWh savings	
with nonlighting recommendations onl	0.039
all premises in model	0.001
Mean gas nonlighting therms savings	
with nonlighting recommendations onl	0.178
all premises in model	0.011

A. Data Screening and Analysis

14 Missing Data

Billing analysis was based on meter reading periods bounded by actual, not estimated, reads.

Normalization eliminated the potential for extreme outliers in the billing analysis.

Weather normalization in the billing analysis was accomplished by inclusion of heating and cooling degree-days per billing period as explanatory variables in the time series cross-sectional model.

15 Background Variables

Use of a participant-only group in the regression allowed non-implementing participants to account for changes unrelated to recommendations implemented.

16 Data Screen Process

See A.2 above.

17 Model Statistics

Table B-6. Billing Analysis Results for Electric Energy

Independent Variable	Coefficient Estimate	Standard Error	H_0: Coefficient = 0	
			t-Statistic	p-Value
$HDD65_{jt}$	-0.0200	0.0256	-0.78	0.44
$CDD70_{jt}$	0.1548	0.0184	8.39	0.00
$LSAV_{jt}$	-0.0396	0.2066	-0.19	0.85
$NLSAV_{jt}$	-1.1200	2.6972	-0.42	0.68
$OCHNG_{jt}$	0.3201	0.2385	1.34	0.18
R^2	0.9322			
# Observations	1719			

Table B-7. Billing Analysis Results for Gas

Independent Variable	Coefficient Estimate	Standard Error	H_0: Coefficient = 0	
			t-Statistic	p-Value
$HDD65_{jt}$	0.0257	0.0052	4.89	0.00
$CDD70_{jt}$	0.0155	0.0040	3.87	0.00
$NLSAV_{jt}$	0.0317	0.1798	0.18	0.86
$OCHNG_{jt}$	-0.2197	0.8709	-0.25	0.80
R^2	0.7796			
# Observations	1931			

18 Model Specification

The billing analysis model specification and rationale are described in Section 4.3.2. Reasons for the failure of the model to provide meaningful estimates of the implementation realization rate are discussed at the end of Section 4.5.1.

Heterogeneity: Heterogeneity was controlled for by normalizing by the number of units in the premise and by including fixed effects for each premise.

Factors affecting consumption over time: Heating and cooling degree-days per day are included as explanatory variables. Fixed effects for each time period help control for exogenous factors varying over time. Other changes at each premise were reported on the survey and included as explanatory variables in the model.

Self Selection: Self-selection effects were minimized by using a participant-only model, which estimated the effects of recommendation implementation.

Omitted Factors: not applicable

Interpretation as net impacts: not applicable.

19 Measurement Errors

To limit the effects of implementation dates reported with errors, the months corresponding to the reported implementation dates for a particular premise were omitted from the analysis, as well as the month immediately before and after these months.

20 Autocorrelation

Effects of autocorrelation were limited by including fixed effects for each premise and for each time period in the model.

21 Heteroscedasticity

Heteroscedasticity was mitigated by normalizing both the dependent consumption variable and the savings predictor variables by the number of units at the premise, and converting to a per-day basis.

22 Collinearity

Collinearity is not a problem.

23 Influential Data Points

The potential for high influence points was mitigated by the normalization by the number of units.

24 Missing Data

See A.0 above.

25 Precision

The standard errors of the take rate and net-to-gross ratios were calculated using standard statistical formulas for the standard error of a ratio estimator.

The standard error of the sum of two or more savings components was calculated as the square root of the sum of the squared component standard errors.

The relative standard error of net savings was calculated as

$$RSE(N_k) \cong \sqrt{RSE(ntg_k)^2 + RSE(R_k)^2} \ ,$$

where $RSE(N_k)$, $RSE(ntg_k)$, $RSE(R_k)$ are the relative standard errors of the net impact, the net-to-gross ratio, and the take rate, respectively, for k = lighting (non-lighting), kW (kWh, therms).

0 Engineering Analyses

The audit savings estimates, which were based on a calibration of total estimated premise consumption to the customer's bills, were used as the gross savings for each implemented recommendation.

1 Self-reported net-to-gross ratio

The respondent was informed.

More than one question was used to determine free ridership.

Instructions preceded the free ridership questions that attempted to make clear what was being asked.

The free ridership questions were measure specific.

A. Data Interpretation and Application

Gross savings were calculated as

(audit estimate of savings for all recommendations with less than or equal to 4-year payback)

x

(take rate),

where the take rate is the ratio of audit-estimated savings for all implemented recommendations to the savings for all recommendations with less than or equal to 4-year payback, calculated from the survey respondents.

Net savings were calculated as

(gross savings)

x

(net-to-gross ratio),

where the net-to-gross ratio is calculated from the survey respondents as the ratio of total program-attributable savings to total savings, where both totals are over all implemented measures.

This procedure starts from the known savings estimate from the audit database and applies a series of adjustment factors. The adjustment factors are based on the survey responses. The chain of adjustments is internally consistent:

Audit estimate of ≤ 4-year payback savings recommended

x

(Savings implemented)/(≤ 4-year payback savings recommended)

x

(Savings attributable to program)/(savings implemented)

Thus, chaining together the take rate and net-to-gross factors provides an overall adjustment factor to translate the sum of audit savings estimates for recommendations with a 4-year payback or less into the total savings attributable to the program.

APPENDIX C
SINGLE FAMILY SURVEY

INTRODUCTION

Hello, this is _____, calling from _____. May I speak with (CONTACT NAME)? (IF THIS PERSON IS AVAILABLE, PROCEED. IF NOT, READ:) May I speak to the person who is the most familiar with energy use in your household. IF THIS PERSON IS NOT AVAILABLE, GET HIS/HER NAME AND MAKE ARRANGEMENTS FOR CALL BACK. IF ASKED WHO IS SPONSORING THE SURVEY, REPLY, "PG&E."

WHEN CONTACT IS ON PHONE, READ: Before we get started, I just want to let you know this is not a sales call. We're conducting research to help PG&E improve its programs and services and help its customers save energy in their homes. PG&E is required by law to conduct this type of research. Your responses will be kept entirely confidential.

READ IF NECESSARY. To verify purpose of the study, respondents can call the PG&E Smarter Energy Line (800) 933-9555.

SC. SCREENER

First, I have a few questions to ensure that we are talking to a representative group of PG&E's customers.

SC1. How long have you lived at this address _____ (years)
-7 Place of business (not residence)
-8 Do not know
-9 Refused
[IF LESS THAN 3 YEARS, PLACE OF BUSINESS, REFUSED - THANK AND TERMINATE.]

SC1a. [IF –8 Do not know, READ LIST] Has it been ..?

Less than one year	1 THANK/TERMINATE
One to two years	2 THANK/TERMINATE
Two to three years	3 THANK/TERMINATE
Three to five years	4
Five to ten years	5
More than ten years	6
Do not know	-8

SC2. Is this address your home, a place of business, or both?

- Home 1
- Place of business (THANK AND TERMINATE) 2
- Both 3

SC3. What kind of home do you live in? Is it a ...[READ LIST]

- Single-family house detached from any others 1
- Single-family house attached to one or more other homes 2
- Building for two to four families 3
- Building for five or more families 4
- Mobile home 5
- Other (Specify) _____ 6
- Do not know ..... -8
- Refused ..... -9

[IF NOT 1 OR 2, THANK AND TERMINATE]

SC4. Do you own or rent this residence?

- Own or buying 1
- Rent or lease 2
- Other (specify) _____ 3
- Refused ..... -9

[IF NOT OWN/BUYING, THANK AND TERMINATE]

OK. Now I have a few questions about the energy-using equipment and appliances in your home.

CENTRAL HEATING

CH1 What is your main heating fuel? If GAS, PROBE: Is that natural gas from a utility or bottled gas such as propane or LPG? ACCEPT ONLY ONE RESPONSE.

Natural gas	1
Electric	2
Propane, LPG, or bottled gas	3
Wood, kerosene, or coal	4
Solar	5
None	6 (SKIP TO AC1)
Other (SPECIFY) _____	7
Do not know	-8 (SKIP TO AC1)

CH2 Have you removed, replaced or added a new heating system in the past 3 years?

Removed	1
Replaced	2
Added	3
No change	4 (SKIP TO AC1)
Do not know	-8 (SKIP TO AC1)

CH3 When? CH3A _____ Month/season CH3B_____ Year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

CH4 (IF REMOVED OR REPLACED) Was the old system fueled by (READ FUEL TYPE IN CH1)?

Yes	1 (SKIP NEXT QUESTION)
No	2
Do not know	-8 (SKIP NEXT QUESTION)

CH5 (IF CHANGED FUEL) What fuel did the old system use?

Natural gas	1
Electric	2
Propane, LPG, or bottled gas	3
Wood, kerosene, or coal	4
Solar	5
Other (SPECIFY) _____	7
Do not know	-8

CH6 (IF REPLACED OR ADDED) Did you purchase a high efficiency central heating system or a standard efficiency central heating system?

High efficiency 1
Standard efficiency 2
Do not know ..... -8

CENTRAL AIR CONDITIONING

AC1 What type of air conditioning do you have in your home? Anything else? CHECK ALL THAT APPLY

Electric fans ..... 1 (SKIP TO WH1 IF NOTHING ELSE)
Electric central air conditioning 2
Electric room or window air conditioning 3
Central evaporative cooler 4
Window or wall evaporative cooler 5
Heat pump 6
Gas central air conditioning 7
Other (SPECIFY) _____ 8
Do not know ..... -8 (SKIP TO WH1)

AC2 Have you removed, replaced or added any air conditioning equipment in the past 3 years?

Removed 1
Replaced 2
Added 3
No change ..... 4 (SKIP TO WH1)
Do not know ..... -8 (SKIP TO WH1)

AC3 When? _____ Month/season _____ Year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

Removed go to WH1
Replaced go to AC5-AC6

AC4 (IF ADDED) Did you have any air conditioning equipment before this?
Yes ..... 1 (SKIP TO AC5)
No ..... 2 (SKIP TO AC6)
Do not know ..... -8 (SKIP TO AC6)

AC5 What type of air conditioning equipment did you have before? Anything else? CHECK ALL THAT APPLY

Electric fans 1
Electric central air conditioning 2
Electric room or window air conditioning 3
Central evaporative cooler 4
Window or wall evaporative cooler 5
Heat pump 6
Gas central air conditioning 7
Other (SPECIFY) _____ 8
Do not know ..... -8

AC6 (IF REPLACED OR ADDED CENTRAL AIR CONDITIONER OR HEAT PUMP) Did you purchase a high efficiency (CENTRAL AIR CONDITIONER/HEAT PUMP) or a standard efficiency (CENTRAL AIR CONDITIONER/HEAT PUMP)?

High efficiency 1
Standard efficiency 2
Do not know ..... -8

WATER HEATING

WH1 What is your water heating fuel? ACCEPT ONLY ONE RESPONSE.

Natural gas 1
Electricity 2
Propane, LPG, or bottled gas 3
Wood, kerosene, or coal 4
Solar 5
Other (SPECIFY) _____ 6
Do not know ..... -8 (SKIP TO OTH1)

WH2 Have you removed, replaced or added a new water heater in the past 3 years?

Removed 1
Replaced 2
Added 3
No change ..... 4 (SKIP TO OTH1)
Do not know ..... -8 (SKIP TO OTH1)

WH3 When? _____ Month/season _____ Year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

WH4 (IF REMOVED OR REPLACED) Was the old system fueled by (READ FUEL TYPE IN WH1)?

Yes ..... 1 (SKIP TO OTH1)
No 2
Do not know ..... -8 (SKIP TO OTH1)

WH5 What fuel did the old system use?

Natural gas 1
Electric 2
Propane, LPG, or bottled gas 3
Wood, kerosene, or coal 4
Solar 5
Other (SPECIFY) _____ 6
Do not know ..... -8

OTHER APPLIANCES

[See table at end of this section for response categories.]

OTH1 Which of the following other major energy-using equipment do you currently have installed in your home: CHECK ALL THAT APPLY

A Refrigerator
(a1 How many? _____)
B Stand-alone freezer
(b1 How many? _____)
C Clothes washer
D Clothes dryer
(D1 Is this a gas or electric dryer? 1 Gas 2 Elec 3 Other -8 Do not know)
E Dishwasher
F Dehumidifier
G Whole-house fan
H Sauna or spa
I Swimming pool
J Electric range (IF YES SKIP K)
K Gas range
L Electric oven (IF YES SKIP M)
M Gas oven

N Large power tools such as a table saw

OTH2 In the past 3 years, have you removed, replaced or added any of these?
PROVIDE LIST FROM OTH1 IF NECESSARY
Yes.....1
No .....2 (SKIP TO EEM1)
Do not know .....-8 (SKIP TO EEM1)

OTH3 Which equipment did you remove? Replace? Add?

OTH4 When did you remove/replace/add this equipment?
RECORD MONTH/SEASON AND YEAR IN APPROPRIATE CELL BELOW
(Note to interviewers:
"Removed" = took out an appliance without replacing it.
"Replaced" = put a new one in and removed the old.
"Added" = put a new one in where none existed or in addition to an existing one.
For example, if they replaced an old refrigerator with a new one, enter the date in the "Replaced" column. If they removed an electric range and replaced it with a gas one, enter the removal date in the "Removed" column for the electric range and enter the installation date (perhaps the same) in the "Added" column for the gas range.

OTH5 Did you replace or add a high efficiency ____ or a standard efficiency ____?
ASK FOR ALL ITEMS MARKED "ASK" IN TABLE BELOW?

1 High efficiency
2 Standard efficiency
-8 Do not know

Other Appliances

		Removed	Replaced	Added	**ASK** Energy Efficiency Measure?
		(Month/Year)	(Month/Year)	(Month/Year)	(1, 2, -8)
A	Refrigerator				Y
B	Stand-alone freezer				
C	Clothes washer				Y
De	Electric clothes dryer				
Dg	Gas Clothes dryer				Y
E	Dishwasher				Y
F	Dehumidifier				Y
G	Whole-house fan				
H	Sauna or spa				
I	Swimming pool				
J	Electric range				
K	Gas range				
L	Electric oven				
M	Gas oven				
N	Large power tools				

ENERGY EFFICIENCY MEASURES

Now I'd like to ask about a few energy efficiency measures.

Water Heater Measures

EEM1. Over the past 3 years, have you installed an insulating blanket on your hot water heater tank, insulated your water heater pipes, installed low-flow showerheads and faucet aerators, or turned-down the temperature on your hot water heater?

1 Yes
2 No [SKIP TO EEM4]
-8 Do not know [SKIP TO EEM4]

EEM2. [IF YES] Which?

a. Water heater wrap
b. Pipe wrap
c. Low flow showerheads
d. Faucet aerators
e. Turned down water heater temperature

EEM3. Can you tell me approximately when you:
READ AND RECORD MONTH/SEASON AND YEAR AS APPROPRIATE FOR EACH MEASURE [13=Spring, 14=Summer, 15=Fall, 16=Winter]
a. Insulated your water heater tank?
b. Insulated your water heater pipes?
c. Installed low-flow showerheads?
d. Installed faucet aerators?
e. Turned-down the water heater temperature?

Weatherization & CFLs

EEM4. In the past 3 years, have you applied weatherstripping or caulking on any doors or windows, had any other air leakages sealed up, or had your ducts insulated and sealed?
1 Yes
2 No [SKIP TO EEM7]
-8 Do not know [SKIP TO EEM7]

EEM5. [If Yes] Which?
a. Weatherstripping/caulking
b. Air leakages sealed
c. Ducts insulated and sealed

EEM6. Can you tell me approximately when you:
READ AND RECORD MONTH/SEASON AND YEAR AS APPROPRIATE FOR EACH MEASURE [13=Spring, 14=Summer, 15=Fall, 16=Winter]
a. Applied weatherstripping or caulking to your doors and windows?
b. Sealed up other air leakages in your home?
c. Insulated and sealed up your ducts?

EEM7. Again, over the past three years, have you:
1 Yes, 2 No, -8 Do not know
a. Insulated your attic, walls or floors?
b. Installed new windows or storm windows?
c. Installed and used a programmable thermostat
d. Installed a whole-house fan
e. Installed a timer on your dehumidifier
f. Purchased and used compact fluorescent light bulbs

For each YES measure in EEM7:
Can you tell me approximately when you:
READ AND RECORD MONTH/SEASON AND YEAR AS APPROPRIATE FOR EACH MEASURE [13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM8. [YES TO Insulation] Which?
- a. Attic
- b. Walls
- c. Floors

EEM9. [YES TO Insulation] When did you insulate your (READ FROM EEM8)?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM10. [YES TO New windows or storm windows]
Did you install new windows, storm windows, or both?
- a. New windows
- b. Storm windows
- c. Both

EEM11. [YES TO New windows or storm windows]
When did you install your (READ FROM EEM10)? [Two fields: New Windows/Both, and Storm windows]
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM12. Have you made any other energy saving improvements to your home?
1 Yes
2 No [SKIP NEXT TWO QUESTIONS]
-8 Do not know [SKIP NEXT TWO QUESTIONS]

EEM13. [IF YES] What? _____

EEM14. When?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM15. In the past 3 years, have you changed the temperature you keep your home at during the winter?
1 Yes
2 No [SKIP NEXT THREE QUESTIONS]
-8 Do not know [SKIP NEXT THREE QUESTIONS]

EEM16. [IF YES] Is your new temperature setting warmer or colder than the old one?
Warmer 1
Colder 2
Do not know ..... -8

EEM17. By how many degrees F? _____ -888 Do not know

EEM18. When did you make that change?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM19. Have you changed the temperature you keep your home at during the summer?
1 Yes
2 No [SKIP NEXT THREE QUESTIONS]
-8 Do not know [SKIP NEXT THREE QUESTIONS]

EEM20. [IF YES] Is your new temperature setting warmer or colder than the old one?
Warmer 1
Colder 2
Do not know ..... -8

EEM21. By how many degrees F? ____ -888 Do not know

EEM22. When did you make that change?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM23. Have you closed off any unused rooms in the winter?
1 Yes
2 No [SKIP NEXT QUESTION]

EEM24. When did you make that change?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

EEM25. Have you closed off any unused rooms in the summer?
1 Yes
2 No [SKIP NEXT QUESTION]

EEM26. When did you make that change?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

FREE RIDERSHIP QUESTIONS (PARTICIPANTS ONLY)

P1 Our records indicated that you received an Energy Savings Plan Survey from PG&E during 1997.

MAIL AUDIT: You filled out a questionnaire about your home and appliances, then PG&E sent you a report with energy savings recommendations for your home.

ONSITE AUDIT: A PG&E inspector visited your home, recorded information about your appliances, and provided energy savings recommendations.

PHONE AUDIT: You spoke with an energy specialist over the phone about your home and appliances, then PG&E sent you a report with energy savings recommendations for your home.

Do you recall having that survey done?
Yes 1
No ..... 2 (SKIP TO D1)
Do not know ..... -8 (SKIP TO D1)

P2 Overall, how would you rate your satisfaction with your participation in this program? Are you… READ LIST. RECORD ONLY ONE RESPONSE

Very satisfied 1
Somewhat satisfied 2
Somewhat dissatisfied 3
Very dissatisfied 4
Do not know ..... -8 (SKIP TO FR1)

P3 Why do you say that?

FREE RIDERSHIP QUESTIONS

(ASK FR1-FR3 IF MADE ONLY ONE ENERGY EFFICIENCY IMPROVEMENT – SEE TABLE AT END OF THE SURVEY)

FR1 Prior to receiving the survey and energy savings recommendations from PG&E, were you planning on making the energy efficiency improvement we discussed earlier? REPEAT IMPROVEMENT IF NECESSARY

Yes 1
No 2
Do not know ..... -8

FR2 Prior to receiving the survey and energy savings recommendations, were you aware of the energy savings potential and costs associated with making this energy efficiency improvement?

Yes 1
No 2
Do not know ..... -8

FR3 Overall, how influential was the survey and energy savings recommendations in your decision to make this improvement? That is, on a scale of 1 to 5, where 1 is not at all influential and 5 is very influential, how influential was it?

Do not know ..... -8

SKIP TO D1

(ASK FR4-FR6 IF MADE MORE THAN ONE ENERGY EFFICIENCY IMPROVEMENT – SEE TABLE AT END OF THE SURVEY)

FR4 Prior to receiving the survey and energy savings recommendations from PG&E, were you planning on making <u>all</u> of the energy efficiency improvements we discussed earlier, <u>some</u> of them, or <u>none</u> of them? REPEAT IMPROVEMENTS IF NECESSARY

All 1
Some 2
None 3
Do not know ..... -8

FR5 Prior to receiving the survey and energy savings recommendations, were you aware of the energy savings potential and costs associated with making <u>all</u> of the energy efficiency improvements we discussed earlier, <u>some</u> of them, or <u>none</u> of them?

All 1
Some 2
None 3
Do not know ..... -8

FR6 Overall, how influential was the survey and energy savings recommendations in your decision to make these improvements? That is, on a scale of 1 to 5, where 1 is not at all influential and 5 is very influential, how influential was it?

Do not know ..... -8

SKIP TO D1

DEMOGRAPHICS

These final questions will help us to further classify the types of respondents we have contacted through this survey.

D1 What is the size in square feet of your home – excluding garages and unheated basements?

Number of square feet (SKIP NEXT QUESTION)..... _____
Do not know .....-8

D2 What is your best estimate of this area? Is it …(READ LIST)

Less than 600 square feet.....1
600 to 999 square feet.....2
1,000 to 1,599 square feet.....3
1,600 to 1,999 square feet.....4
2,000 to 2,399 square feet.....5
2,400 to 2,999 square feet.....6
3,000 or more square feet 7
Do not know .....-8
Refused.....-9

D3 Over the past 3 years, have you added more living space to your home?

Yes.....1
No .....2 (SKIP TO NEXT TWO QUESTIONS)
Do not know ..... -8 (SKIP TO NEXT TWO QUESTIONS)
Refused..... -9 (SKIP TO NEXT TWO QUESTIONS)

D3a How many square feet did you add? _____

D3b When did you make that change?
_____ month/season _____ year
[13=Spring, 14=Summer, 15=Fall, 16=Winter]

D4 Including yourself, how many people live in your home at least six months of the year?

Number of people..... _____
Do not know .....-8 (SKIP NEXT TWO QUESTIONS)
Refused.....-9 (SKIP NEXT TWO QUESTIONS)

D5 How many of these people are children under age 18?

Number of children ..... _____
Do not know .....-8
Refused .....-9

D6 How many of these people are over 65?

Number of people ..... _____
Do not know .....-8
Refused .....-9

D7 Has there been a change in the number of people living in your home at least 6 months out of the year?

Yes 1
No .....2 (SKIP TO NEXT TWO QUESTIONS)
Do not know ..... -8 (SKIP TO NEXT TWO QUESTIONS)

D7a Did the number of people increase or decrease?

Increased 1
Decreased 2

D7b By how many people? _____

D8 What is your age, please?

Under 18 1
18 - 25 2
26 - 35 3
36 - 45 4
46 - 55 5
56 - 65 6
over 65 7
Refused .....-9

D9 What is the highest level of education you have completed?

Eighth grade or less	1
Some high school	2
Graduated high school	3
Some college or technical school	4
Graduated college or technical school	5
Post graduate work	6
Refused	-9

D10 Which of the following categories best describes your total household income during 1997, before taxes?

Less than $10,000	1
$10,000 to under $20,000	2
$20,000 to under $30,000	3
$30,000 to under $40,000	4
$40,000 to under $50,000	5
$50,000 to under $75,000	6
$75,000 to under $100,000	7
Over $100,000	8
Refused	-9

D9 Record gender of respondent [DO NOT ASK]

Male	1
Female	2

Those are all of my questions. Thank you very much for taking the time to participate in this study.

IF NECESSARY, READ: To verify purpose of the study, or to obtain answers to questions you may have about how to save energy in your home, please call PG&E's Smarter Energy Line (800) 933-9555.

Free Rider Question Triggers

The following table shows the questions and responses that will indicate the measures that should be checked to indicate that AT LEAST ONE energy efficiency measure was installed by participants. This list will help in programming the skip patterns to ensure that the free rider questions are asked of the appropriate respondents.

Ask the free-rider questions (FR1 and FR2) if you get the indicated response to *any* of the questions in this table.

Question	Response
CH2 Have you removed, replaced or added a new heating system in the past 3 years?	1. Removed 2. Replaced
AC2 Have you removed, replaced or added any air conditioning equipment in the past 3 years?	1. Removed 2. Replaced
WH2 Have you removed, replaced or added a new water heater in the past 3 years?	1. Removed 2. Replaced
OTH3 A. Refrigerator	Removed Replaced
OTH3B. Freezer	Removed
OTH3C. Clothes Washer	Replaced
OTH3D. Electric dryer removed and replaced with gas dryer	Remove AND replace
OTH3J-K. Electric range Removed and replaced with Gas Range	Remove AND replace
OTH3L-M. Electric range Removed and replaced with Gas Range	Remove AND replace
EEM1. Over the past 3 years, have you installed an insulating blanket on your hot water heater tank, insulated your water heater pipes, installed low-flow showerheads and faucet aerators, or turned-down the temperature on your hot water heater?	1. Yes
EEM4. In the past 3 years, have you applied weatherstripping or caulking on any doors or windows, had any other air leakages sealed up, or had your ducts insulated and sealed?	1. Yes
EEM7. Insulation, CFL, thermostat, etc.	1. Yes to any of the measures
EEM16. [IF YES] Is your new temperature setting warmer or colder than the old one? [Winter]	2. Colder
EEM20. [IF YES] Is your new temperature setting warmer or colder than the old one? [Summer]	1. Warmer
EEM23. Have you closed off any unused rooms in the winter?	1. Yes
EEM25. Have you closed off any unused rooms in the summer?	1. Yes

APPENDIX D
MULTIFAMILY PROPERTY SURVEY

99/01/21 14:01

1: **INTRO**

Customer Contact Name: <CUCON > Customer Phone: <CPHON > Telematch Phone: <TPHON > Alternate Contact: <IR2NA > Alternate Phone: <IR2PH > [INTERVIEWER: IF ALTERNATE CONTACT NAME/NUMBER, PLEASE CALL THAT PERSON]

(1/ 21)

01 ..... [CONTINUE]	01	
02 ..... DISPOSITION	02	=> INT

«INTRO»

99/01/20 10:36

2: **IR1**

Section I: Informed Respondent

Hello, may I speak with:<CUCON >? ALTERNATE CONTACT: <IR2NA > <IR2PH >? [INTERVIEWER: IF AN ALTERNATE CONTACT NAME IS SHOWN, PLEASE ASK FOR THAT PERSON.]

(1/ 23)

01 ..... INTERVIEW FOR SECOND COMPLEX	00	=> IR9
02 ..... Yes	01	=> IR3
03 ..... No, currently unvailable	02	=> INT
04 ..... No, no longer works there [CONTINUE]	03	

«IR1»

99/01/20 9:47

3: **IR2**

READ: My name is ___ and I'm with Atlantic Research.

I'm calling on behalf of PG&E to follow up on the energy audit of the common areas <AUNAM > from PG&E did in <AYEAR> for the multi-family complex <CONAM > located at <COSTR > in <COCTY >,California. I need to speak with someone who would be knowledgeable about energy saving actions taken at this complex. Could you please put me in touch with the person most likely to have such knowledge?

(1/ 25)

01 .. Yes, person currently talking with [RECORD INFO NAME, PHONE, TITLE]	01	=> IR2NA
02 Yes, different person than talking with [RECORD INFO NAME, PHONE, TITLE AND ASK FOR THAT PERSON]	02	=> IR2NA
03 ..... No [THANK AND TERMINATE]	03	=> INT

«IR2»

99/01/11 16:15

4: **IR2NA**

RECORD NEW CONTACT'S NAME

(1/ 27)

«IR2NA»

99/01/11 16:15

5: **IR2PH**

RECORD NEW CONTACT'S PHONE

(1/ 57)

«IR2PH»

99/01/11 16:15

6: **IR2TI**

RECORD NEW CONTACT'S TITLE

(1/ 67)

«IR2TI»

99/01/15 13:28

7: **SKIP**

INTERVIEWER: IF YOU'RE TALKING TO THE PERSON MOST KNOWLEDGEABLE ABOUT ENERGY SAVING ACTION, PLEASE ENTER "01" AND CONTINUE TO FIRST QUESTION OF THE SURVEY. IF THE PERSON YOU ARE SPEAKING WITH GAVE YOU A NEW NAME, ASK TO SPEAK WITH THAT PERSON AND ENTER "02" FOR NEW RESPONDENT.

(1/ 97)

01 ..... CORRECT PERSON - CONTINUE WITH SURVEY	01	=> IR5A
02 ..... NEW RESPONDENT - RETURN TO INTRO	02	=> IR1

«SKIP»

99/01/15 9:05

8: **IR3**

My name is _____ and I'm with Atlantic Research. I'm calling on behalf of PG&E to follow up on the energy audit of the common areas <AUNAM > from PG&E did in <AYEAR> for the multifamily complex <CONAM > located at <COSTR > in <COCTY >, California. You were identified as someone who would be knowledgeable about energy saving actions taken at this complex. Is this in fact the case?

(1/ 99)

01 ..... Yes	01	=> IR5A
02 ..... No [CONTINUE]	02	

«IR3»

99/01/11 16:17

9: **IR4**

I need to speak with someone who would be knowledgeable about energy saving actions taken at this complex. Could you please put me in touch with the person most likely to have such knowledge?

(1/ 101)

01 ..... Yes, [RECORD NAME, PHONE, TITLE, ASK FOR THAT PERSON]	01	=> IR2NA
02 ..... No [THANK AND TERMINATE]	02	=> INT

«IR4»

99/01/11 16:00

10: **IR5A**

Let me begin by saying this is not a marketing call. We're collecting data to help PG&E improve its programs and services and help its customers save energy. PG&E is required by law to conduct this type of research. I have a few questions, which will take at most 15 minutes. Your responses will be kept entirely confidential.

(1/ 103)

01 ..... CONTINUE 01

«IR5A»

99/01/15 13:45

11: **IR5**

SECOND COMPLEX: <CONAM >,<COSTR >

In <AYEAR>, <AUNAM > from PG&E did an energy audit of the common areas. [IF ASKED, READ: Common areas include hallways and lobbies, laundry rooms, parking areas, pools and spas, recreation rooms, and outside grounds.] Do you recall the onsite energy audit or do you recall the report that followed, which was based on the audit and made specific cost-effective energy saving recommendations?

(1/ 105)

01 ..... Yes 01 => LR1A
02 ..... No 02

«IR5»

99/01/12 7:46

12: **IR6**

Is there someone else I could speak with who might recall the onsite energy audit or the report, and who would be knowledgeable about energy saving actions taken at the complex?

(1/ 107)

01 Yes, [RECORD NAME, PHONE, TITLE AND ASK TO SPEAK TO THAT PERSON] 01 => IR2NA
02 ..... No [CONTINUE] 02
03 ..... Refused [THANK AND TERMINATE] 98 => INT

«IR6»

99/01/20 9:59

13: **LR1A**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

(INTERVIEWER: READ ONLY IF A RECOMMENDATION APPEARS BELOW) First, I'm going to ask about the implementation of the primary lighting recommendations from the energy audit. Since the energy audit in <aumth > <ayear > . . . <LREAA ><LREAB ><LREAC ><LREAD >?

(1/ 109)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1B
05	Don't know	97	=> LR1B
06	Refused	98	=> LR1B
07	BLANK SCREEN	00	=> LR3A

«LR1A»

99/01/12 12:09

14: **LR2AM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 111)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2AM»

99/01/19 11:35

15: **LR2AY**

And the year?

(1/ 113)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2AY»

99/01/14 16:13

16: **LR1B**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREBA ><LREBB ><LREBC ><LREBD >?

(1/ 117)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1C
05	Don't know	97	=> LR1C
06	Refused	98	=> LR1C
07	BLANK SCREEN	00	=> LR3A

«LR1B»

99/01/12 12:10

17: **LR2BM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 119)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2BM»

99/01/19 11:35

18: **LR2BY**

And the year?

(1/ 121)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2BY»

99/01/14 16:11

19: **LR1C**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LRECA ><LRECB ><LRECC ><LRECD >?

(1/ 125)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1D
05	Don't know	97	=> LR1D
06	Refused	98	=> LR1D
07	BLANK SCREEN	00	=> LR3A

«LR1C»

99/01/12 7:54

20: **LR2CM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 127)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2CM»

99/01/19 11:35

21: **LR2CY**

And the year?

(1/ 129)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2CY»

99/01/14 16:14

22: **LR1D**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREDA ><LREDB ><LREDC ><LREDD >?

(1/ 133)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1E
05	Don't know	97	=> LR1E
06	Refused	98	=> LR1E
07	BLANK SCREEN	00	=> LR3A

«LR1D»

99/01/14 10:34

23: **LR2DM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 135)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2DM»

99/01/19 11:35

24: **LR2DY**

And the year?

(1/ 137)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2DY»

99/01/14 16:14

25: **LR1E**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREEA ><LREEB ><LREEC ><LREED >?

(1/ 141)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1F
05	Don't know	97	=> LR1F
06	Refused	98	=> LR1F
07	BLANK SCREEN	00	=> LR3A

«LR1E»

99/01/14 10:35

26: **LR2EM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 143)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2EM»

99/01/19 11:35

27: **LR2EY**

And the year?

(1/ 145)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2EY»

99/01/14 16:17

28: **LR1F**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREFA ><LREFB ><LREFC ><LREFD >?

(1/ 149)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1G
05	Don't know	97	=> LR1G
06	Refused	98	=> LR1G
07	BLANK SCREEN	00	=> LR3A

«LR1F»

99/01/14 10:38

29: **LR2FM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 151)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2FM»

99/01/19 11:35

30: **LR2FY**

And the year?

(1/ 153)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2FY»

99/01/14 16:17

31: **LR1G**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREGA ><LREGB ><LREGC ><LREGD >?

(1/ 157)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1H
05	Don't know	97	=> LR1H
06	Refused	98	=> LR1H
07	BLANK SCREEN	00	=> LR3A

«LR1G»

99/01/14 10:41

32: **LR2GM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 159)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2GM»

99/01/19 11:36

33: **LR2GY**

And the year?

(1/ 161)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2GY»

99/01/14 16:19

34: **LR1H**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREHA ><LREHB ><LREHC ><LREHD >?

(1/ 165)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1I
05	Don't know	97	=> LR1I
06	Refused	98	=> LR1I
07	BLANK SCREEN	00	=> LR3A

«LR1H»

99/01/14 10:41

35: **LR2HM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 167)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2HM»

99/01/19 11:36

36: **LR2HY**

And the year?

(1/ 169)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2HY»

99/01/14 16:19

37: **LR1I**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREIA ><LREIB ><LREIC ><LREID >?

(1/ 173)

01 ..... Yes	01	
02 ..... Something like this was done there/to this, but don'tknow exactly what	02	
03 ..... This was done but don't know exactly where/to what	03	
04 ..... No	04	=> LR1J
05 ..... Don't know	97	=> LR1J
06 ..... Refused	98	=> LR1J
07 ..... BLANK SCREEN	00	=> LR3A

«LR1I»

99/01/14 10:42

38: **LR2IM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 175)

01 ..... January	01	
02 ..... February	02	
03 ..... March	03	
04 ..... April	04	
05 ..... May	05	
06 ..... June	06	
07 ..... July	07	
08 ..... August	08	
09 ..... September	09	
10 ..... October	10	
11 ..... November	11	
12 ..... December	12	
13 ..... Winter	13	
14 ..... Spring	14	
15 ..... Summer	15	
16 ..... Fall	16	
17 ..... Don't know	97	
18 ..... Refused	98	

«LR2IM»

99/01/19 11:36

39: **LR2IY**

And the year?

(1/ 177)

$E 1996 1998

01 ..... Don't know	9997	
02 ..... Refused	9998	

«LR2IY»

99/01/14 16:20

40: **LR1J**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREJA ><LREJB ><LREJC ><LREJD >?

(1/ 181)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1K
05	Don't know	97	=> LR1K
06	Refused	98	=> LR1K
07	BLANK SCREEN	00	=> LR3A

«LR1J»

99/01/14 10:43

41: **LR2JM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 183)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2JM»

99/01/19 11:36

42: **LR2JY**

And the year?

(1/ 185)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2JY»

99/01/14 16:20

43: **LR1K**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREKA ><LREKB ><LREKC ><LREKD >?

(1/ 189)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1L
05	Don't know	97	=> LR1L
06	Refused	98	=> LR1L
07	BLANK SCREEN	00	=> LR3A

«LR1K»

99/01/14 10:44

44: **LR2KM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 191)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2KM»

99/01/19 11:36

45: **LR2KY**

And the year?

(1/ 193)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2KY»

99/01/14 16:21

46: **LR1L**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LRELA ><LRELB ><LRELC ><LRELD >?

(1/ 197)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1M
05	Don't know	97	=> LR1M
06	Refused	98	=> LR1M
07	BLANK SCREEN	00	=> LR3A

«LR1L»

99/01/14 10:44

47: **LR2LM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 199)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2LM»

99/01/19 11:36

48: **LR2LY**

And the year?

(1/ 201)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2LY»

99/01/14 16:21

49: **LR1M**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREMA ><LREMB ><LREMC ><LREMD >?

(1/ 205)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1N
05	Don't know	97	=> LR1N
06	Refused	98	=> LR1N
07	BLANK SCREEN	00	=> LR3A

«LR1M»

99/01/14 10:46

50: **LR2MM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 207)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2MM»

99/01/19 11:36

51: **LR2MY**

And the year?

(1/ 209)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2MY»

99/01/14 16:22

52: **LR1N**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LRENA ><LRENB ><LRENC ><LREND >?

(1/ 213)

01 ..... Yes	01	
02 ..... Something like this was done there/to this, but don't know exactly what	02	
03 ..... This was done but don't know exactly where/to what	03	
04 ..... No	04	=> LR1O
05 ..... Don't know	97	=> LR1O
06 ..... Refused	98	=> LR1O
07 ..... BLANK SCREEN	00	=> LR3A

«LR1N»

99/01/14 10:52

53: **LR2NM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 215)

01 ..... January	01	
02 ..... February	02	
03 ..... March	03	
04 ..... April	04	
05 ..... May	05	
06 ..... June	06	
07 ..... July	07	
08 ..... August	08	
09 ..... September	09	
10 ..... October	10	
11 ..... November	11	
12 ..... December	12	
13 ..... Winter	13	
14 ..... Spring	14	
15 ..... Summer	15	
16 ..... Fall	16	
17 ..... Don't know	97	
18 ..... Refused	98	

«LR2NM»

99/01/19 11:37

54: **LR2NY**

And the year?

(1/ 217)

$E 1996 1998

01 ..... Don't know	9997	
02 ..... Refused	9998	

«LR2NY»

99/01/14 16:22

55: **LR1O**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREOA ><LREOB ><LREOC ><LREOD >?

(1/ 221)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR1P
05	Don't know	97	=> LR1P
06	Refused	98	=> LR1P
07	BLANK SCREEN	00	=> LR3A

«LR1O»

99/01/14 11:07

56: **LR2OM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 223)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2OM»

99/01/19 11:37

57: **LR2OY**

And the year?

(1/ 225)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2OY»

99/01/14 18:10

58: **LR1P**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<LREPA ><LREPB ><LREPC ><LREPD >?

(1/ 229)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> LR3A
05	Don't know	97	=> LR3A
06	Refused	98	=> LR3A
07	BLANK SCREEN	00	=> LR3A

«LR1P»

99/01/14 11:07

59: **LR2PM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 231)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«LR2PM»

99/01/19 11:37

60: **LR2PY**

And the year?

(1/ 233)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«LR2PY»

99/01/19 9:21

61: **LR3A**

=> OR1A else => LR3AA if IR5<>01

(1/ 237)

99/01/19 11:53

62: **LR3AA**

=> LR3B if LR1A<01

Do you recall any additional lighting recommendations from the energy audit besides the recommendation(s) we've talked about?

(1/ 237)

01	Yes	01	=> LR4A
02	No	02	=> LR7A
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR3AA»

99/01/15 13:29

63: **LR3B**

=> OR1A if IR5<>01

Do you recall any lighting recommendations from the energy audit?

(1/ 239)

01	Yes	01	=> LR4B
02	No	02	=> LR7A
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR3B»

99/01/12 12:19

64: **LR4A**

Have any of these additional recommendations been implemented, entirely or in part?

(1/ 241)

01	Yes	01	=> LR5AA
02	No	02	=> LR7A
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR4A»

99/01/19 14:11

65: **LR4B**

Have any of these recommendations been implemented, entirely or in part?

(1/ 243)

01	Yes	01	=> LR5AA
02	No	02	=> LR7A
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR4B»

99/01/20 16:32

66: **LR5AA**

Please provide a brief description of the first of these recommendations you recall.

(1/ 245)

01	[SPECIFY]	94	O	
	_____			
	_____			
	_____			
02	Don't know	97		=> LR7A
03	Refused	98		=> LR7A

«LR5AA»
«O_LR5AA»

99/01/12 12:24

67: **L6AAM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 247)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«L6AAM»

99/01/19 11:38

68: **L6AAY**

And the year?

(1/ 249)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«L6AAY»

99/01/20 9:52

69: **LR5AB**

Please provide a brief description of the second recommendation you recall.

(1/ 253)

01	None	00	=> LR7A
02	[SPECIFY]	94	O
	_____		
	_____		
	_____		
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR5AB»
«O_LR5AB»

99/01/12 12:25

70: **L6ABM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN-RECORD YEAR ON NEXT SCREEN.

(1/ 255)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«L6ABM»

99/01/19 11:38

71: **L6ABY**

And the year?

(1/ 257)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«L6ABY»

99/01/20 9:52

72: **LR5AC**

Please provide a brief description of the third recommendation you recall.

(1/ 261)

01	None	00	=> LR7A
02	[SPECIFY]	94	O
	_____		
	_____		
	_____		
03	Don't know	97	=> LR7A
04	Refused	98	=> LR7A

«LR5AC»
«O_LR5AC»

99/01/12 12:26

73: **L6ACM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 263)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«L6ACM»

99/01/19 11:38

74: **L6ACY**

And the year?

(1/ 265)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«L6ACY»

99/01/20 9:56

75: **LR5AD**

Do you recall any other additional lighting recommendations from the energy audit?

(1/ 269)

01	Yes	01
02	No	02
03	Don't know	97
04	Refused	98

«LR5AD»

99/01/20 9:58

76: **LR7A**

=> OR1A else => LR7AA if LR2AM<01 AND LR2BM<01 AND LR2CM<01 AND LR2DM<01 AND LR2EM<01 AND LR2FM<01 AND LR2GM<01 AND LR2HM<01 AND LR2IM<01 AND LR2JM<01 AND LR2KM<01 AND LR2LM<01 AND LR2MM<01 AND LR2NM<01 AND LR2OM<01 AND LR2PM<01 AND LR4A<>01 AND LR4B<>01_

(1/ 271)

«LR7A»

99/01/20 9:58

77: **LR7AA**

=> +1 if NOT LR4A 01

To answer the next series of questions, consider all of the lighting recommendations from the energy audit that you've indicated were implemented. This includes any lighting recommendations I asked about that you were certain were implemented, as well as any for which you thought something similar was implemented. This also includes the recommendations you remembered on your own as having been implemented.

(1/ 272)

01	CONTINUE	1	=> LR7

«LR7AA»

99/01/19 11:58

78: **LR7AB**

=> +1 if	NOT LR4B 01

To answer the next series of questions, consider all of the lighting recommendations from the energy audit that you've indicated were implemented.

(1/ 273)

01	CONTINUE	1	=> LR7

«LR7AB»

99/01/19 15:24

79: **LR7AC**

To answer the next series of questions, consider all of the lighting recommendations from the energy audit that you've indicated were implemented. This includes any lighting recommendations I asked about that you were certain were implemented, as well as any for which you thought something similar was implemented.

(1/ 274)

01	CONTINUE	1	=> LR7

«LR7AC»

99/01/12 12:32

80: **LR7**

Prior to the energy audit, how aware were you or your organization of the likely energy savings from implementing these recommendations? Were you or your organization aware of the likely energy savings for all of the lighting recommendations that were implemented, for some but not all of the recommendations implemented, or for none of the recommendations implemented?

(1/ 275)

01	None	00	
02	All	01	
03	Some but not all	02	
04	Don't know	97	=> LR8
05	Refused	98	=> LR8

«LR7»

99/01/12 8:33

81: **LR8**

Prior to the energy audit, were you or your organization aware of the cost of doing all, some but not all, or none of the lighting recommendations that were implemented?

(1/ 277)

01	None	00
02	All	01
03	Some but not all	02
04	Don't know	97
05	Refused	98

«LR8»

99/01/15 13:06

82: **LR9**

Prior to the energy audit, did you or your organization already have specific plans to do all, some but not all, or none of the lighting recommendations that were implemented?

(1/ 279)

01	None	00
02	All	01
03	Some but not all	02
04	Don't know	97
05	Refused	98

«LR9»

99/01/20 12:36

83: **LR10**

If the energy audit had not been done, how many of the lighting recommendations that were implemented, would most likely have been implemented anyway ? All, some but not all, something similar but less extensive, or none?

(1/ 281)

01	None	00	=> OR1A
02	All	01	=> OR1A
03	Some but not all or something similar but less extensive	02	
04	Don't know	97	=> OR1A
05	Refused	98	=> OR1A

«LR10»

99/01/12 12:40

84: **LR11**

If the energy audit had not been done, approximately what percentage of the lighting recommendations that were implemented would have been implemented anyway? Less than 25%, at least 25% but not more than 75%, or more than 75%?

(1/ 283)

01	Less than 25%	01
02	At least 25% but not more than 75%	02
03	More than 75%	03
04	Don't know	97
05	Refused	98

«LR11»

99/01/20 10:00

85: **OR1A**

INTERVIEWER: IF NO RECOMMENDATION APPEARS CHOOSE "BLANK SCREEN" BELOW

The next set of questions is about the non-lighting recommendations from the energy audit. First, I'm going to ask about the implementation of the primary non-lighting recommendations from the audit. Since the energy audit in <aumth > <ayear> . . .<OREAA ><OREAB ><OREAC ><OREAD >?

(1/ 285)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1B
05	Don't know	97	=> OR1B
06	Refused	98	=> OR1B
07	BLANK SCREEN	00	=> OR3A

«OR1A»

99/01/22 12:05

86: **OR2AM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 287)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2AM»

99/01/19 11:39

87: **OR2AY**

And the year?

(1/ 289)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2AY»

99/01/14 17:47

88: **OR1B**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREBA ><OREBB ><OREBC ><OREBD >?

(1/ 293)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1C
05	Don't know	97	=> OR1C
06	Refused	98	=> OR1C
07	BLANK SCREEN	00	=> OR3A

«OR1B»

99/01/22 12:06

89: **OR2BM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 295)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2BM»

99/01/19 11:39

90: **OR2BY**

And the year?

(1/ 297)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2BY»

99/01/14 17:47

91: **OR1C**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<ORECA ><ORECB ><ORECC ><ORECD >?

(1/ 301)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1D
05	Don't know	97	=> OR1D
06	Refused	98	=> OR1D
07	BLANK SCREEN	00	=> OR3A

«OR1C»

99/01/22 12:06

92: **OR2CM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 303)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2CM»

99/01/19 11:39

93: **OR2CY**

And the year?

(1/ 305)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2CY»

99/01/14 16:25

94: **OR1D**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREDA ><OREDB ><OREDC ><OREDD >?

(1/ 309)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1E
05	Don't know	97	=> OR1E
06	Refused	98	=> OR1E
07	BLANK SCREEN	00	=> OR3A

«OR1D»

99/01/22 12:06

95: **OR2DM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 311)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2DM»

99/01/19 11:39

96: **OR2DY**

And the year?

(1/ 313)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2DY»

99/01/14 17:47

97: **OR1E**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREEA ><OREEB ><OREEC ><OREED >?

(1/ 317)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1F
05	Don't know	97	=> OR1F
06	Refused	98	=> OR1F
07	BLANK SCREEN	00	=> OR3A

«OR1E»

99/01/22 12:06

98: **OR2EM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 319)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2EM»

99/01/19 11:39

99: **OR2EY**

And the year?

(1/ 321)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2EY»

99/01/14 17:47

100: **OR1F**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREFA ><OREFB ><OREFC ><OREFD >?

(1/ 325)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1G
05	Don't know	97	=> OR1G
06	Refused	98	=> OR1G
07	BLANK SCREEN	00	=> OR3A

«OR1F»

99/01/22 12:07

101: **OR2FM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 327)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2FM»

99/01/19 11:40

102: **OR2FY**

And the year?

(1/ 329)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2FY»

99/01/14 16:25

103: **OR1G**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREGA ><OREGB ><OREGC ><OREGD >?

(1/ 333)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1H
05	Don't know	97	=> OR1H
06	Refused	98	=> OR1H
07	BLANK SCREEN	00	=> OR3A

«OR1G»

99/01/22 12:07

104: **OR2GM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 335)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2GM»

99/01/19 11:40

105: **OR2GY**

And the year?

(1/ 337)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2GY»

99/01/14 17:48

106: **OR1H**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREHA ><OREHB ><OREHC ><OREHD >?

(1/ 341)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1I
05	Don't know	97	=> OR1I
06	Refused	98	=> OR1I
07	BLANK SCREEN	00	=> OR3A

«OR1H»

99/01/22 12:07

107: **OR2HM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 343)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2HM»

99/01/19 11:40

108: **OR2HY**

And the year?

(1/ 345)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2HY»

99/01/14 17:48

109: **OR1I**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREIA ><OREIB ><OREIC ><OREID >?

(1/ 349)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1J
05	Don't know	97	=> OR1J
06	Refused	98	=> OR1J
07	BLANK SCREEN	00	=> OR3A

«OR1I»

99/01/22 12:07

110: **OR2IM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 351)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2IM»

99/01/19 11:40

111: **OR2IY**

And the year?

(1/ 353)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2IY»

99/01/14 16:27

112: **OR1J**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREJA ><OREJB ><OREJC ><OREJD >?

(1/ 357)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1K
05	Don't know	97	=> OR1K
06	Refused	98	=> OR1K
07	BLANK SCREEN	00	=> OR3A

«OR1J»

99/01/22 12:08

113: **OR2JM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 359)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2JM»

99/01/19 11:40

114: **OR2JY**

And the year?

(1/ 361)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2JY»

99/01/14 17:48

115: **OR1K**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<OREKA ><OREKB ><OREKC ><OREKD >?

(1/ 365)

01	Yes	01	
02	Something like this was done there/to this, but don't know exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR1L
05	Don't know	97	=> OR1L
06	Refused	98	=> OR1L
07	BLANK SCREEN	00	=> OR3A

«OR1K»

99/01/22 12:08

116: **OR2KM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 367)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2KM»

99/01/19 11:40

117: **OR2KY**

And the year?

(1/ 369)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2KY»

99/01/14 17:48

118: **OR1L**

INTERVIEWER: IF THIS SCREEN IS BLANK, CHOOSE "BLANK SCREEN" BELOW.

<ORELA ><ORELB ><ORELC ><ORELD >?

(1/ 373)

01	Yes	01	
02	Something like this was done there/to this, but don'tknow exactly what	02	
03	This was done but don't know exactly where/to what	03	
04	No	04	=> OR3A
05	Don't know	97	=> OR3A
06	Refused	98	=> OR3A
07	BLANK SCREEN	00	=> OR3A

«OR1L»

99/01/22 12:08

119: **OR2LM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 375)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OR2LM»

99/01/19 11:40

120: **OR2LY**

And the year?

(1/ 377)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OR2LY»

99/01/20 10:03

121: **OR3A**

=> FR1 else => OR3AA if IR5<>01

(1/ 381)

«OR3A»

99/01/15 10:03

122: **OR3AA**

=> OR3B if OR1A<01

Do you recall any additional non-lighting recommendations from the energy audit besides the recommendation(s) we've talked about?

(1/ 382)

01	Yes	01	=> OR4A
02	No	02	=> OR7A
03	Don't know	97	=> OR7A
04	Refused	98	=> OR7A

«OR3AA»

99/01/20 10:03

123: **OR3B**

Do you recall any non-lighting recommendations from the energy audit?

(1/ 384)

01	Yes	01	=> OR4B
02	No	02	=> OR7A
03	Don't know	97	=> OR7A
04	Refused	98	=> OR7A

«OR3B»

99/01/20 10:12

124: **OR4A**

Have any of these additional recommendations been implemented, entirely or in part?

(1/ 386)

01	Yes	01	=> OR5BA
02	No	02	=> OR7A
03	Don't know	97	=> OR7A
04	Refused	98	=> OR7A

«OR4A»

99/01/14 17:50

125: **OR4B**

Have any of these recommendations been implemented, entirely or in part?

(1/ 388)

01	Yes	01	
02	No	02	=> OR7A
03	Don't know	97	=> OR7A
04	Refused	98	=> OR7A

«OR4B»

99/01/20 10:15

126: **OR5BA**

Please provide a brief description of the first of these recommendations you recall.

(1/ 390)

01	[SPECIFY]	94	O	
	_____			
	_____			
	_____			
02	Don't know	97		=> OR7A
03	Refused	98		=> OR7A

«OR5BA»
«O_OR5BA»

99/01/12 9:44

127: **OR6BA**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 392)

01	January	01	
02	February	02	
03	March	03	
04	April	04	
05	May	05	
06	June	06	
07	July	07	
08	August	08	
09	September	09	
10	October	10	
11	November	11	
12	December	12	
13	Winter	13	
14	Spring	14	
15	Summer	15	
16	Fall	16	
17	Don't know	97	
18	Refused	98	

«OR6BA»

99/01/19 11:41

128: **O6BAY**

And the year?

(1/ 394)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«O6BAY»

99/01/20 10:14

129: **OR5BB**

Please provide a brief description of the second recommendation you recall.

(1/ 398)

01	None	00		=> OR7A
02	[SPECIFY]	94	O	
	_____			
	_____			
	_____			
03	Don't know	97		=> OR7A
04	Refused	98		=> OR7A

«OR5BB»
«O_OR5BB»

99/01/12 9:45

130: **O6BBM**

In what month this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 400)

01	January	01	
02	February	02	
03	March	03	
04	April	04	
05	May	05	
06	June	06	
07	July	07	
08	August	08	
09	September	09	
10	October	10	
11	November	11	
12	December	12	
13	Winter	13	
14	Spring	14	
15	Summer	15	
16	Fall	16	
17	Don't know	97	
18	Refused	98	

«O6BBM»

99/01/19 11:41

131: **O6BBY**

And the year?

(1/ 402)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«O6BBY»

99/01/20 10:14

132: **OR5BC**

Please provide a brief description of the third recommendation you recall.

(1/ 406)

01	None	00		=> OR7A
02	[SPECIFY]	94	O	
	_____			
	_____			
	_____			
03	Don't know	97		=> OR7A
04	Refused	98		=> OR7A

«OR5BC»
«O_OR5BC»

99/01/22 12:08

133: **O6BCM**

In what month was this most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 408)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«O6BCM»

99/01/19 11:41

134: **O6BCY**

And the year?

(1/ 410)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«O6BCY»

99/01/20 10:17

135: **OR5BD**

Do you recall any other additional non-lighting recommendations from the energy audit?

(1/ 414)

01	Yes	01
02	No	02
03	Don't know	97
04	Refused	98

«OR5BD»

99/01/19 12:16

136: **OR7A**

=> FR1 else => OR7AA if OR2AM<01 AND OR2BM<01 AND OR2CM<01 AND OR2DM<01 AND OR2EM<01 AND OR2FM<01 AND OR2GM<01 AND OR2HM<01 AND OR2IM<01 AND OR2JM<01 AND OR2KM<01 AND OR2LM<01 AND OR4A<>01 AND OR4B<>01

(1/ 416)

«OR7A»

99/01/20 10:18

137: **OR7AA**

=> +1 if NOT OR4A 01

To answer the next series of questions, consider all of the non-lighting recommendations from the energy audit that you've indicated were implemented. This includes any non-lighting recommendations I asked about that you were certain were implemented, as well as any for which you thought something similar was implemented. This also includes the recommendations you remembered on your own as having been implemented.

(1/ 417)

01 ..... CONTINUE 1 => OR7

«OR7AA»

99/01/19 12:19

138: **OR7AB**

=> +1 if NOT OR4B 01

To answer the next series of questions, consider all of the non-lighting recommendations from the energy audit that you've indicated were implemented.

(1/ 418)

01 ..... CONTINUE 1 => OR7

«OR7AB»

99/01/20 10:18

139: **OR7AC**

To answer the next series of questions, consider all of the non-lighting recommendations from the energy audit that you've indicated were implemented. This includes any non-lighting recommendations I asked about that you were certain were implemented, as well as any for which you thought something similar was implemented.

(1/ 419)

01 ..... CONTINUE 1 => OR7

«OR7AC»

99/01/14 17:50

140: **OR7**

Prior to the energy audit, how aware were you or your organization of the likely energy savings from implementing these recommendations? Were you or your organization aware of the likely energy savings for all of the non-lighting recommendations that were implemented, for some but not all of the recommendations implemented, or for none of the recommendations implemented?

(1/ 420)

01	None	00	
02	All	01	
03	Some but not all	02	
04	Don't know	97	=> OR8
05	Refused	98	=> OR8

«OR7»

99/01/12 10:07

141: **OR8**

Prior to the energy audit, were you or your organization aware of the cost of doing all, some but not all, or none of the non-lighting recommendations that were implemented?

(1/ 422)

01	None	00	
02	All	01	
03	Some but not all	02	
04	Don't know	97	
05	Refused	98	

«OR8»

99/01/15 13:05

142: **OR9**

Prior to the energy audit, did you or your organization already have specific plans to do all, some but not all, or none of the non-lighting recommendations that were implemented?

(1/ 424)

01	None	00	
02	All	01	
03	Some but not all	02	
04	Don't know	97	
05	Refused	98	

«OR9»

99/01/20 12:37

143: **OR10**

If the energy audit had not been done, how many of the non-lighting recommendations that were implemented, would most likely have been implemented anyway ? All, some but not all, something similar but less extensive, or none?

(1/ 426)

01	None	00	=> FR1
02	All	01	=> FR1
03	Some but not all or something similar but less extensive	02	
04	Don't know	97	=> FR1
05	Refused	98	=> FR1

«OR10»

99/01/12 10:08

144: **OR11**

If the energy audit had not been done, approximately what percentage of the non-lighting recommendations that were implemented would have been implemented anyway? Less than 25%, at least 25% but not more than 75%, or more than 75%?

(1/ 428)

01	Less than 25%	01	
02	At least 25% but not more than 75%	02	
03	More than 75%	03	
04	Don't know	97	
05	Refused	98	

«OR11»

99/01/20 16:33

145: **FR1**

In the cases of any lighting or non-lighting recommendations not yet implemented, are there specific plans to implement any of them within the next two years, entirely or in part?

(1/ 430)

01	All recommendations have been implemented.	00	=> CA1A
02	Yes	01	
03	No	02	=> CA1A
04	Don't know	97	=> CA1A
05	Refused	98	=> CA1A

«FR1»

99/01/20 10:20

146: **FR2A**

Please provide a brief description of the first of these recommendations you recall.

(1/ 432)

01 .....[SPECIFY 1ST PLAN] 94 O
_____
_____
_____
02 .....Don't know 97 => CA1A
03 ..... Refused 98 => CA1A

«FR2A»
«O_FR2A»

99/01/20 10:20

147: **FR2B**

Please provide a brief description of the second recommendation you recall.

(1/ 434)

01 .....No other recommendation 00 => CA1A
02 .....[SPECIFY 2ND PLAN] 94 O
_____
_____
_____
03 .....Don't know 97 => CA1A
04 ..... Refused 98 => CA1A

«FR2B»
«O_FR2B»

99/01/20 10:21

148: **FR2C**

Please provide a brief description of the third recommendation you recall.

(1/ 436)

01 .....No other recommendation 00
02 .....[SPECIFY] 94 O
_____
_____
_____
03 .....DK 97
04 ..... Refused 98

«FR2C»
«O_FR2C»

99/01/20 10:22

149: **FR3**

Do recall any more recommendations?

(1/ 438)

01 ..... Yes 01
02 ..... No 02
03 ..... Don't know 97
04 ..... Refused 98

«FR3»

99/01/14 16:48

150: **CA1A**

Section III: Other Changes

The next set of questions is concerned with other changes at the complex; that is, changes not related to the recommendations from PG&E's energy audit of the common areas in the complex in <AYEAR>.

(1/ 440)

01 ..... CONTINUE 01

«CA1A»

99/01/14 17:51

151: **CA1**

In December 1998, what was the approximate total square footage of the indoor common areas, where indoor common areas includes hallways and lobbies, laundry rooms, indoor pools and spas, and recreation rooms?

(1/ 442)

$E 0 9999996

01 ..... Don't know 9999997
02 ..... Refused 9999998

«CA1»

99/01/14 17:52

152: **CA2**

=> CA3 if CA1<9999997

Which of the following categories best describes the indoor common area total square footage? (READ LIST)

(1/ 449)

01 ..... Less than 1,000 01
02 ..... More than 1,000 but less than 2,500 02
03 ..... More than 2,500 but less than 5,000 03
04 ..... More than 5,000 but less than 10,000 04
05 ..... More than 10,000 but less than 25,000 05
06 ..... More than 25,000 but less than 50,000 06
07 ..... More than 50,000 but less than 100,000 07
08 ..... More than 100,000 08
09 ..... Don't know 97
10 ..... Refused 98

«CA2»

99/01/12 10:21

153: **CA3**

Over the past three years, have there been any changes in the total square footage of the indoor common areas?

(1/ 451)

01	Yes	01	
02	No	02	=> UN1
03	Don't know	97	=> UN1
04	Refused	98	=> UN1

«CA3»

99/01/19 15:31

154: **CA3A**

I have a few questions about these changes, starting with the earliest.

(1/ 453)

01	CONTINUE	01

«CA3A»

99/01/19 11:46

155: **CA4AM**

In what month was the first change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 455)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«CA4AM»

99/01/19 11:41

156: **CA4AY**

And the year?

(1/ 457)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«CA4AY»

99/01/19 9:25

157: **CA5A**

Was the change an increase or a decrease?

(1/ 461)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> CA9A
04	Refused	98	=> CA9A

«CA5A»

99/01/14 17:53

158: **CA6A**

Of approximately how many square feet?

(1/ 465)

$E 0 9999996

01	Don't know	9999997
02	Refused	9999998

«CA6A»

99/01/12 10:27

159: **CA7A**

What was the percentage change in the total square footage of the indoor common areas?

(1/ 472)

$E 1 100

01	Don't know	997
02	Refused	998

«CA7A»

99/01/12 10:27

160: **CA8A**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 475)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«CA8A»

99/01/14 17:54

161: **CA9A**

Have there been any other changes in the total square footage of the indoor common areas since that time?

(1/ 477)

01	Yes	01	
02	No	02	=> UN1
03	Don't know	97	=> UN1
04	Refused	98	=> UN1

«CA9A»

99/01/19 11:46

162: **CA4BM**

In what month was the second change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 479)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«CA4BM»

99/01/19 11:41

163: **CA4BY**

And the year?

(1/ 481)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«CA4BY»

99/01/19 9:26

164: **CA5B**

Was the change an increase or a decrease?

(1/ 485)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> CA9B
04	Refused	98	=> CA9B

«CA5B»

99/01/14 17:55

165: **CA6B**

Of approximately how many square feet?

(1/ 489)

$E 0 9999996

01	Don't know	9999997
02	Refused	9999998

«CA6B»

99/01/14 17:55

166: **CA7B**

What was the percentage change in the total square footage of the indoor common areas?

(1/ 496)

$E 1 100

01	DK	997
02	Refused	998

«CA7B»

99/01/11 16:00

167: **CA8B**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 499)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«CA8B»

99/01/14 18:43

168: **CA9B**

Have there been any other changes in the total square footage of the indoor common areas since that time?

(1/ 501)

01	Yes	01	
02	No	02	=> UN1
03	Don't know	97	=> UN1
04	Refused	98	=> UN1

«CA9B»

99/01/19 11:47

169: **CA4CM**

In what month was the third change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 503)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«CA4CM»

99/01/19 11:42

170: **CA4CY**

And the year?

(1/ 505)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«CA4CY»

99/01/19 9:27

171: **CA5C**

Was the change an increase or a decrease?

(1/ 509)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> CA9C
04	Refused	98	=> CA9C

«CA5C»

99/01/14 17:55

172: **CA6C**

Of approximately how many square feet?

(1/ 513)

$E 0 9999996

01	Don't know	9999997
02	Refused	9999998

«CA6C»

99/01/12 10:35

173: **CA7AC**

What was the percentage change in the total square footage of the indoor common areas?

(1/ 520)

$E 1 100

01	Don't know	997
02	Refused	998

«CA7AC»

99/01/11 16:00

174: **CA8C**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 523)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«CA8C»

99/01/12 10:35

175: **CA9C**

Have there been any other changes in the total square footage of the indoor common areas since that time?

(1/ 525)

01	Yes	01	
02	No	02	=> UN1
03	Don't know	97	=> UN1
04	Refused	98	=> UN1

«CA9C»

99/01/14 17:56

176: **UN1**

In December 1998, approximately how many units were there?

(1/ 527)

$E 0 99996

01	Don't know	99997	
02	Refused	99998	

«UN1»

99/01/14 18:02

177: **UN2**

Over the past three years, have there been any changes in the number of units?

(1/ 532)

01	Yes	01	
02	No	02	=> OC1
03	Don't know	97	=> OC1
04	Refused	98	=> OC1

«UN2»

99/01/19 15:31

178: **UN2A**

I have a few questions about these changes, starting with the earliest.

(1/ 534)

01 ..... CONTINUE 01

«UN2A»

99/01/19 11:47

179: **UN3AM**

In what month was the first change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 536)

01 ..... January 01
02 ..... February 02
03 ..... March 03
04 ..... April 04
05 ..... May 05
06 ..... June 06
07 ..... July 07
08 ..... August 08
09 ..... September 09
10 ..... October 10
11 ..... November 11
12 ..... December 12
13 ..... Winter 13
14 ..... Spring 14
15 ..... Summer 15
16 ..... Fall 16
17 ..... Don't know 97
18 ..... Refused 98

«UN3AM»

99/01/19 11:42

180: **UN3AY**

And the year?

(1/ 538)

$E 1996 1998

01 ..... Don't know 9997
02 ..... Refused 9998

«UN3AY»

99/01/19 9:33

181: **UN4A**

Was the change an increase or a decrease?

(1/ 542)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> UN6A
04	Refused	98	=> UN6A

«UN4A»

99/01/14 17:57

182: **UN5A**

Of approximately how many units?

(1/ 544)

$E 0 99996

01	Don't know	99997
02	Refused	99998

«UN5A»

99/01/14 17:57

183: **UN6A**

Have there been any other changes in the number of units since that time?

(1/ 549)

01	Yes	01	
02	No	02	=> OC1
03	Don't know	97	=> OC1
04	Refused	98	=> OC1

«UN6A»

99/01/19 11:47

184: **UN3BM**

In what month was the second change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 551)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«UN3BM»

99/01/19 11:42

185: **UN3BY**

And the year?

(1/ 553)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«UN3BY»

99/01/19 9:33

186: **UN4B**

Was the change an increase or a decrease?

(1/ 557)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> UN6B
04	Refused	98	=> UN6B

«UN4B»

99/01/14 18:31

187: **UN5B**

Of approximately how many units?

(1/ 559)

$E 0 99996

01	Don't know	99997
02	Refused	99998

«UN5B»

99/01/14 17:57

188: **UN6B**

Have there been any other changes in the number of units since that time?

(1/ 564)

01	Yes	01	
02	No	02	=> OC1
03	Don't know	97	=> OC1
04	Refused	98	=> OC1

«UN6B»

99/01/19 11:47

189: **UN3CM**

In what month was the third change most likely completed? (INTERVIEWER: IF MONTH UNKNOWN, PROMPT FOR SEASON--PLEASE RECORD MONTH (OR SEASON) ON THIS SCREEN--RECORD YEAR ON NEXT SCREEN.

(1/ 566)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«UN3CM»

99/01/19 11:42

190: **UN3C**

And the year?

(1/ 568)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«UN3C»

99/01/19 9:33

191: **UN4C**

Was the change an increase or a decrease?

(1/ 572)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> UN6C
04	Refused	98	=> UN6C

«UN4C»

99/01/14 17:57

192: **UN5C**

Of approximately how many units?

(1/ 574)

$E 0 99996

01	Don't know	99997	
02	Refused	99998	

«UN5C»

99/01/14 18:02

193: **UN6C**

Have there been any other changes in the number of units since that time?

(1/ 579)

01	Yes	01	
02	No	02	=> OC1
03	Don't know	97	=> OC1
04	Refused	98	=> OC1

«UN6C»

99/01/19 9:38

194: **OC1**

So far, we've talked about the energy audit recommendations and we've talked about changes in floor space and units. Apart from those changes and excluding general maintenance, have there been any other changes in lighting systems, or non-lighting systems since January 1996?(INTERVIEWER PROMPT IF ASKED ABOUT NON-LIGHTING SYSTEMS:"NON-LIGHTING SYSTEMS INCLUDE FOR EXAMPLE MOTORS, WATER HEATING AND SHOWERHEADS")

(1/ 581)

01	Yes	01	
02	No	02	=> VA1
03	Don't know	97	=> VA1
04	Refused	98	=> VA1

«OC1»

99/01/19 15:32

195: **OC1A**

I have a few questions about these other changes, starting with the earliest.

(1/ 583)

01	CONTINUE	01	

«OC1A»

99/01/19 15:32

196: **OC2A**

How would you briefly describe the first change? (If addition, removal, or replacement of equipment, PROMPT for the type and quantity of equipment-If change in operating hours, PROMPT for an increase or a decrease and number of hours, was it temporary or permanent, if temporary - how long?)

(1/ 585)

01	[SPECIFY CHANGE]	94	O

_____

_____

_____

02	Don't know	97	
03	Refused	98	

«OC2A»

«O_OC2A»

99/01/20 10:25

197: **OC3AM**

In what month was it most likely completed? (INTERVIEWER: RECORD MONTH (OR SEASON)-RECORD YEAR ON NEXT SCREEN)

(1/ 587)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OC3AM»

99/01/19 11:42

198: **OC3AY**

And the year?

(1/ 589)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OC3AY»

99/01/11 16:00

199: **OC4A**

Did the change increase, decrease, or leave unchanged the electric use covered by the property manager or owner's bill?

(1/ 593)

01	Increase	01
02	Decrease	02
03	Leave unchanged	03
04	Don't know	97
05	Refused	98

«OC4A»

99/01/11 16:00

200: **OC5A**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 595)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«OC5A»

99/01/20 10:27

201: **OC6A**

Have there been any other changes in lighting systems or non-lighting systems since that time?

(1/ 597)

01	Yes	01	
02	No	02	=> VA1
03	Don't know	97	=> VA1
04	Refused	98	=> VA1

«OC6A»

99/01/19 9:46

202: **OC2B**

How would you briefly describe the second change? (If addition, removal, or replacement of equipment, PROMPT for the type and quantity of equipment-If change in operating hours, PROMPT for an increase or a decrease and number of hours, was it temporary or permanent, if temporary - how long?)

(1/ 599)

01	[SPECIFY CHANGE]	94	O
	_____		
	_____		
	_____		
02	Don't know	97	
03	Refused	98	

«OC2B»
«O_OC2B»

99/01/20 10:26

203: **OC3BM**

In what month was it most likely completed? (INTERVIEWER: RECORD MONTH (OR SEASON)-RECORD YEAR ON NEXT SCREEN)

(1/ 601)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OC3BM»

99/01/19 11:43

204: **OC3BY**

And the year?

(1/ 603)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OC3BY»

99/01/11 16:00

205: **OC4B**

Did the change increase, decrease, or leave unchanged the electric use covered by the property manager or owner's bill?

(1/ 607)

01	Increase	01
02	Decrease	02
03	Leave unchanged	03
04	Don't know	97
05	Refused	98

«OC4B»

99/01/11 16:00

206: **OC5B**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 609)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«OC5B»

99/01/20 10:28

207: **OC6B**

Have there been any other changes in lighting systems or non-lighting systems since that time?

(1/ 611)

01	Yes	01	
02	No	02	=> VA1
03	Don't know	97	=> VA1
04	Refused	98	=> VA1

«OC6B»

99/01/19 9:46

208: **OC2C**

How would you briefly describe the third change? (If addition, removal, or replacement of equipment, PROMPT for the type and quantity of equipment-If change in operating hours, PROMPT for an increase or a decrease and number of hours, was it temporary or permanent, if temporary - how long?)

(1/ 613)

01	[SPECIFY CHANGE]	94	O

_____

_____

_____

02	Don't know	97	
03	Refused	98	

«OC2C»

«O_OC2C»

99/01/20 10:26

209: **OC3CM**

In what month was it most likely completed? (INTERVIEWER: RECORD MONTH (OR SEASON)-RECORD YEAR ON NEXT SCREEN)

(1/ 615)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«OC3CM»

99/01/19 11:43

210: **OC3CY**

And the year?

(1/ 617)

$E 1996 1998

01	Don't know	9997
02	Refused	9998

«OC3CY»

99/01/11 16:00

211: **OC4C**

Did the change increase, decrease, or leave unchanged the electric use covered by the property manager or owner's bill?

(1/ 621)

01	Increase	01
02	Decrease	02
03	Leave unchanged	03
04	Don't know	97
05	Refused	98

«OC4C»

99/01/11 16:00

212: **OC5C**

Did the change increase, decrease, or leave unchanged the gas use covered by the property manager or owner's bill?

(1/ 623)

01	Increase	01	
02	Decrease	02	
03	Leave unchanged	03	
04	Don't know	97	
05	Refused	98	

«OC5C»

99/01/20 10:28

213: **OC6C**

Have there been any other changes in lighting systems or non-lighting systems since that time?

(1/ 625)

01	Yes	01	
02	No	02	=> VA1
03	Don't know	97	=> VA1
04	Refused	98	=> VA1

«OC6C»

99/01/14 17:59

214: **VA1**

In December 1998, approximately how many vacant units were there?

(1/ 627)

$E 0 99996

01	Don't know	99997
02	Refused	99998

«VA1»

99/01/11 16:00

215: **VA2**

Over the past three years, have there been any major changes in the number of vacant units?

(1/ 632)

01	Yes	01	
02	No	02	=> PQ1
03	Don't know	97	=> PQ1
04	Refused	98	=> PQ1

«VA2»

99/01/19 15:32

216: **VA2A**

I have a few questions about these major changes, starting with the earliest.

(1/ 634)

01 ..... CONTINUE 01

«VA2A»

99/01/20 10:28

217: **VA3AM**

In what month did the first change most likely occur? (INTERVIEWER: RECORD MONTH (OR SEASON) OF CHANGE--RECORD YEAR ON NEXT SCREEN)

(1/ 636)

01 ..... January 01
02 ..... February 02
03 ..... March 03
04 ..... April 04
05 ..... May 05
06 ..... June 06
07 ..... July 07
08 ..... August 08
09 ..... September 09
10 ..... October 10
11 ..... November 11
12 ..... December 12
13 ..... Winter 13
14 ..... Spring 14
15 ..... Summer 15
16 ..... Fall 16
17 ..... Don't know 97
18 ..... Refused 98

«VA3AM»

99/01/19 15:33

218: **VA3AY**

And the year?

(1/ 638)

$E 1996 1998

01 ..... Don't know 9997
02 ..... Refused 9998

«VA3AY»

99/01/19 9:50

219: **VA4A**

Was the change an increase or a decrease?

(1/ 642)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> VA6A
04	Refused	98	=> VA6A

«VA4A»

99/01/14 18:01

220: **VA5A**

Approximately how many units were vacant?

(1/ 644)

$E 0 99996

01	Don't know	99997
02	Refused	99998

«VA5A»

99/01/19 9:50

221: **VA6A**

Have there been any other major changes in the number of vacant units since that time?

(1/ 649)

01	Yes	01	
02	No	02	=> PQ1
03	Don't know	97	=> PQ1
04	Refused	98	=> PQ1

«VA6A»

99/01/20 10:29

222: **VA3BM**

In what month did the second change most likely occur? (INTERVIEWER: RECORD MONTH (OR SEASON) OF CHANGE--RECORD YEAR ON NEXT SCREEN)

(1/ 651)

01	January	01	
02	February	02	
03	March	03	
04	April	04	
05	May	05	
06	June	06	
07	July	07	
08	August	08	
09	September	09	
10	October	10	
11	November	11	
12	December	12	
13	Winter	13	
14	Spring	14	
15	Summer	15	
16	Fall	16	
17	Don't know	97	
18	Refused	98	

«VA3BM»

99/01/19 11:43

223: **VA3BY**

And the year?

(1/ 653)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«VA3BY»

99/01/19 9:50

224: **VA4B**

Was the change an increase or a decrease?

(1/ 657)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> VA6B
04	Refused	98	=> VA6B

«VA4B»

99/01/14 18:00

225: **VA5B**

Approximately how many units were vacant?

(1/ 659)

$E 0 99996

01	Don't know	99997	
02	Refused	99998	

«VA5B»

99/01/12 11:03

226: **VA6B**

Have there been any other major changes in the number of vacant units since that time?

(1/ 664)

01	Yes	01	
02	No	02	=> PQ1
03	Don't know	97	=> PQ1
04	Refused	98	=> PQ1

«VA6B»

99/01/20 10:29

227: **VA3CM**

In what month did the third change most likely occur? (INTERVIEWER: RECORD MONTH (OR SEASON) OF CHANGE--RECORD YEAR ON NEXT SCREEN)

(1/ 666)

01	January	01
02	February	02
03	March	03
04	April	04
05	May	05
06	June	06
07	July	07
08	August	08
09	September	09
10	October	10
11	November	11
12	December	12
13	Winter	13
14	Spring	14
15	Summer	15
16	Fall	16
17	Don't know	97
18	Refused	98

«VA3CM»

99/01/19 11:43

228: **VA3CY**

And the year?

(1/ 668)

$E 1996 1998

01	Don't know	9997	
02	Refused	9998	

«VA3CY»

99/01/19 9:50

229: **VA4C**

Was the change an increase or a decrease?

(1/ 672)

01	Increase	01	
02	Decrease	02	
03	Don't know	97	=> VA6C
04	Refused	98	=> VA6C

«VA4C»

99/01/14 18:01

230: **VA5C**

Approximately how many units were vacant?

(1/ 674)

$E 0 99996

01	Don't know	99997	
02	Refused	99998	

«VA5C»

99/01/12 11:05

231: **VA6C**

Have there been any other major changes in the number of vacant units since that time?

(1/ 679)

01	Yes	01	
02	No	02	=> PQ1
03	Don't know	97	=> PQ1
04	Refused	98	=> PQ1

«VA6C»

99/01/14 18:00

232: **PQ1**

Section IV: Final Questions

This questionnaire concludes with some background questions. Approximately how many years have you been involved in the management of this complex?

(1/ 681)

$E 0 96

01	Don't know	97	
02	Refused	98	

«PQ1»

99/01/12 11:07

233: **PQ2**

What is the title of the person who was primarily responsible for making the decision regarding whether or not to implement the recommendations from the energy audit?

(1/ 683)

01	[RECORD TITLE]	94	O
	_____		
	_____		
	_____		
02	Don't know	97	
03	Refused	98	

«PQ2»

«O_PQ2»

99/01/20 10:29

234: **PQ3**

In the last 5 years, how many times has PG&E done an energy audit of the common areas in this complex, including the energy audit we're discussing?

(1/ 685)

$E 1 5

01	Don't know	97	
02	Refused	98	

«PQ3»

99/01/20 10:34

235: **PQ4**

Is the person who determined PG&E should do an energy audit of the common areas in this complex in <AYEAR>, also involved in the management of other multi-family complexes with 5 or more units?

(1/ 687)

01	Yes	01	
02	No	02	=> SOLNG
03	Don't know	97	=> SOLNG
04	Refused	98	=> SOLNG

«PQ4»

99/01/20 10:35

236: **PQ5**

In the last 5 years, has an energy audit of the common areas been done by PG&E for any of these other multi-family complexes?

(1/ 689)

01	Yes	01	=> SOLNG
02	No	02	=> SOLNG
03	Don't know	97	=> SOLNG
04	Refused	98	=> SOLNG

«PQ5»

99/01/20 16:37

237: **IR9**

=> +1 if CPLEX<>2

I also need to follow up on the energy audit of the common areas <AUNAM > from PG&E did in <AYEAR> for the multifamily complex <CONAM > located at <COSTR > in <COCTY >, California. You were also identified as someone who would be knowledgeable about energy saving actions taken at this complex. Is this in fact the case?

(1/ 691)

01	Yes	01	=> IR5
02	No	02	=> IR4

«IR9»

99/01/14 16:55

238: **SOLNG**

NUMBER OF COMPLEXES: <CPLEX> (INTERVIEWER: IF NUMBER OF COMPLEXES = "2" LOOK AT PAPER SAMPLE AND FIND THE CORRECT CASE NUMBER TO CONTINUE INTERVIEWING FOR SECOND COMPLEX.) IF NUMBER OF COMPLEXES = "1" OR THIS WAS THE SURVEY FOR THE SECOND COMPLEX, READ: Thank you very much for taking the time to help with this study. [INTERVIEWER: BE AWARE--YOU MAY CONTINUE!]

(1/ 693)

01	CONTINUE TO INT SCREEN	01	=> INT

«SOLNG»

99/01/26 13:51

239: **INT**

Thank you very mnuch for taking the time to help with this study.

(1/ 695 - 697 - 699 - 701 - 703 - 705 - 707 - 709 - 711 - 713)

01	COMPLETED	CO	C	=> END
02	SCREENOUT1: Don't recall Audit	S1		=> END
03	NO ANSWER ONLY! (CallBack in 10 Minutes or so)	NA	R	=> END
04	BUSY SIGNAL (CallBack in 30 Minutes or so)	BS	R	=> END
05	CALLBACK - 1 HOUR	H1	R	=> END
06	CALLBACK - 2 HOURS	H2	R	=> END
07	BACK TOMORROW	D1	R	=> END
08	BACK IN 2 DAYS / WATTS	D2	R	=> END
09	BACK IN 3 DAYS	D3	R	=> END
10	BACK IN 7 DAYS	D7	R	=> END
11	GENERAL CALL BACK	CB	R	=> CB
12	REFUSAL	RE		=> END
13	TERMINATE	TR		=> END
14	LANGUAGE/DEAF	LG		=> END
15	WRONG NUMBERS	WN		=> END
16	DUPLICATE	DP		=> END

«INT_01»
«INT_02»
«INT_03»
«INT_04»
«INT_05»
«INT_06»
«INT_07»
«INT_08»
«INT_09»
«INT_10»

240: **CB**

Today is: $D It is $H Questionnaire:$Q

<NAME > REMEMBER TO USE MILITARY TIME 24 HOUR CLOCK FOR THE AFTERNOON AND CHECK TIME. PHONE:<PHONE >

(1/ 715)

$CH
«CB»

241: **CLOS1**

=> END if 1>0

(1/ 725)

«CLOS1»

242: **TZONE**

TIME ZONE

(1/ 726)

01	Newfoundland	1	
02	Atlantic	2	
03	East	3	
04	Central	4	
05	Rockies	5	
06	Pacific	6	
07	Alaska	7	
08	Hawaii	8	

«TZONE»

243: **F5**

ENTER A COMMENT

(1/ 727)

01	COMMENT ANYONE?	1	O	
	_____			
	_____			
	_____			
	_____			
02	NO COMMENT	2		

«F5»
«O_F5»

244: **NAME**

And what is your name so we can ask to speak with you when we call back?

(1/ 728)

«NAME»

245: **CLOS2**

Thank you again for your time today. We will be calling back in about 6-8 weeks.

(1/ 758)

01	end	1	D	=> END

«CLOS2»