Customer Energy Efficiency Program
Measurement and Evaluation Program

IMPACT EVALUATION OF PACIFIC GAS & ELECTRIC COMPANY'S 1994 RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES AND 1994 RESIDENTIAL WEATHERIZATION RETROFIT INCENTIVES PROGRAMS

PG&E Study ID numbers:
332: Residential Weatherization: Insulation
384a: Residential Appliance Efficiency: Refrigerators
384b: Residential Appliance Efficiency: Lighting
384c: Residential Appliance Efficiency: A/C

March 1, 1997

Measurement and Evaluation
Customer Energy Efficiency Policy & Evaluation Section
Pacific Gas and Electric Company
San Francisco, California

All inquiries should be directed to:

Lisa K. Lieu
Revenue Requirements
Pacific Gas and Electric Company
P. O. Box 770000, Mail Code B9A
San Francisco, CA 94177

IMPACT EVALUATION OF PG&E'S 1994 RESIDENTIAL WEATHERIZATION RETROFIT INCENTIVES PROGRAM AND 1994 RESIDENTIAL APPLIANCE EFFICIENCY RETROFIT INCENTIVES PROGRAM: REFRIGERATION, LIGHTING, HEATING/COOLING

PG&E STUDY ID NUMBERS 332 (RWRI), & 384A, 384B, 384C (RAEI) RESPECTIVELY

PURPOSE OF STUDY

This evaluation was conducted in compliance with the requirements specified in "Protocols and Procedures for the Verification of Costs, Benefits, and Shareholders Earnings from Demand-Side Management Programs" ("Protocols"), as adopted by California Public Utilities Commission Decision 93-05-063, revised January, 1997, pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, and 96-12-079.

These studies evaluated the energy savings attributable to Pacific Gas & Electric Company's 1994 Residential Appliance Efficiency Retrofit Incentives and Residential 1994 Weatherization Retrofit Incentives programs.[1]

METHODOLOGY

Heating, heating/cooling, and lighting savings from the Appliance Efficiency Retrofit and Weatherization Retrofit programs, were evaluated primarily through billing analysis. A telephone survey employing a sample of program participants and non-participants was conducted as part of the evaluation. Results from the survey were used as input to the evaluations and to develop net-to-gross adjustments as necessary for certain program components. Refrigeration savings were evaluated using an engineering approach together with a net-to-gross adjustment developed for a CADMAC statewide study residential refrigeration.[2] The analysis methods were designed to comply with guidelines specified in Tables C-1, C-2, C-3A, C-3B and other applicable portions of the Protocols.

[1] A waiver granting PG&E permission to delay filing these evaluations was approved by the CADMAC on February 4, 1996. A copy of the waiver is provided in Appendix C.

[2] This methodology was approved by a CADMAC waiver on September 19, 1996. A copy of the waiver is provided in Appendix C.

STUDY RESULTS

The results of the analyses are summarized in the following table.

SUMMARY OF IMPACTS

	Reported Accomplishments*			Evaluation			Realization Rates		
	MW	GWh	1,000 Therms	MW	GWh	1,000 Therms	MW	MWh	1,000 Therms
1994 PROGRAMS									
Appliance Efficency Incentives									
Efficient Refrigerator Rebate	2.06	3.80		0.67	4.35		0.325	1.146	
Ref. Salesperson/Dealer Incentive	1.64	3.02		0.53	3.49		0.323	1.157	
Multiple Ref. Rebate Program	0.82	1.51		0.11	0.72		0.134	0.477	
CAC Rebate	1.18	1.16		1.13	1.16		0.958	1.001	
MF Rebate	1.98	16.64	110.3	0.87	10.97	61.2	0.441	0.659	0.554
Appliance Efficency Total	7.69	26.12	110.30	3.31	20.69	61.2	0.431	0.792	0.554
Weatherization Retrofit Incentives									
Insulation Rebate Program	1.99	1.57	227.1	0.47	0.36	145.4	0.236	0.226	0.640

*1994 accomplishments are taken from *Annual Summary Report on Demand Side Management Programs in 1994 and 1995* Pacific Gas and Electric Company (Revised September 1995).

REGULATORY WAIVERS AND FILING VARIANCES

Two regulatory waivers were filed in conjunction with these evaluations (see Footnotes 1 and 2 below). Copies of these waivers are provided in Appendix C. Table 7 documents related to databases used in these evaluations will be filed on March 10, 1997, as approved by Joshua Faulk of ECONorthwest (February 19, 1997). There are no other filing variances.

1994 RESIDENTIAL WEATHERIZATION RETROFIT INCENTIVES AND APPLIANCE EFFICIENCY INCENTIVES PROGRAMS IMPACT EVALUATION

Final Report

Prepared for

Pacific Gas and Electric Company
San Francisco, California

Prepared by

XENERGY Inc.
Madison, Wisconsin
and
Oakland, California

February 28, 1997

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

This report presents the results of impact evaluations of several of Pacific Gas and Electric Company's (PG&E's) 1994 Residential Demand-Side Management Programs. The delayed filing of evaluation results for these programs was approved by a CADMAC waiver dated February 4, 1996. A copy of the waiver is included in Appendix C.

The programs evaluated are as follows:

Weatherization Retrofit Incentives

- Insulation Rebate Program

Appliance Efficiency Incentives

- Central Air Conditioner Rebate Program (CAC Rebate)
- Multi-Family Property Rebate Program (MF Rebate)
- Efficient Refrigerator Programs

1.1 PROGRAM DESCRIPTIONS

A brief description of each program evaluated is given below.

1.1.1 Weatherization Retrofit Incentives

Insulation Rebate Program

This program provided incentives for installation of insulation in ceiling or attic, walls, and floors. Customers were eligible for rebates for contractor-installed insulation, as well as for customer-installed (Do-It-Yourself) insulation. The Do-It-Yourself rebates covered ceiling insulation only.

1.1.2 Appliance Efficiency Incentives

The Appliance Efficiency Incentives programs provide rebates to customers who purchase efficient equipment.

Central Air Conditioner Rebate Program (CAC Rebate)

This program provided rebates for the purchase of efficient central air conditioners. The rebate varied with the SEER of the new unit, and included a bonus for downsizing, as indicated in Table 1-1.

Table 1-1
Central Air Conditioner Program Rebate Schedule

SEER	Rebate Amount	Additional Requirements for Rebate
11.0-11.9	$125	Packaged units only
12.0-13.4	$250	
≥ 13.5	$450	
Downsizing Bonus		
1/2 ton	$150	
1 ton	$300	

Multi-Family Property Rebate Program

This program offered rebates to Multi-Family property owners for efficiency improvements in common-use areas. Most of the rebates involved lighting measures, though controls, space conditioning, motors, and pipe wrap were also rebated.

Efficient Refrigerator Programs

Efficient Refrigerator Rebate Program

This program offered rebates to residential customers for purchase of efficient refrigerators, according to the schedule indicated in Table 1-2. The program was implemented in the summer months of 1994 (June-August) through local retailers.

Table 1-2
Efficient Refrigerator Program Rebate Schedule

Efficiency Increment above Federal Appliance Efficiency Standards	Rebate Amount	Additional Requirements for Rebate
15%	$25	
20%	$50	
25%	$75	CFC free

Refrigerator Salesperson/Dealer Incentive Program

The Refrigerator Salesperson/Dealer Incentive Program (SPIFF) offered incentives to salespersons and dealers during the non-summer months of 1994 (January - May and September - December). Table 1-3 presents the relationship between the percentage of energy savings beyond standards to the incentive offered.

Table 1-3
Refrigerator Incentives Offered by SPIFF Program

Percentage Energy Savings Beyond Federal Standards	Salesperson/ Dealer Incentive
10% - 14.9%	$10/$3
15% - 19.9%	$15/$5
20% or more	$20/$8

Multiple Refrigerator Rebate Program

The Multiple Refrigerator Rebate Program (Multi) offered incentives to property managers and builders who purchased two or more refrigerators. The program ran throughout the year. Table 1-4 presents the relationship between the percentage of energy savings beyond standards to the rebate offered.

Table 1-4
Refrigerator Incentives Offered by Multi Program

Percentage Energy Savings Beyond Federal Standards	Rebate Amount
15%	$25
20%	$50
25% and more	$75

1.2 SUMMARY OF EVALUATION METHODS

The evaluation approach varied according to the type of program evaluated. For the refrigerator programs, the analysis used an engineering approach to calculate gross savings. Net savings were based on the application of a net-to-gross ratio developed in another study. This evaluation approach was approved by a CADMAC waiver dated September 19, 1996. A copy of the waiver is included in Appendix C.

For the remaining programs, billing analysis was the primary basis of the evaluation. The model structure and comparison group construction varied across the programs. For the rebate

programs addressed to individual residential customers, the analysis was designed to determine gross savings. Separate adjustments were made for free ridership. For the CAC program, additional adjustments were required to isolate the gross savings relative to the appropriate baseline. For the Multi-Family rebates, the analysis gave net savings.

For the Multi-Family program, the only supplemental data incorporated into the billing analysis were customer data collected by the program, and weather data. For the residential rebate programs, an evaluation survey was conducted with participant and nonparticipant samples. The same survey instrument was used for participants in both these programs and for nonparticipants, with supplemental program-related questions asked for participants in each program. A copy of the survey instrument is included in Appendix A.

The evaluation survey served several purposes:

- It identified measures implemented by participants as well as nonparticipants, and the timing of these measure installations.
- It provided information used to estimate free ridership.
- It provided information on changes taking place in customer households, to account for some components of variation in the billing analysis.

The methods used to evaluate each of the programs are summarized in Table 1-5. Details on the evaluation methods are presented in Section 2.

Table 1-5
Summary of Evaluation Methods

	Billing Analysis Approach		Additional Adjustments	Basis
Appliance Efficency Incentives	**Stucture**	**Basis**		
Efficient Refrigerator Programs	None	None	• Net-to-gross factor	Prior Study
Central Air Conditioner Rebate Program (CAC Rebate)	Pooled TSXS	Gross Relative to Prior	• Separate Gross relative to base from Gross relative to prior	Engineering
			• Correct for Adders	Billing Analysis & Evaluation Surveys
			• Free Ridership	Evaluation Surveys
Multi-Family Property Rebate Program (MF Rebate)	Pooled TSXS	Net	None	----------
Weatherization Retrofit Incentives				
Insulation Rebate Program	Pooled TSXS	Gross	Free Ridership	Evaluation Surveys

1.3 SUMMARY OF RESULTS

The savings from the programs evaluated are summarized in Table 1-6. Overall, the Appliance Efficiency program saved a total of 21 GWh, 3.3 MW, and 0.061 million therms. The Weatherization Retrofit program save 0.36 GWh, 0.47 MW, and 0.145 million therms.

Table 1-6
Summary of Impacts

	Reported Accomplishments*			Evaluation			Realization Rates		
	MW	GWh	1,000 Therms	MW	GWh	1,000 Therms	MW	MWh	1,000 Therms
1994 PROGRAMS									
Appliance Efficency Incentives									
Efficient Refrigerator Rebate	2.06	3.80		0.67	4.35		0.325	1.146	
Ref. Salesperson/Dealer Incentive	1.64	3.02		0.53	3.49		0.323	1.157	
Multiple Ref. Rebate Program	0.82	1.51		0.11	0.72		0.134	0.477	
CAC Rebate	1.18	1.16		1.13	1.16		0.958	1.001	
MF Rebate	1.98	16.64	110.3	0.87	10.97	61.2	0.441	0.659	0.554
Appliance Efficency Total	7.69	26.12	110.30	3.31	20.69	61.2	0.431	0.792	0.554
Weatherization Retrofit Incentives									
Insulation Rebate Program	1.99	1.57	227.1	0.47	0.36	145.4	0.236	0.226	0.640

*1994 accomplishments are taken from *Annual Summary Report on Demand Side Management Programs in 1994 and 1995* Pacific Gas and Electric Company (Revised September 1995).

1.4 ORGANIZATION OF REPORT

A general discussion of the evaluation methods is provided in Section 2. The evaluations (Insulation Rebate, CAC Rebate, MF Rebate, and Efficient Refrigerators) are presented in Sections 3 through 6. Each section contains a description of the relevant program, the specifics of the analysis methods used, and the findings. The evaluation survey instrument used for the residential rebate programs is included in Appendix A. Tables conforming to the requirements of the CADMAC M&E Protocols Table 6 are contained in Appendix B. Copies of the waivers for the delayed filing and for the refrigerators programs impact analysis method are contained in Appendix C.

2 METHODOLOGY

2.1 OVERVIEW OF METHODS BY PROGRAM

This section presents a discussion of the evaluation methods used in this study. To avoid repetition, methods that are common to two or more programs are described here. Specifics of the application of these methods are given in each program section.

As noted in Section 1, the primary evaluation method for most of the programs was billing analysis. These methods are described first. A brief description of the engineering methods use for the Refrigerator Rebate programs is then provided.

2.2 BILLING ANALYSIS [INSULATION REBATE, CENTRAL AIR CONDITIONER REBATE, MULTI-FAMILY REBATE PROGRAMS]

2.2.1 Data Sources

The following data sources were used for each of the billing analyses.

Program Tracking Data

The tracking data included the customer control number, type of measure installed, and installation or program participation date. Additional measure or customer information was available for some programs. For some of the programs, the program estimate of gross savings was also included.

Billing Records

Billing records were matched to participants by control number. The records for each customer included the beginning and ending of each meter reading period, number of days in the period, and amount consumed. The billing data used covered the period from January 1993 through October 1996.

Weather Data

Each customer was assigned to one of PG&E's 25 weather stations. The weather station assignment is based on the PG&E local office which is identified in part of the customer's account number. Data taken from these weather stations were the daily temperatures for each day included in the billing analysis. In addition, we used the long-run average degree-days for each weather station, computed for the 12 year period from 1984 through 1995.

Customer Survey Data [Insulation Rebate and Central Air Conditioner Rebate Programs]

For the Insulation Rebate and Central Air Conditioner Rebate programs, evaluation surveys were conducted with a sample of participant and nonparticipant customers. This survey is described in Section 2-3. A copy of the survey instrument is given in Appendix A.

2.2.2 Billing Analysis Approach for Programs Primarily Serving Individual Residential Customers [Insulation Rebate and Central Air Conditioner Rebate]

The billing analysis approach for the insulation rebate and CAC rebate programs was a pooled time-series/cross-sectional (TSXS) regression analysis to determine gross savings. That is, observations from all customers and all time periods in the analysis were combined into a single regression model. This regression was designed to estimate the gross effect on consumption of implementing the program measure. This "gross savings" actually included the effects of snapback, short-term measure persistence, and participant spillover. A separate adjustment for free ridership was made, based on survey results.

General TSXS model

The general form of the regression model fit is

$$
\begin{aligned}
Y_{jt} = {} & \mu_j + \tau_t \\
& + \beta_{HT}\, HDD63_{jt} + \beta_{AC}\, CDD72_{jt} \\
& + \delta_{HT}\, HDD63_{jt} * P_j + \delta_{AC}\, CDD72_{jt} * P_j \\
& + \Sigma_k\, \beta_k D_{kjt} \\
& + \gamma_0 PST_{jt} + \gamma_{HT}\, HDD63_{jt} * PST_{jt} + \gamma_{AC}\, CDD72_{jt} * PST_{jt} \\
& + \varepsilon_{jt}
\end{aligned}
$$

where

Y_{it}	= consumption per day for customer *j* during time period *t*
HDD63	= Heating degree-days per day base 63°F for customer *j*'s time period *t*
CDD72	= Cooling degree-days per day base 72°F for customer *j*'s time period *t*
P_j	= 0/1 cross-sectional dummy indicating that customer *j* is a program participant
PST_{jt}	= 0/1 dummy variable indicating that customer *j* implemented the program measure prior to time period *t*
D_{kjt}	= 0/1 dummy variable indicating that customer *j* implemented change *k* prior to time period *t*
ε_{jt}	= residual error

In the pooled model, the terms μ_i are customer-specific intercepts. The terms τ_t are time trends. The coefficients β, δ and γ are estimated by the regression. The dummy variables for participation PST_{jt} are zero for time periods *t* prior to customer *j*'s participation, and 1 thereafter. Similarly, the dummy variables D_{kjt} are zero prior to the change and 1 thereafter.

The inclusion of the customer-specific and month-specific terms μ_j and τ_t is a first-order correction for the fact that observations for the same customer at different times or for the same time across customers are not all independent. Rather, some of the unexplained factors that make up the residuals, ε_{jt} will be similar across time periods t for a given customer j, and across customers j for a given time period. Excluding the customer- and time-specific effects would treat the model as if there were many more independent observations than there really are, with the result that the precision of the estimates would be exaggerated.

Some evaluation practitioners fit the pooled time series cross sectional models using participants only. The reasoning is that the exogenous changes are captured by those who have not yet participated in a given month. The limitation of this approach is that virtually all participants in a given year are "nonparticipants" during the first few months, and all are participants in the later months. As a result, any general (nonprogram) trends that made consumption different in the early months from that in the later months would be confounded with the participation effect. For this reason, a comparison group is included in the models for each program.

For both programs, the effect of the measures is expected to be temperature-related. To account for this relationship, the measure dummy variable PST is interacted with degree-days, to estimate the savings per degree-day. The dummy is also included not interacted with degree-days. The separate savings terms are not necessarily all significant. However, including the multiple terms allows adjustment in the model for possible misspecification of the weather dependence, thus reducing possible biases in the combined estimate of the effect.

The index *t* indicates the month and year of the end date of the meter reading period. The dates used for the degree-day calculation are the reading dates specific to each customer. For example, for a customer *j* assigned to weather station 22 for a meter reading period *t* with begin date June 10, 1994 and end date July 8, 1994, cooling degree-days CDD_{jt} are computed using the daily temperatures from that weather station and that range of dates.

Separate degree-day coefficients are allowed for nonparticipants than for participants, to account for the fact that the two groups may have been different in this respect even prior to participation. The different coefficients are estimated by interacting the degree-day variables with the cross-sectional participation dummy P_j.

To estimate annual savings, the average annual value of each of the terms interacted with the post-participation dummy variable is determined, and multiplied by the corresponding coefficient. Total annual savings is estimated by the sum of these effects. The degree-day terms interacted with the post-participation dummy variables are calculated using long-run normal weather conditions. The average is computed across all customers in the tracking system. This approach satisfies the weather adjustment requirements of the Protocols (Tables C-1 and C-2).

For each of the programs there were some variations on this general modeling approach. The specifics of each program's model are described in the section on that program.

Interpretation as gross savings

The pooled model was fit across program participants and nonparticipants. For the insulation program model, the nonparticipants were screened to exclude those who reported on the survey that they had installed insulation on their own over the time period included in the regression. Likewise, for the CAC model, nonparticipants who had installed a new central air conditioning system on their own were excluded.

The terms interacted with the time-series participation variable PST capture the effect of installing the measure. Other changes that may have taken place are controlled for explicitly by the change variables D_k. Because nonparticipants who implemented the program measure on their own are excluded from the model, there is no "netting out" of natural adoption in the estimated measure effect. Thus, this effect estimates the "gross" effect of the measure installation including any snapback, participant spillover, and short-term persistence effects.

For the CAC program, the gross effect captured by the billing analysis is the effect of installing the new unit, relative to the condition prior to its installation. However, PG&E's program defines the "gross effect" as the savings relative to the new, standard efficiency unit that would otherwise have been installed. Therefore, an adjustment is made to the billing analysis results to bring the baseline for gross savings obtained in the billing analysis in line with the program baseline. This adjustment is described in Section 4.

Another adjustment is made to account for free ridership in each program. This adjustment is described briefly in the discussion below, and in greater detail in Sections 3 and 4.

2.2.3 Multi-Family Billing Analysis

For the Multi-Family rebate program, the billing analysis model had a different structure. That model is described in Section 5.

2.3 SURVEY OF RESIDENTIAL CUSTOMERS [INSULATION REBATE AND CENTRAL AIR CONDITIONER REBATE]

A survey was conducted as part of the evaluation with participants in the Insulation Rebate Program and in the Central Air Conditioner Program, as well as with a sample of nonparticipants. This survey was used to support the billing analysis. Information collected on the survey included

- home ownership
- fuels used for end uses
- major changes that occurred over the study period and the dates of these changes

For the program participants, additional questions were asked regarding their participation. These questions were used to determine free ridership.

The same nonparticipant sample was used to support both program evaluations. Participants were selected for the sample only if they had a minimum of 12 months of billing history prior to participation and nine months after participation. Nonparticipants were selected only if they had a minimum of 24 months of billing history. These are requirements of the Protocols for inclusion in the analysis sample. A simple random sample of customers satisfying these criteria was selected for each surveyed group. Table 2-1 shows the number of sampled customers in each category.

Table 2-1
Customer Surveys

Group	Number of Completed Surveys
Insulation Rebate Participants	
Ceiling Wall Floor	213
DIY	32
CAC Rebate Participants	214
Nonparticipants	1008

2.3.1 Free Ridership Questions

It is well understood that simply asking participants if they would have implemented the measure in the absence of the program can lead to overstatement of free ridership. The reason is that customers will tend to give the "right" or socially desirable response. In addition, there is a tendency to respond based on their current experience with the measure, rather than on their prior knowledge and understanding. Thus, customers who are satisfied with the measure will say "yes" to indicate that they would consider it worth doing without the rebate, not necessarily because they would have done so at the time of implementation.

To overcome some of these limitations with self-reports, we used a series of screening questions. We classify customers as free riders only if they had planned to implement the efficiency measure prior to learning of the program, and had already investigated the associated costs. Customers who indicate that they were planning to implement the measure but who were unaware of the cost implications are considered unlikely to have implemented and paid full cost. We have applied this screening approach for evaluations of several similar programs.

2.4 REFRIGERATOR PROGRAM ANALYSIS

Details of the impact analysis methods for the refrigerator programs are presented in Section 6. A summary of these methods is outlined here.

Gross impacts were calculated using an engineering approach. The energy savings were calculated for each refrigerator by subtracting the model's annual energy consumption from the

annual energy consumption standard for a model of the same size and attributes. Both the annual energy consumption and annual energy consumption standard for a model of the same size and attributes values were obtained form the California Energy Commission's Directory of Certified Refrigerators and Freezers. Total energy savings were calculated by summing the annual energy savings for all confirmed rebated refrigerators.

The gross load impact for each refrigerator was calculated by applying a normalized refrigerator load factor applicable to the peak load hour to the average refrigerator load. The average load was calculated by dividing the gross energy impacts by 8,760 hour per year.

The equation used to calculate the gross load impact is as follows:

$$GLI = GEI * \frac{NRL}{8760 hr / yr}$$

where:

GLI = Gross Load Impact
GEI = Gross Energy Impact
NRL = Normalized Refrigerator Load, which is a factor relating the load at a given time to the average annual load = 1.34[1]

Net impacts were calculated by multiplying the gross savings by the net-to-gross ratio of .97. The net-to-gross ratio was developed for the 1994 Southern California Edison and San Diego Gas and Electric residential refrigerator programs[2]. The method automatically incorporates the calculation of gross spillover effects and free ridership.

Comparison of Evaluation Results with PG&E Estimates

Tables in Section 1 and Appendix B compare evaluation results with PG&E program-level savings reported in the *Annual Summary Report on Demand Side Management Programs*. Realization rates reported by program component in Sections 3 through 6 compare evaluation results with PG&E planning documents.

[1] Source: *Analysis of SCE and PG&E Refrigerator Load Data, AAG & Associates, Inc*., prepared for the California DSM Measurement Advisory Committee, April 5, 1995.

[2] Residential Appliance Efficiency Incentive Program High Efficiency Refrigeration 1994 First Year Statewide Load Impact Study, prepared for Southern California Edison and San Diego Gas & Electric, by XENERGY, February 1996.

3 WEATHERIZATION PROGRAM: INSULATION REBATE

3.1 PROGRAM DESCRIPTION

The program is described as follows in PG&E's *Annual Summary Report on Demand Side Management Programs in 1994 and 1995* (Revised September, 1995).

INSULATION REBATE PROGRAM

Description of Program

This incentive program helps offset some of the cost for residential customers to install insulation into their attic area, walls and/or floors to help reduce loss of heating and cooling in their homes. The rebate was based on the type of heat and central cooling present in the customer's home.

Implementation Strategy

This program was promoted primarily to residential customers with high electric heating and cooling loads.

Target Market

Residential customers with electric heating and/or electric cooling.

1994 PROGRAM ACCOMPLISHMENTS

In 1994, PG&E accomplished 4,256 single and multi-family ceiling insulations, 489 do-it-yourself ceiling insulations, 827 wall insulations and 452 floor insulations.

. . .

Net Energy Impacts (First Year)

kW	1,987
kWh	1,574,424
therms	227,122

3.2 SUMMARY OF RESULTS

Table 3-1 summarizes the savings estimated by the evaluation.

Table 3-1
Summary of Net Impact Estimates
Insulation Rebate Program

	Evaluation Results					Program Planning			
	Customers	Total Energy (MWh or 1000 Therms/year)	SE(Total Energy	Total MW	SE(Total MW)	Measures	Total Energy (MWh or 1000 Therms/year)	Total MW	Realization Rate
Gas/Heating									
Gas Heat w/o AC	1,982	71.0	12.6			2,419	109		
Gas/Heating and Cooling									
Gas Heat w/AC	2,079	74.5	13.2			2,538	118		
Total Gas	4,061	145.4	25.8			4,957	227		0.640
Electric/Heating									
Elec Heat w/o AC	276	58.9	34.8	0.00	0.00	337	307	0.00	0.192
Electric/Heating and Cooling									
Gas heat w/AC	2,079	150.3	60.3			2,538			
Electric Heat and AC	496	141.6	65.1			605			
AC onl	75	5.4	2.1			92			
Total Electric Heating and Cooling	2,650	297.3	100.2	0.47	0.003	3,235	1,267	2.00	0.235
Total Electric	2,926	356.2	126.7	0.47	0.167	3,572	1,574	2.00	0.226

The table shows that the net electricity savings estimated by the evaluation are lower than the program planning estimates. There are several reasons for this shortfall: (1) the planning estimates for unit gross savings, based on a prior study, may have been overestimated, however those results are not significantly different that the current results (from a statistical standpoint); and (2) the planning estimates assumed a higher net-to-gross ratio than was determined in the evaluation.

The methods used to develop the evaluation estimates and more detailed results are presented below.

3.3 METHODOLOGY

As described in Section 2, the basis for the impact estimates was a billing analysis to determine gross savings, combined with a free rider estimate based on survey data.

3.3.1 Billing Analysis

The general form of the billing analysis regression model is described in Section 2. This model is a pooled time series cross-sectional model, which combines into a single model all time periods from all customers included in the analysis. The regression model incorporated information from the customer survey as well as billing and weather data.

For the Insulation Program, the comparison group included in the model was the set of all surveyed nonparticipants who had not installed insulation on their own. The model identifies the gross savings as the average change associated with participants' installation of insulation. Because nonparticipants who installed insulation are excluded from the model, there is no netting out of natural adoption. The nonparticipants do, however, control for other changes over the

study period that are unrelated to the program but might have affected consumption. These effects are controlled for both explicitly, by including change terms based on survey responses, and implicitly, through the monthly time terms.

The great majority of participants were in single-family, owner-occupied homes. To avoid possible spurious effects associated with a handful of customers in other house types, both participants and nonparticipants included in the billing analysis were restricted to single-family, owner-occupied homes.

The terms included in the regression models are

- Customer-specific dummy variables (included implicitly, but not explicitly estimated by the model)
- Time-period dummy variables for each month in the analysis
- Heating degree-days, base 63^{o}F (separate coefficients for nonparticipants and participants, with and without electric heat)
- Cooling degree-days, base 72^{o}F (electric model only, separate coefficients for nonparticipants and participants, with and without air conditioning)
- Change variables
  - additions of floorspace
  - additions of new air conditioning units
  - changes in the number of occupants
  - replacements of a major appliances
  - unplugging or disuse of a major appliances
- Time series participation dummy variable, by itself and interacted with heating (and cooling) degree-days.

3.3.2 Free Rider Adjustment

The free rider rate was estimated using data collected in the evaluation survey, as described in Section 2.

3.3.3 Participation Counts

Both program planning estimates and evaluation estimates are developed on a per-unit basis. To make sense of these unit estimates, it is necessary to know how a unit is defined. To compare the estimates, it is necessary to put them on a common basis.

Program Planning Estimates

The program planning estimates count each insulation rebate as a unit. Thus, a customer who received rebates for more than one type of measure (ceiling, wall, or floor insulation installed by a contractor, or do-it yourself ceiling insulation) would be counted once for each insulation type.

The program separated participating customers by heating and cooling combination. Program summary data bases separated the counts for each rebate type by heating and cooling fuel. Rebates were counted in the heating end use if the customer had gas or electric space heat, without air conditioning. Rebates were counted in the heating and cooling end use if the customer had air conditioning with gas or electric space heat, or with neither.

Evaluation Estimates

The evaluation estimates are developed from billing analysis for electricity and gas. The resulting estimates are per participant with the particular fuel type. Separate estimates are developed for gas and electric space heating and for air conditioning.

Total program savings estimates are required by two end-use components: heating, and heating and cooling. The heating component includes electric and gas heated customers without air conditioning. The cooling component includes all customers with air conditioning, whether heated by electricity, gas, or neither. The program-level savings estimates for these two end-use categories are determined by multiplying the unit estimates by the number of customers in each component with each heating fuel type.

Thus, it was necessary to determine the number of households by heating/cooling fuel combinations. The heating and cooling fuel for each customer were not identified in the tracking data. Program summary files identified the number of rebates in each category, but not the number of unique households.

We assumed that the distribution of households across categories was the same as the distribution of the total number of rebates. (This approach gives slightly more weight to households with multiple rebates.) Thus, we rescaled the program summary counts in each category so that the total count matched the total unique households identified in the tracking system.

Table 3-2 summarizes the program-reported counts and the evaluation counts.

Table 3-2
Participation by End-Use Component, Program Summary and Evaluation Counts

End-Use Component	Heating/Cooling Fuels	Program Summary Measure Count*	Tracking Customer Count Unduplicated	Evaluation Customer Count (rescaled measure count)
Heating				
	Gas Heat	2,419		1,982
	Electric Heat	337		276
	TOTAL	2,756		2,258
Heating and Cooling				
	Gas Heat	2,538		2,079
	Electric Heat	605		496
	AC only	92		75
	TOTAL	3,235		2,650
Program Total		5,991	4908	4,908
Ratio: customers/measures			0.819	

*Based on program summary data supplied by PG&E program planners.

3.3.4 Discussion of Modeling Issues and Approaches

Limitations of the Billing Analysis Model

- The electric model includes terms for savings associated with secondary space heat and with room air conditioners. Both these terms were found to be small and not at all statistically significant. They do not substantially affect the total estimated savings, but are included to reduce the bias in the primary effects of interest. The overall savings estimate is driven by savings associated with central air conditioning and with space heating, and is well determined.

Data Issues

- The evaluation could have been improved with a more consistent field for the program estimate of savings in the tracking data.
- The classification of rebates by end use category--combinations of electric or gas heating, central air conditioning, and heat pumps--should be entered systematically in the tracking data.

Other Efforts Attempted

- Obtain gross savings from a model that included both participant and nonparticipant installers. This model failed to give statistically significant results, probably because of the lack of reliable installation dates from customer reports.
- Obtain gross savings from a model that included only participants, but used the customer-reported installation date. This model was fit as a comparison with the model using tracking dates, since both were available for all surveyed participants. The model using customer-reported dates gave savings about one-fifth as large as the same model with the same customers, but using tracking system dates. This would be expected from the blurring of the savings effect across periods when the measure was and wasn't in place.
- Include addition of floorspace as an explanatory variable. This variable gave physically nonsensical results, and was therefore excluded from the final regression.

3.4 RESULTS

3.4.1 Gross Savings

Table 3-3 lists the variables used in the regression model. The attrition analysis, indicating which customers were included in the regressions, is summarized in Table 3-4. Results of the regression are shown in Table 3-5. The gross savings estimates based on the regression results are shown in Table 3-6.

Table 3-3
Variables Included in the Pooled Regression Model
Insulation Rebate Program

Variable	Description
HDD63	HDD/Day Base 63°F
CDD72	CDD/Day Base 72°F
NONPART	Non-Participant
INSUL94	Cross-Sectional Program Participant Dummy (0/1)
PST_INSL	Time Series Program Participation Dummy (0/1)
MHEAT_EL	Main Heat = Electric
MHEAT_NG	Main Heat = Gas
SHEAT_EL	Secondary Heat = Electric
CAC	Central Air Conditioning - Including Heat Pumps
RAC_EL	Room Air Conditioners
DSQFT	Added Square Footage to Home
DNPEOP	# of People Changed (-1/0/+1)
ADD_RAC	Added Room AC
ADD_CAC	Added CAC
RPLC_CAC	Replaced CAC
RPLCW	Replaced Windows

Table 3-4
Attrition Analysis
Insulation Rebate Program
Load Impact Model

Total Analysis Dataset

Gas	CWF		DIY		Nonparticipants	
Screen	# Cases Le	# Screened out	# Cases Left	# Screened out	# Cases Left	# Screened out
Original Surveyed	213		32		1008	
Merged with Control ID	213	*0*	32	*0*	977	*31*
Only in Single Program	209	*4*	32	*0*	977	*0*
Merged w/ Gas Billing Data	177	*32*	30	*2*	752	*225*
Without Major System Change	173	*4*	29	*1*	741	*11*
Single Famiy, Own Home, Pay own Electric	167	*6*	29	*0*	620	*121*
Nonparticipants who never added Insulatio	166	*1*	29	*0*	541	*79*
Max Therm/Day between 1.5 and 8.0	161	*5*	28	*1*	506	*35*
No Missing Data for Regressio	146	*15*	28	*0*	478	*28*
Electric	**CWF**		**DIY**		**Nonparticipants**	
Scree	# Cases Left	# Screened out	# Cases Left	# Screened out	# Cases Left	# Screened out
Original Surveyed	213		32		100	
Only in Single Progra	209	*4*	32	*0*	977	*31*
Merged w/ Electric Billing Data	196	*13*	31	*1*	861	*116*
Without Major System Change	192	*4*	30	*1*	851	*10*
Single Famiy, Own Home, Pay own Electric	184	*8*	30	*0*	700	*151*
Max. kWh 15-100/da	170	*14*	28	*2*	618	*82*
Nonparticipants who never added Insulatio	170	*0*	28	*0*	526	*92*
No Missing Data for Regressio	149	*21*	28	*0*	468	*58*

Subset w/ AC

Gas	CWF		DIY		Nonparticipants	
Screen	# Cases Le	# Screened out	# Cases Left	# Screened out	# Cases Left	# Screened out
Original Surveyed	143		19		431	
Merged with Control ID	139	*4*	19	*0*	431	*0*
Only in Single Program	129	*10*	18	*1*	325	*106*
Merged w/ Gas Billing Data	117	*12*	17	*1*	323	*2*
Without Major System Change	114	*3*	16	*1*	317	*6*
Single Famiy, Own Home, Pay own Electric	111	*3*	16	*0*	284	*33*
Nonparticipants who never added Insulatio	111	*0*	16	*0*	246	*38*
Max Therm/Day between 1.5 and 8.0	107	*4*	16	*0*	234	*12*
No Missing Data for Regressio	99	*8*	16	*0*	222	*12*
Electric	**CWF**		**DIY**		**Nonparticipants**	
Scree	# Cases Left	# Screened out	# Cases Left	# Screened out	# Cases Left	# Screened out
Original Surveyed	143		19		431	
Only in Single Progra	139	*4*	19	*0*	431	*0*
Merged w/ Electric Billing Data	129	*10*	18	*1*	321	*110*
Without Major System Change	126	*3*	17	*1*	316	*5*
Single Famiy, Own Home, Pay own Electric	123	*3*	17	*0*	280	*36*
Max. kWh 15-100/da	119	*4*	17	*0*	263	*17*
Nonparticipants who never added Insulatio	119	*0*	17	*0*	232	*31*
No Missing Data for Regressio	111	*8*	17	*0*	217	*15*

Table 3-5A
Load Impact Regression Model
Insulation Rebate Program (Gas)

Parameter	Estimate	t-Statistic	Pr > |T|	SE
Dec-92	0.0036	0.03	0.9797	0.1410
Feb-93	-0.3077	-9.48	0.0001	0.0325
Mar-93	-0.5936	-15.81	0.0001	0.0375
Apr-93	-0.8097	-20.64	0.0001	0.0392
May-93	-0.9268	-21.66	0.0001	0.0428
Jun-93	-0.9943	-22.58	0.0001	0.0440
Jul-93	-1.0532	-23.72	0.0001	0.0444
Aug-93	-1.0513	-23.65	0.0001	0.0445
Sep-93	-1.0127	-23.02	0.0001	0.0440
Oct-93	-0.8745	-20.20	0.0001	0.0433
Nov-93	-0.6201	-17.84	0.0001	0.0347
Dec-93	-0.2617	-8.28	0.0001	0.0316
Jan-94	-0.1931	-6.09	0.0001	0.0317
Feb-94	-0.3053	-9.40	0.0001	0.0325
Mar-94	-0.6355	-17.39	0.0001	0.0365
Apr-94	-0.8028	-20.37	0.0001	0.0394
May-94	-0.8793	-21.25	0.0001	0.0414
Jun-94	-0.9875	-22.45	0.0001	0.0440
Jul-94	-1.0343	-23.40	0.0001	0.0442
Aug-94	-1.0461	-23.54	0.0001	0.0444
Sep-94	-0.9933	-22.35	0.0001	0.0444
Oct-94	-0.8581	-20.85	0.0001	0.0412
Nov-94	-0.4705	-14.52	0.0001	0.0324
Dec-94	-0.1778	-5.42	0.0001	0.0328
Jan-95	-0.0557	-1.68	0.0936	0.0332
Feb-95	-0.3315	-9.41	0.0001	0.0352
Mar-95	-0.4325	-12.26	0.0001	0.0353
Apr-95	-0.6547	-17.60	0.0001	0.0372
May-95	-0.7981	-19.57	0.0001	0.0408
Jun-95	-0.9705	-22.23	0.0001	0.0437
Jul-95	-1.0483	-23.64	0.0001	0.0444
Aug-95	-1.0573	-23.91	0.0001	0.0442
Sep-95	-1.0155	-22.84	0.0001	0.0445
Oct-95	-0.8940	-20.74	0.0001	0.0431
Nov-95	-0.6052	-15.05	0.0001	0.0402
Dec-95	-0.4109	-12.22	0.0001	0.0336
Jan-96	-0.2225	-6.83	0.0001	0.0326
Feb-96	-0.3031	-8.59	0.0001	0.0353
Mar-96	-0.5291	-14.41	0.0001	0.0367
Apr-96	-0.7869	-19.96	0.0001	0.0394
May-96	-0.9073	-21.03	0.0001	0.0431
Jun-96	-1.0207	-23.31	0.0001	0.0438
Jul-96	-1.0576	-23.98	0.0001	0.0441
Aug-96	-1.0587	-23.92	0.0001	0.0443
Sep-96	-1.0088	-22.68	0.0001	0.0445
Oct-96	-0.9481	-20.32	0.0001	0.0467
INSUL94*DNPEOP	0.0871	3.71	0.0002	0.0235
INSUL94*HDD63	0.1174	28.33	0.0001	0.0041
INSUL9*HDD63*MHEAT_N	0.0485	13.27	0.0001	0.0037
INSUL94*HDD63*DSQFT	0.0718	6.30	0.0001	0.0114
DNPEOP*NONPART	0.0237	1.67	0.0954	0.0142
HDD63*NONPART	0.0866	25.77	0.0001	0.0034
HDD63*MHEAT_*NONPART	0.0519	18.92	0.0001	0.0027
HDD63*DSQFT*NONPART	0.0168	2.17	0.0301	0.0077
HDD63*PST_INSL	-0.0267	-11.99	0.0001	0.0022

Dependent Variable:	**Therms/day**
Number of Customers:	**652**
Number of Observations:	**28,992**
R^2=	**0.812**

Table 3-5B
Load Impact Regression Model
Insulation Rebate Program (Electric)

Parameter	Estimate	t-Statistic	Pr > |T|	SE
Dec-92	0.723	0.55	0.581	1.311
Feb-93	-1.421	-4.36	0.000	0.326
Mar-93	-2.211	-6.12	0.000	0.361
Apr-93	-2.839	-7.52	0.000	0.377
May-93	-3.107	-7.64	0.000	0.406
Jun-93	-2.864	-6.76	0.000	0.423
Jul-93	-1.814	-4.21	0.000	0.431
Aug-93	-2.362	-5.48	0.000	0.430
Sep-93	-2.171	-5.17	0.000	0.420
Oct-93	-1.895	-4.62	0.000	0.410
Nov-93	-1.445	-4.21	0.000	0.343
Dec-93	0.260	0.82	0.412	0.317
Jan-94	-0.779	-2.45	0.014	0.318
Feb-94	-1.611	-4.97	0.000	0.324
Mar-94	-2.233	-6.38	0.000	0.350
Apr-94	-2.551	-6.77	0.000	0.376
May-94	-2.836	-7.22	0.000	0.393
Jun-94	-2.447	-5.81	0.000	0.421
Jul-94	-1.755	-4.10	0.000	0.428
Aug-94	-2.177	-5.07	0.000	0.429
Sep-94	-2.164	-5.10	0.000	0.424
Oct-94	-2.003	-5.15	0.000	0.389
Nov-94	-1.146	-3.62	0.000	0.316
Dec-94	0.853	2.66	0.007	0.320
Jan-95	0.040	0.13	0.899	0.323
Feb-95	-1.220	-3.55	0.000	0.344
Mar-95	-1.603	-4.71	0.000	0.340
Apr-95	-2.294	-6.47	0.000	0.354
May-95	-2.618	-6.77	0.000	0.386
Jun-95	-2.548	-6.11	0.000	0.417
Jul-95	-1.602	-3.72	0.000	0.431
Aug-95	-1.708	-3.99	0.000	0.428
Sep-95	-2.011	-4.73	0.000	0.425
Oct-95	-1.631	-3.99	0.000	0.409
Nov-95	-0.956	-2.50	0.012	0.382
Dec-95	0.489	1.49	0.135	0.327
Jan-96	-0.112	-0.35	0.724	0.318
Feb-96	-0.852	-2.49	0.012	0.342
Mar-96	-1.723	-4.89	0.000	0.352
Apr-96	-2.464	-6.56	0.000	0.375
May-96	-2.529	-6.17	0.000	0.410
Jun-96	-1.936	-4.61	0.000	0.420
Jul-96	-1.261	-2.92	0.003	0.431
Aug-96	-0.762	-1.76	0.079	0.434
Sep-96	-2.107	-4.95	0.000	0.425
Oct-96	-2.322	-5.11	0.000	0.454

Dependen Variable: **kWh/day**

Number of Customers: **645**

Number of Observations: **29,14**

R^2= **0.741**

Table 3-5B (Continued)
Load Impact Regression Model
Insulation Rebate Program (Electric)

Parameter	Estimate	t-Statistic	Pr > |T|	SE
INSUL94*CDD7	1.415	16.90	0.000	0.083
INSUL94*CDD72*CA	0.373	4.10	0.000	0.091
INSUL94*CDD72*RAC_EL	1.257	7.17	0.000	0.175
INSUL94*DNPEO	0.967	3.84	0.000	0.252
INSUL94*HDD6	0.096	4.07	0.000	0.023
INSUL9*HDD63*MHEAT_E	0.520	10.50	0.000	0.049
CDD72*NONPART	0.436	11.53	0.000	0.037
CDD72*CAC*NONPART	1.494	37.56	0.000	0.039
CDD72*RAC_EL*NONPART	0.513	7.02	0.000	0.073
DNPEOP*NONPART	1.195	7.51	0.000	0.159
HDD63*NONPART	0.141	6.71	0.000	0.021
HDD63*MHEAT_*NONPART	0.609	24.85	0.000	0.024
HDD63*MHEAT_*PST_INS	-0.122	-2.19	0.028	0.056
CDD72*PST_INSL*AC	-0.165	-3.57	0.000	0.046

Table 3-6
Unit Gross Savings Based on the Load Impact Model
Insulation Rebate Program

Program/ Subset	Fuel	Variable	Description	Coefficient	T	SE	Variable Mean: Pooled regression dat set (Degree-Days/day)	Variable Mean: Cross-Sectional Tracking Data (long-run normal) (Degree-Days/day)	Annual Savings per Unit
Gas									Th/year
Gas Heat	Gas	HDD63*PST_INS	HDD/day	-0.0267	-12.0	0.0022	4.40	4.60	44.9
Electric									kWh/year
Elec Main Heat	Elec	HDD63*MHEAT_EL*PST_INSL	HDD/day	-0.1227	-2.2	0.0560	4.29	5.97	267.4
AC	Elec	CDD72*AC*PSTINSL	CDD/day	-0.1652	-3.6	0.0463	0.91	1.50	90.5

3.4.2 Free Rider Analysis

The free rider analysis is presented in Table 3-7. The analysis is for the ceiling/wall/floor and Do-It-Yourself components combined. The table shows the successive set of screens that had to be passed to classify a respondent as a free rider. This analysis gives a free rider rate of 20.3 percent.

Table 3-7
Insulation Rebate Program Free Rider Analysis

	Survey Question/ Response Code	Number of Respondents	Percent: of all surveyed	Percent: of all who recall rebate
Participants		245	100.0%	
Recalls receiving a rebate for insulation	R10=1	192	78.4%	100.0%
AND at that time, had asked for estimates for this work from contractor or insulation supplier	R12=1	53	21.6%	27.6%
AND if the rebate had not been available, would most likely have installed the same amount without a rebate within one yea	R13=1	39	15.9%	20.3%

It would be expected that the free rider rate for wall and floor insulation would be lower than that for ceiling insulation. Ceiling insulation is more common and more easily and cheaply installed. For these reasons, natural adoption of this measure would be expected to be higher.

Most participants in the insulation programs installed ceiling insulation. Since a relatively small proportion installed wall or floor insulation, the survey sample included only a small number of wall/floor participants. As a result, reliable estimates of free ridership specifically for wall and floor measures are not available. The overall free rider rate determined for the insulation program is close to PG&E planning estimates for ceiling insulation (net-to-gross = 0.85) and probably overstates the rate for wall and floor measures.

3.4.3 Net Savings

Net savings for the insulation program are shown in Table 3-8. These results combine the gross savings from the billing analysis with the free rider estimate from the survey analysis.

Table 3-8
Insulation Program Net Savings

	Evaluation Results							Program Claim				
	Customers	kWh or therms/ customer	Total MWh or 1000 Therms	SE(Total Energy)	kW/ customer	Total MW	SE(Total MW)	Measures	kWh or therms/ Measure	Total MWh or 1000 Therms	Total MW	Realizatio Rate
GAS Therms												
Gas Heating												
Gas Heat w/o AC	1,982	36	71.0	12.6				2,419	45	109		0.652
Gas Heating and Coolin												
Gas Heat w/AC	2,079	36	74.5	13.2				2,538	47	118		0.630
Total Gas	4,061	36	145.4	25.8				4,957	46	227		0.640
ELECTRICIT kWh												
Electric Heating												
Elec Heat w/o AC	276	213	58.9	34.8	0.000	0.00	0.00	337	911	307	0.00	0.192
Electric Heating and Cooli												
Gas heat w/AC	2,079	72	150.3	60.3				2,538				
Electric Heat and AC	496	286	141.6	65.1				605				
AC only	75	72	5.4	2.1				92				
Total Electric Heating and Cooli	2,650	112	297.3	100.2	0.177	0.47	0.158	3,235	392	1,267	2.00	0.235
Total Electric	2,926	122	356.2	126.7	0.160	0.47	0.167	3,572	441	1,574	2.00	0.226

The table shows that the net electricity savings estimated by the evaluation are lower than the program planning estimates. The differences between the planning and evaluation estimates are statistically significant at a high significance level (99.9 percent confidence or better) for both electricity and gas. There are several reasons for this shortfall.

1. The planning estimates for unit gross savings may have been overestimated. The planning estimates were based on prior M&E results. However, the estimates from the prior study had very wide confidence bands and the results of the present evaluation fall well within those bands.

2. The planning estimates assumed a net-to-gross ratio of 1.0 for wall and floor insulation and 0.85 for ceiling insulation. The evaluation survey results found a free rider rate of 20.3 percent (i.e., an overall net-to-gross ratio of 0.8).

The standard errors shown in Table 3-8 include the statistical uncertainty in the free rider estimate as well as the regression standard error from the load impact model. The free rider estimate is the dominant source of statistical uncertainty in the net savings estimates.

4 APPLIANCE EFFICIENCY: CAC REBATE

4.1 PROGRAM DESCRIPTION

The program is described as follows in PG&E's *Annual Summary Report on Demand Side Management Programs in 1994 and 1995* (Revised September, 1995).

CENTRAL AIR CONDITIONER REBATE

Description of Program

This program offered residential customers an incentive for purchasing an energy-efficient central air conditioner. The rebate amounts were:

SEER	Rebate
11.0 - 11.9	$125 *
12.0 - 13.4	$250
13.5 +	$450

* Rebate applied to package units only.

In 1994 the program was expanded to include proper equipment sizing. PG&E offered a bonus incentive to consumers when they installed a smaller unit compared to their previous unit. The bonus rebate was $150 for 1/2 ton reduction and $300 for a full ton reduction.

Implementation Strategy

This program was implemented through the local HVAC trade and promoted to customers through PG&E bill inserts.

Target Market

Residential customers with central air conditioning, primarily in the hot central valley areas.

1994 PROGRAM ACCOMPLISHMENTS

In 1994, PG&E provided incentives for 4,708 energy-efficient central air conditioning units. In addition, 95 customers were eligible for the 1/2 ton central air conditioning downsizing bonus incentive and 62 received incentives for downsizing by 1 ton.

. . .

Net Energy Impacts (First Year)

kW	1,181
kWh	1,158,650
therms	N/A

4.2 SUMMARY OF RESULTS

Table 4-1 summarizes the savings estimated by the evaluation.

Table 4-1
Summary of Impact Estimates
Central Air Conditioner Rebate Program

	Evaluation Results					Program Planning*			
Electricity	Customers	Total MWh	SE(Total MWh)	Total MW	SE(Total MW)	Customers	Total MWh	Total MW	Realization Rate
Packaged	1,850	599	112	0.58	0.11	1,884	440	.43	1.362
Split	2,817	561	105	0.55	0.10	2,824	719	.70	0.781
Total Progra	4,667	1,160	216	1.13	0.21	4,708	1,159	1.2	1.001

*Summary files supplied by PG&E program planners.

The table shows that the overall electricity savings estimated by the evaluation are almost identical to the program planning estimates. However, the savings are higher than the planning estimates for packaged units, and lower than the planning estimates for split units.

The primary reason for the lower savings for split units and higher for packaged appears to be the location of the two types of units. The packaged units are found in hotter climates, where usage and corresponding savings are somewhat higher than for a typical customer. By contrast, the split units were found in milder climates, where usage and savings were lower than for a typical customer.

The methods used to develop the evaluation estimates and more detailed results are presented below.

4.3 METHODOLOGY

As described in Section 2, the basis for the impact estimates was a billing analysis to determine gross savings, combined with a free rider estimate based on survey data

4.3.1 Billing Analysis

The general form of the billing analysis regression model is described in Section 2. This model is a pooled time series cross-sectional model, which combines into a single model all time periods from all customers included in the analysis.

For the Central Air Conditioning Program, the comparison group included in the model was the set of all surveyed nonparticipants who had central air conditioning, and had not installed a new CAC system on their own over the time period included in the analysis. The model identifies the gross savings relative to the old system as the average change associated with participants' installation of the new system. Because nonparticipants who installed a new system are excluded

from the model, there is no netting out of natural adoption. The nonparticipants do, however, control for other changes over the study period that are unrelated to the program but might have affected consumption. These effects are controlled for both explicitly, by including change terms based on survey responses, and implicitly, through the monthly time terms.

Participants included in the model are all the participants for whom adequate billing records could be matched. This criterion provided a large pool of participants to include in the model, and allowed very good definition of the effect of installing the new system. The trade-off was that survey data were not collected for most of these customers. Thus, the analysis used a large sample with limited information on each customer rather than a smaller sample with more detailed information on each customer. Effects of nonprogram changes are assumed to average out over time and over participants and nonparticipants included in the model.

The terms included in the regression models are

- Customer-specific dummy variables (included implicitly, but not explicitly estimated by the model)
- Time-period dummy variables for each month in the analysis
- Heating degree-days, base 63^{o}F (separate coefficients for nonparticipants, packaged system participants, and split system participants)
- Cooling degree-days, base 72^{o}F (separate coefficients for nonparticipants, packaged system participants, and split system participants)
- Cooling degree-days interacted with tons of new equipment installed (for participants only, separate coefficients for packaged and split system participants)
- Time series participation dummy variable, interacted with cooling degree-days and the program estimate of savings.

The separate coefficients of degree-days for the different groups of customers allow for the possibility that these customers' response to temperature is different even prior to the installation of the new system. Thus, the average effect of installing each type of system is determined by the consumption change relative to that group's pre-installation pattern, not relative to the average pattern over all customers in the regression.

Likewise, the interaction of cooling degree-days with tons recognizes that homes with a higher projected cooling need, as reflected in the purchased tonnage, are likely to have higher consumption per degree-day. The tons in place prior to the installation of the new system is not necessarily the same as the new tons. Indeed, 64 percent of the participants reported that their new system had higher capacity than the old system. Nonetheless, the new tons installed is a useful indicator of the cooling load even in the pre-installation period.

Another reason to include the new tons as a predictor across all time periods is that the engineering savings estimate is proportional to tons. The incremental savings on a per-ton basis is most reliably determined if the baseline against which the increment is determined is also

estimated on a per-ton basis. If the baseline usage is not scaled to tons but the savings effect included in the regression is, the coefficient of the savings term could be biased.

4.3.2 Gross Savings Adjustments

As described above, the gross savings determined by the regression model is the savings relative to the prior condition. However, the gross savings as defined for the program are the savings relative to the baseline of standard efficiency equipment that would otherwise be installed. To determine the savings relative to the program baseline, two types of adjustments must be made. The first is to correct the regression gross savings for the inclusion of participants who added CAC systems where there was none before. The second is to apportion the total savings relative to old systems between (1) the savings moving from old efficiency to standard and (2) the savings moving from standard to program-eligible high efficiency.

Adjustment for CAC Participants Who Added CAC

The regression estimates the average change in consumption associated with acquisition of a new central air conditioning system. This average across all participants is the (weighted) average of the effect for replacers and the effect for adders.

For adders, the effect is an increase in consumption. Assuming the customer had no air conditioning before, the amount of this increase is the average UEC of a new efficient unit. For replacers, the effect is negative, with magnitude equal to the savings associated with changing from the old unit to the new one.

Thus, the estimated effect from the regression is

$$EFF_{REG} = a\ UEC_{NEW} - (1\text{-}a)\ SAV_O$$

where

a = fraction of participants who added CAC
UEC_{NEW} = average UEC of a new efficient unit
SAV_O = gross savings for replacement, relative to the old unit

We maintain the convention that an increase in consumption is a positive effect, but negative savings. Conversely, positive savings means a negative effect, or a decrease in consumption. That is, EFF_{REG} is a negative number, while SAV_O and UEC_{NEW} are positive numbers.

The same gross savings is assumed to apply to both replacement and added units. The base in either case is the standard-efficiency equipment that would otherwise have been installed. We assume that the rebate had no effect on the decision to replace or add a unit at all.

The UEC for a new unit is estimated by the UEC for old units, plus the incremental effect (savings) associated with replacing an old unit with a new one. That is

$$UEC_{NEW} = UEC_{OLD} - SAV_O$$

Thus,

$$EFF_{REG} = a\,(UEC_{OLD} - SAV_O) - (1-a)\,SAV_O$$
$$= -SAV_O + a\,UEC_{OLD}.$$

Thus, we estimate the term of interest as

$$SAV_O = -EFF_{REG} + a\,UEC_{OLD}$$
$$= SAV_{REG} + a\,UEC_{OLD}$$

where

$$SAV_{REG} = -\,EFF_{REG}$$

is the initial gross savings estimate from the regression.

Adjustment for Efficiency Base

The savings due to increasing the efficiency of a unit from $SEER_{LOW}$ to $SEER_{HI}$ can be calculated as the product of equivalent full-load hours of use, tons, and the difference in SEER, as follows:

$$SAV_{LOW\text{-}HI} = (Hours)(tons)C(1/SEER_{LOW} - 1/SEER_{HI})$$

where C is a conversion factor from tons to kWh. Thus, the total savings due to replacing old equipment with new high-efficiency equipment can be split between the savings increment for new standard equipment and the savings increment for moving above standard in proportion to the increments of 1/SEER. That is

$$SAV_{OLD\text{-}HI} = (Hours)(tons)C(1/SEER_{OLD} - 1/SEER_{HI})$$

and

$$SAV_{STD\text{-}HI} = (Hours)(tons)C(1/SEER_{STD} - 1/SEER_{HI})$$

so that

$$SAV_{STD-HI} = \frac{(1/SEER_{STD} - 1/SEER_{HI})}{(1/SEER_{OLD} - 1/SEER_{HI})}.$$

The standard-efficiency new-equipment baseline is specified by the program, as the 1993 Federal standard. The high-efficiency SEER actually installed is known from the program tracking data. The total gross savings from replacing old equipment with new high-efficiency equipment is determined from the regression analysis, with the adder adjustment described above. The final piece of information required to determine the gross savings relative to the program baseline is

the SEER of the old equipment. This information is not known. Based on recent studies and practice, we assume that the stock efficiency of existing equipment is an average SEER of 8.8.

4.3.3 Participation Counts

Both program planning estimates and evaluation estimates are developed on a per-unit basis. To make sense of these unit estimates, it is necessary to know how a unit is defined. To compare the estimates, it is necessary to put them on a common basis.

Program Planning Estimates

The program planning estimates count each CAC rebate as a unit. Downsizing in connection with a rebated CAC purchase is counted separately.

Evaluation Estimates

The evaluation estimates are developed from billing analysis for electricity and gas. The resulting estimates are per participant. Separate estimates are developed for split and packaged units. Total program savings are determined by multiplying the unit estimates by the number of participants of each type.

We assumed that no customer should have received a rebate for more than one CAC system. Under this assumption the total number of customers is equal to the total number of units in the program. For those cases where we found more than one tracking system record for the same control number, we counted that control number only once.

The impact analysis developed separate unit estimates for packaged and split units. For the 1993 carryover, this distinction was not made. To develop program-level estimates from unit savings, it was necessary to estimate the total number of units in each category. This estimate was developed by allocating the 1993 units between packaged and split in the proportions found for 1994. The program planning energy numbers were similarly allocated. Table 4-2 summarizes the program-reported counts and the evaluation counts.

Table 4-2
Allocated Program Planning and Evaluation Counts

	Unknown	Split	Packaged	Total
Program Planning Files	**1993**	**1994**	**1994**	**1994**
Count	1,577	1,878	1,253	3,131
Net Savings (kWh)	346,157	503,938	308,555	812,493
Peak Demand (kW)	337	491	301	792
Allocated 1993				
allocated 1993 count		946	631	1,577
allocated 1993 energy		214,699	131,458	346,157
allocated 1993 demand		209	128	337
94 + allocated 93				
Count		2,824	1,884	4,708
Net Savings (kWh)		718,637	440,013	1,158,650
Peak Demand (kW)		701	429	1,130
Evaluation Counts				
Tracking Data Count	1266	2020	1381	4667
Allocated tracking count		752	514	1266
Known + allocated unknown		2772	1895	4667

4.3.4 Free Rider Adjustment

The free rider rate was estimated from the evaluation survey responses, as described in Section 2.

4.3.5 Discussion of Modeling Issues and Approaches

Limitations

- The free rider estimates are based on qualitative responses determining whether the customer would have purchased the efficient equipment or standard equipment in the absence of the program. The SEER associated with standard equipment is assumed to be the program baseline. However, what would actually have been sold as "standard" equipment is unknown, lacking market studies conducted during the program period.

Data Issues

- An indication in the tracking data of whether the unit was a replacement or addition would strengthen the analysis. Apparently the program has taken steps in this direction.
- Information on SEER and capacity of the replaced unit would also strengthen the analysis.

- For the 1993 carry over, no control number was entered in the tracking data base. Billing records therefore could not be matched for many of those customers. The 1994 records were almost all complete.

Other Efforts Attempted

- Obtain the incremental savings for replacement through the program over and above the savings for basic replacement. This attempt was a model including both participants and nonparticipants, using customer-reported installation and dates. Meaningful results were not obtained, for the following reasons.
    1. We had too few nonparticipant replacers. Although there were about 40 nonparticipants who reported purchasing a new air conditioner, we had electric bills for only 17 of these customers.
    2. Customers did not seem able to report the installation dates accurately, even within one year, based on a comparison of survey-reported and tracking dates for participants.
- Separate the effects on consumption for replacers versus adders--customers who installed air conditioning equipment where there had not been any previously. These models gave unstable results, largely because of the limited number of adders in the participant and nonparticipant groups.
- Obtain the incremental savings per unit change in SEER. This model was fit across all participants in the tracking system, with one term for the base savings per ton associated with installation, and a separate term for the incremental savings per ton per SEER unit above the base level in the tracking system (SEER = 11). The intent was to develop a valid estimate of savings per ton per SEER from this model, and apply it to the entire SEER increment from the program base to the installed equipment. However, this model did not give meaningful results, probably because of the limited range of SEER above 11, particularly for packaged units.
- Allow separate degree-day coefficients for customers in different broad weather regions. This distinction was statistically significant, but did not substantially improve the quality of the estimates of interest.

4.4 RESULTS

4.4.1 Gross Savings Relative to Prior Conditions

Table 4-3 lists the variables used in the regression model. The attrition analysis, indicating which customers were included in the regressions, is summarized in Table 4-4. Results of the regression are shown in Table 4-5. The resulting gross savings estimates relative to prior conditions are shown in Table 4-6.

Table 4-3
Variables Included in the Pooled Regression Model
CAC Rebate Program

Variable	Description
HDD63	HDD/Day Base 63 (^{o}F-day/day)
CDD72	CDD/Day Base 72 (^{o}F-day/day)
NPART	Non-Participant Dummy
PSTCAC94	Time Series Participation Dummy
PACKAGE	Cross-Sectional Package CAC Participation Dummy
SPLIT	Cross-Sectional Split System CAC Participation Dummy
TON	New CAC Capacity (tons)
ENGK	Engineering Savings Estimate (kWh/year)

Table 4-4
Attrition Analysis
CAC Rebate Program

Screen	# Cases Left	# Screened out
Participants		
Original Tracking Syste	4698	
Deduplicated Tracking Syste	4667	
With Control ID	3324	*1343*
Merged w/ Electric Billing Data	2918	*406*
With 12 Months and 9 Months Post Data	2737	*181*
Nonparticipants		
Original Surveyed	1008	
Merged with Control ID	977	31
Merged w/ Electric Billing Data	861	116
Without Major System Change	851	10
With CAC System	234	617
Never Changed CAC System	208	26

Table 4-5
Load Impact Regression Model
CAC Rebate Program

Parameter	Estimate	T for H0: arameter=0	Pr > |T|	Std Error o Estimate
Dec-92	1.3069	1.33	0.1838	0.9831
Feb-93	-0.9204	-4.23	0.0001	0.2175
Mar-93	-0.6331	-2.50	0.0124	0.2532
Apr-93	-1.0725	-4.03	0.0001	0.2660
May-93	-0.7233	-2.49	0.0127	0.2904
Jun-93	0.2683	0.87	0.3855	0.3091
Jul-93	1.7974	5.59	0.0001	0.3213
Aug-93	0.9788	3.08	0.0021	0.3180
Sep-93	0.3982	1.31	0.1915	0.3048
Oct-93	0.0381	0.13	0.8959	0.2913
Nov-93	-0.4831	-2.10	0.0355	0.2297
Dec-93	0.4441	2.15	0.0312	0.2061
Jan-94	-0.3217	-1.55	0.1211	0.2075
Feb-94	-0.9149	-4.24	0.0001	0.2157
Mar-94	-0.8892	-3.59	0.0003	0.2475
Apr-94	-0.8848	-3.26	0.0011	0.2710
May-94	-0.4000	-1.39	0.1644	0.2877
Jun-94	1.6518	5.24	0.0001	0.3150
Jul-94	3.6975	11.33	0.0001	0.3265
Aug-94	3.2943	10.27	0.0001	0.3206
Sep-94	1.5216	4.96	0.0001	0.3066
Oct-94	0.0109	0.04	0.9692	0.2810
Nov-94	-1.2529	-5.94	0.0001	0.2108
Dec-94	-0.3270	-1.56	0.1188	0.2096
Jan-95	-0.1138	-0.53	0.5955	0.2144
Feb-95	-0.9533	-4.10	0.0001	0.2326
Mar-95	-1.1335	-4.84	0.0001	0.2341
Apr-95	-1.2724	-5.10	0.0001	0.2495
May-95	-0.5356	-1.93	0.0535	0.2774
Jun-95	1.7435	5.78	0.0001	0.3015
Jul-95	4.4855	14.07	0.0001	0.3188
Aug-95	4.5126	14.22	0.0001	0.3173
Sep-95	2.2465	7.35	0.0001	0.3059
Oct-95	0.7317	2.51	0.0119	0.2910
Nov-95	0.5336	2.00	0.0458	0.2672
Dec-95	0.6520	2.99	0.0027	0.2177
Jan-96	-0.5859	-2.79	0.0053	0.2103
Feb-96	-0.5973	-2.57	0.0103	0.2327
Mar-96	-0.9395	-3.85	0.0001	0.2438
Apr-96	-0.6463	-2.44	0.0145	0.2644
May-96	0.9518	3.23	0.0012	0.2946
Jun-96	3.4499	11.18	0.0001	0.3086
Jul-96	5.7375	17.56	0.0001	0.3268
Aug-96	5.4212	16.54	0.0001	0.3278
Sep-96	1.7728	5.82	0.0001	0.3046
Oct-96	0.3731	1.20	0.2311	0.3115
HDD63*NPART	0.3718	17.53	0.0001	0.0212
NPART*CDD72	1.5495	48.58	0.0001	0.0319
HDD63*PACKAGE	0.4247	28.77	0.0001	0.0148
CDD72*PACKAGE	0.9830	19.69	0.0001	0.0499
CDD72*PACKAGE*TON	0.3017	20.63	0.0001	0.0146
CDD7*PACK*PSTCA*ENGK	-0.0019	-27.65	0.0001	0.0001
HDD63*SPLIT	0.3789	24.42	0.0001	0.0155
CDD72*SPLIT	0.5524	8.89	0.0001	0.0621
CDD72*TON*SPLIT	0.4125	23.38	0.0001	0.0176
CDD7*PSTC*ENGK*SPLIT	-0.0018	-19.45	0.0001	0.0001

Dependent Variable: kWh/day

Number of Customers: 2,945

Number of Observations: 125,789

R^2= 0.791

Table 4-6
Unit Gross Savings Relative to Prior Conditions
Based on the Load Impact Model
CAC Rebate Program

Program/Subset	Variable	Coefficient	T	SE	Variable Mean Pooled regression data set	Variable Mean Cross-Sectiona Tracking Data (long-run normal	Annual Savings per Unit
							kWh/yea
Packaged	CDD72*PSTCAC94*ENGK*PACKAG	-0.0019	-27.7	0.00007	443.18	558.60	397.8
Spli	CDD72*PSTCAC94*ENGK*SPLIT	-0.0017	-19.5	0.00009	260.01	298.00	195.0

4.4.2 Gross Savings Adjusted for Adders

Table 4-7 shows the adder adjustment as described in section 4.3.2. The results show a substantial understatement of the gross savings in the unadjusted regression estimate. One-eighth of the packaged unit participants and over one-fourth of the split unit participants added CAC systems where there had not been one previously. Correcting for the inclusion of these customers in the regression increases the packaged system gross savings by about one-third, and more then doubles the estimate for split systems.

Table 4-7
CAC Program Unit Gross Savings Adjusted for Adders

	Regression Savings Relative to Old	Cooling UEC, Old Eqt	Fraction of Adders	Adjusted Gross Savings Relative to Old	Program Count
	(kWh/year)	(kWh/year)		(kWh/year)	
A	B	C	D	E	F
Source:	Regression	Regression	Survey	B+D*C	Tracking
Packaged	398	1598	0.125	597	1,850
Split	195	796	0.280	418	2,817
Total	275	1114	0.219	489	4,667

4.4.3 Gross Savings Adjusted to the Program Baseline

Table 4-8 shows the baseline adjustment as described in section 4.3.2. Also shown in the table is the free rider adjustment. The free rider analysis is described below.

Table 4-8
CAC Program Unit Gross Savings Adjusted for Program Baseline and Free Riders

	Unit Savings							
	Savings Relative to Old	Assumed Old SEER	Baseline SEER	Average Participant SEER	(Savings New-Base)/ (Savings New-Old)	Savings Relative to Base	Free Rider Rate	Net Savings
	(kWh/year)					(kWh/year)		(kWh/year)
	A	B	C	D	E	F	G	H
Source:	Regression	Engineering	Federal Standar	Tracking	(1/B-1/D) (1/C-1/D)	ExA	Surveys	(1-G)xF
Packaged	597	8.8	9.7	11.6	0.62	368	0.12	324
Split	418	8.8	10.0	12.0	0.55	230	0.12	202
Program	489	8.8	9.9	11.8	0.58	284	0.12	250

4.4.4 Free Rider Analysis

The free rider analysis is presented in Table 4-9. The table shows the successive set of screens that had to be passed to classify a respondent as a free rider. This analysis gives a free rider rate of 12.0 percent.

Table 4-9
CAC Program Free Rider Analysis

	Survey Question Response	Number of Respondents	Percent of all surveyed	Percent of all who reca rebate
All CAC participants		214	100.0%	
Recalls receiving a rebate for an air conditione	R1=1	158	73.8%	100.0%
AND prior to hearing of PG&E's rebate program, had compared the energy efficiency of alternative air conditioners	R2=1	58	27.1%	36.7%
AND prior to hearing of PG&E's rebate program, had compared the prices of alternative air conditioners	R3=1	43	20.1%	27.2%
AND prior to hearing of PG&E's rebate program, was planning to buy a model with the same energy efficiency	R6=2 (same)	22	10.3%	13.9%
AND if the rebate had not been available would most likely have paid full price for same efficient model	R7=1	19	8.9%	12.0%

4.4.5 Net Savings

Net savings for the CAC program are shown in Table 4-10. These results combine the gross savings from the billing analysis with the adder and baseline adjustments and the free rider estimate from the survey analysis.

Table 4-10
CAC Program Net Savings

	Evaluation Results							Program Claim					
	Customers	kWh/ customer	Total MWh	SE(Total MWh)	kW/ customer	Total MW	SE(Total MW)	Customers	kWh/ customer	Total MWh	Total MW	Realization Rate	
Packaged	1,850	324	599	112	0.3158	0.58	0.11	1,884	234	440	0.43	1.362	
Split	2,817	199	561	105	0.1941	0.55	0.10	2,824	254	719	0.70	0.781	
Total Program	4,667	249	1,160	216	0.2424	1.13	0.21	4,708	246	1,159	1.18	1.001	MWh
												0.958	MW

The table shows that the overall electricity savings estimated by the evaluation are almost identical to the program planning estimates. However, the savings are higher than the planning estimates for packaged units, and lower than the planning estimates for split units.

The primary reason for the lower savings for split units and higher for packaged appears to be the location of the two types of units. The packaged units are found in hotter climates, where usage and corresponding savings are somewhat higher than for a typical customer. By contrast, the split units were found in milder climates, where usage and savings were lower than for a typical customer.

The demand savings are estimated by applying the energy realization rates to the program planning estimates of demand savings. This calculation is done separately for split and packaged units. The planning estimates of demand savings for the two unit types are not quite proportional to the corresponding energy estimates. As a result, the overall demand realization rate is slightly different from the overall energy realization rate.

The standard errors shown in Table 4-10 include the statistical uncertainty in the free rider estimate as well as the regression standard error from the load impact model. The free rider estimate is the dominant source of statistical uncertainty in the net savings estimates.

5 MULTI-FAMILY REBATE PROGRAM

5.1 OVERVIEW

The Multi-Family Properties Rebate Program provides cash incentives for a variety of energy efficient measures in common-use areas of multi-family buildings (e.g., apartments, condominiums, and mobile home parks) whose structures are serviced by PG&E. Rebates are based on the purchase price of the energy upgrade product. In 1994, rebates were approved for 1103 applications in 986 complexes. Most of the rebates involved lighting measures, but some HVAC, water heating, and motors measures were also rebated.

5.2 SUMMARY OF RESULTS

The savings estimated by the program are summarized in Table 5-1.

Table 5-1
Summary of Impact Results
Multi-Family Rebate Program

Component	Evaluation Savings	PG&E Estimate	Realization Rate
Program Totals			
Electric Savings (kWh/yr)	10,967,665	16,642,356	0.66
Electric Savings (kW)	871.5	1,978.4	0.44
Gas Savings (Thm/yr)	61,154	110,306	0.55

The overall electric savings were 66 percent of the program estimate. This estimate is significantly less than one, at the 90 percent confidence level. Key factors for program realization rates falling below one include impacts on the billing analysis of:

- Lighting upgrades that customers undertake at the time of the rebate, thereby increasing their level of lighting service at the expense of a lower post retrofit energy bill; and
- Customers who replace a significant number of burned-out or broken lights at the time of the retrofit which also increases their post-retrofit level of lighting service at the expense of a lower bill.

The methods used to develop the impacts, and the details of the analytic results are presented below.

5.3 EVALUATION METHODOLOGY

Approach to the Billing Analysis

The multi-family common area customers who were candidates for participation in the PG&E multi-family rebate program can be distinguished from the other residential customers in a number of ways:

- In many cases a customer is served through multiple meters with multiple PG&E accounts; accurately identifying and aggregating all the meters affected by a particular audit is difficult;
- Many of the retrofits involve significant change-outs of equipment that can occur over multi-month periods; and
- Locating the customer contact who is knowledgeable about the audit, measures implemented, or other nonprogram site changes can be difficult because of changeover in property managers and physical separation of the property manager from the affected complex.

These factors contributed to a somewhat different modeling approach than that used for the other residential programs. First, a cross-sectional model that relies on annual data was used instead of the pooled time series/cross-sectional model that relies on monthly data. The annual model mitigated problems encountered in aggregating multiple accounts into an accurate monthly billing history (meter read dates for a given site did not always line up). In addition, the annual model was better able to accommodate measure installations that extended over a number of months.

Second, the limited ability to locate the appropriate site contact person at each site precluded the effective use of surveys to identify nonprogram factors that could affect energy use. (For a similar 1993 multi-family study, surveys conducted for 450 sites, but none of the nonprogram variables developed from the surveys were significant in the billing analysis.) The models utilized in this study rely only on billing, weather, and tracking system data.

Finally, because of the significant difficulties in identifying all the PG&E meters that serve the common area of the multi-family complexes, all the participants included in the study were taken from a subset of customers who had received audits. As part of the audit process PG&E collects billing control numbers for all the common area meters at an audited complex.

General Annualized Model

The energy model regression analysis uses a cross-sectional change-in-consumption model specification. Each customer's billing history is divided into three periods: a pre-audit period, a blackout period, and a post-audit period. The blackout period is chosen to be sufficiently large to maximize the probability that the measure installation occurs within this period. Then pre- and post-audit billing data (viewed on an annual basis) are compared as part of the billing analysis.

For the regression models, annual post-retrofit energy consumption per dwelling is explained as a function of annual pre-retrofit consumption per dwelling unit, a variable or variables identifying program participation, and weather variables:

$$Use_{i,Post} = \alpha + \beta_0 Use_{i,Pre} + \beta_1 Part_i + \beta_2 \Delta HDD_i + \beta_3 \Delta CDD_i + \varepsilon_i$$

where:

$Use_{i,Post}$ = post-retrofit period consumption per dwelling unit for customer *i*

$Use_{i,Pre}$ = pre-retrofit period consumption per dwelling unit for customer *i*

$Part_i$ = the engineering-based estimate of program savings from the program tracking system

ΔHDD_i = Change in heating degree days, 65°F base, between the pre-retrofit and the post-retrofit periods for customer *i*

ΔCDD_i = Change in cooling degree days, 70°F base, between the pre-retrofit and the post-retrofit periods for customer *i*

α, β's = estimated parameters

ε_i = random error term

The parameter of interest in this equation is β_1, the coefficient for the program savings variable. When the program savings variable is a 0/1 dummy variable, this coefficient represents the average energy savings per dwelling unit associated with program participation. When the participation variable is expected savings, this parameter represents the estimated realization rate, the fraction of tracking system savings realized in customer bills.

Interpretation as net savings

For each of the multi-family models, the change in bills for program participants is compared against the change in bills for a comparison group. No attempt was made to exclude nonparticipants who had undertaken nonprogram energy efficiency activities. In addition, nonprogram energy efficiency activities were not controlled for in the regression equations. Under these conditions, the nonparticipant comparison group accounts for naturally occurring energy efficiency activity. Thus, the model estimates the net effects of program participation.

Construction of Data Sets for Billing Analysis

As described above, an annual billing analysis was used to directly estimate net rebate program savings by comparing changes in energy use for a participant group against changes in energy use for a comparison group. These groups were defined as follows:

- Participant group: customers who received Multi-Family rebates in 1994, received Multi-Family audits during the 1993-1996 period, and did not participate in any other PG&E rebate program during the 1993-1995 period.

- Nonparticipant comparison group: Multi-Family customers who received audits in the 1993-1996 period but did not participate in any other PG&E rebate program during the 1993-1995 period.

As the study group descriptions indicate, the analysis was limited to a subset of customers, those who received multi-family audits during the 1993-1996 period. This approach was taken because of the significant difficulties in identifying all the PG&E meters that serve the common area of the Multi-Family complexes. As part of the audit process PG&E collects billing control numbers for all the common area meters at an audited complex. In addition, the audits collected information on the number of dwelling units in each complex. Billing and program savings variables were normalized by the number of dwelling units in order to account for large variations in complex size.

Prior to inclusion in the final models, customers were screened for adequacy of billing data (complete billing histories, at least 12 months pre-retrofit data and at least 9 month of post-retrofit data). In addition, customers whose bills had changed by over 70 percent between the pre- and post- periods were eliminated because these changes were considered too large to be handled within the existing model structure. (A relatively loose screen was used for the analysis because it was likely that some large lighting rebate projects could achieve savings of over 50 percent.) Table 5-2 presents the counts of participants and nonparticipants included in the final models.

Table 5-2
Customers in Final Multi-Family Rebate Models

Customer Group	Electric Model
Participants	
Audited in 1994	70
Audited in other years	27
Total Participants	97
Nonparticipants	
Audited in 1994	299
Audited in other years	294
Total Nonparticipants	593

In 1994, only 20 customers installed gas saving measures, and only 6 of these customers received audits during the 1993-1996 period. This number of participants was insufficient to develop independent gas savings estimates using the billing analysis methodology. (Preliminary results showed that a model with all 6 gas participants returned a realization rate of 0.25, and a model with 2 large outlier participants removed returned a realization rate of 2.5. Neither of these results was significant at the 85 percent confidence level.) In the absence of reliable gas billing analysis results, the realization rate for the electric model was used to adjust gas savings.

In order to implement the billing analysis models, annualized bills for the 1995 were compared against annualized bills for 1993. The entire 1994 period was “blacked out” to increase the

likelihood that all the measure installation would be reflected in customer bills. The only dates available in the program tracking database were the rebate application date and the rebate check issue date. These dates do not necessarily correspond to the measure installation period.

Table 5-3 presents the variables utilized in the billing analysis model along with their descriptions.

Table 5-3
1994 Multi-Family Rebate Program - Electric Model Variables

Variable	Description
POSKWHU	Dependent Variable: Post-retrofit (1995) annualized kWh per dwelling unit
PREKWHU	Pre-retrofit (1993) annualized kWh per dwelling unit
KWHSAVU	Annual kWh/unit savings estimates from the tracking system, 0 for nonparticipants
DHDD65I	Annual heating degree days, 65°F base, interacted with a heating index
DCDD70I	Annual cooling degree days, 70°F base, interacted with a cooling index

For the model, heating and cooling degree days variables were interacted with heating and cooling index variables. These variables were added to allow for different weather sensitivity among customers and especially to eliminate heating and cooling responses for customers without heating and/or cooling loads. (Many complexes have lighting-only loads.) The heating index was defined as average winter usage (January/February) divided by average fall usage (October/November). The cooling index was defined as average summer usage (July/August) divided by average spring usage (April/May). An index of 1.2 or less was set to zero.

The estimated electric equation is presented in Table 5-4.

Table 5-4
1994 Multi-Family Rebate Program - Electric Model
Dependent Variable POSKWHU - Post Retrofit kWh/Unit

Variable	Parameter Estimate	Standard Error	t-statistic
INTERCEPT	8.2989	9.8274	0.8440
PREKWHAU	0.9789	0.0053	186.2400
KWHSAVU	-0.5544	0.0561	-9.8790
DHDD65I	0.0093	0.0413	0.2260
DCDD70I	0.7210	0.3886	1.8550
Number of Observations	690		
R^2	0.9806		

For the model, all variables have the appropriate signs and key variables are reasonably significant (t-statistics greater that 1.65 indicate significance at the 90% confidence level). The coefficient on the program savings variable (KWHSAVU) reflects a realization rate of 0.55.

That is, net savings are estimated to be 55 percent of the tracking estimates of gross measure savings.

The evaluation estimate for net therm and kW demand savings also was based on the 0.55 realization rate developed in the electric energy model.

5.4 NET SAVINGS RESULTS

Net program savings are calculated by applying the 0.55 realization rate to gross measure savings estimates from the program tracking system. These results are presented by major end use category in Table 5-5. Overall the program is estimated to be saving 11.0 million kWh, 872 kW, and 0.06 million therms per year.

Table 5-5
1995 Multi-Family Rebate Program - Program Level Savings by End Use

Component	Realization Rate	Tracking System Gross Savings	Net Program Savings	Standard Error	90% Confidence Interval
Lighting					
Electric Savings (kWh/yr)	0.5544	19,626,446	10,880,902	1,101,044	9,069,685 - 12,692,118
Electric Savings (kW)	0.5544	1,399.9	776.1	78.5	646.9 - 905.3
Gas Savings (Thm/yr)	0.5544	0	0	0	0 - 0
HVAC					
Electric Savings (kWh/yr)	0.5544	148,700	82,439	8,342	68,717 - 96,162
Electric Savings (kW)	0.5544	171.0	94.8	9.6	79.0 - 110.6
Gas Savings (Thm/yr)	0.5544	24,653	13,668	1,383	11,393 - 15,943
Miscellaneous					
Electric Savings (kWh/yr)	0.5544	7,800	4,324	438	3,605 - 5,044
Electric Savings (kW)	0.5544	1.1	0.6	0.1	0.5 - 0.7
Gas Savings (Thm/yr)	0.5544	85,654	47,487	4,805	39,582 - 55,391
Program Totals					
Electric Savings (kWh/yr)	0.5544	19,782,946	10,967,665	1,109,823	9,142,006 - 12,793,325
Electric Savings (kW)	0.5544	1,572	871.5	88.2	726.4 - 1,016.6
Gas Savings (Thm/yr)	0.5544	110,307	61,154	6,188	50,975 - 71,334

The evaluation results are compared to PG&E's expected savings in Table 5-5. As the table indicates, the evaluation estimates range between 42 percent and 66 percent of PG&E's Program Planning estimates. Variations in realization rates across end uses and savings components are due to the following:

1. PG&E's net-to-gross ratio for lighting was assumed to be 0.94, while the net-to-gross ratio for HVAC and Miscellaneous was assumed to be 1.0.
2. PG&E decreased its gross kWh savings claims (versus what was contained in tracking system) by about 2.1 million kWh, from 19.8 million kWh to 17.7 million kWh; this affected the lighting and miscellaneous categories.

3. PG&E increased its gross kW savings claims (versus the tracking system) by about 0.5 MW, from 1.6 MW to 2.1 MW; this change affected lighting and HVAC.

Factors (1) and (2) above tended to increase the realization rates in Table 5-6 above the 0.55 rate estimated in the evaluation. Factor (3) tended to decrease the kW realization rates below 0.55.

Table 5-6
1995 Multi-Family Rebate Program - Comparison to PG&E Net Estimates

Component	Evaluation Savings	PG&E Estimate	Realization Rate
Lighting			
Electric Savings (kWh/yr)	10,880,902	16,486,456	0.66
Electric Savings (kW)	776.1	1,754.5	0.44
Gas Savings (Thm/yr)	0	0	-
HVAC			
Electric Savings (kWh/yr)	82,439	148,700	0.55
Electric Savings (kW)	94.8	223.1	0.42
Gas Savings (Thm/yr)	13,668	24,653	0.55
Miscellaneous			
Electric Savings (kWh/yr)	4,324	7,200	0.60
Electric Savings (kW)	0.6	0.8	0.71
Gas Savings (Thm/yr)	47,487	85,653	0.55
Program Totals			
Electric Savings (kWh/yr)	10,967,665	16,642,356	0.66
Electric Savings (kW)	871.5	1,978.4	0.44
Gas Savings (Thm/yr)	61,154	110,306	0.55

Key factors for program realization rates falling below one include impacts on the billing analysis of:

- Lighting upgrades that customers undertake at the time of the rebate, thereby increasing their level of lighting service at the expense of a lower post retrofit energy bill; and
- Customers who replace a significant number of burned-out or broken lights at the time of the retrofit which also increases their post-retrofit level of lighting service at the expense of a lower bill.

A study of the 1993 Multi-Family Rebate Program indicated that lighting upgrades could lower the billing analysis realization rate by about 0.13 versus what would otherwise have occurred if the customer's increased level of service had been accounted for. In addition, replacement of burned-out or broken lights could lower the billing analysis realization rate by another 0.15. If these factors are added to the 0.66 realization rate for lighting (in Table 5-6), the resulting realization rate is 0.94. This estimate is not significantly different from 1.0.

6 REFRIGERATORS

6.1 OVERVIEW

This section presents results of the Pacific Gas & Electric's 1994 Efficient Refrigerator Programs. Results are shown for the following three PG&E programs:

- Efficient Refrigerator Rebate Program (Rebate),
- Refrigerator Salesperson/Dealer Incentive Program (SPIFF), and
- Multiple Refrigerator Rebate Program (Multi).

6.2 PROGRAM DESCRIPTIONS

The PG&E energy efficient refrigerator programs were designed to encourage refrigerator purchasers to save energy by buying new, high efficiency refrigerators. The programs provided incentives for the purchase of refrigerators that consumed less energy than is allowable under federal appliance standards. The amount of incentive offered depended on the rate of energy consumption of the refrigerator relative to the federal energy consumption standard for the refrigerator.

6.2.1 Efficient Refrigerator Rebate Program (Rebate)

The Efficient Refrigerator Rebate Program (Rebate) offered incentives directly to PG&E residential customers during the summer months of June 1994 through August 1994. Table 6-1 presents the relationship between the percentage of energy savings beyond standards to the rebate offered.

Table 6-1
Refrigerator Incentives Offered by Rebate Program

Percentage Energy Savings Beyond Federal Standards	Rebate Amount
15%	$25
20%	$50
25% or more	$75

6.2.2 Refrigerator Salesperson/Dealer Incentive Program (SPIFF)

The Refrigerator Salesperson/Dealer Incentive Program (SPIFF) offered incentives to salespersons and dealers during the non-summer months of 1994 (January - May & September - December). Table 6-2 presents the relationship between the percentage of energy savings beyond standards to the incentive offered.

Table 6-2
Refrigerator Incentives Offered by SPIFF Program

Percentage Energy Savings Beyond Federal Standards	Salesperson/ Dealer Incentive
10% - 14.9%	$10/$3
15% - 19.9%	$15/$5
20% or more	$20/$8

6.2.3 Multiple Refrigerator Rebate Program (Multi)

The Multiple Refrigerator Rebate Program (Multi) offered incentives to property managers and builders who purchased two or more refrigerators. The program ran throughout 1994. Table 6-3 presents the relationship between the percentage of energy savings beyond standards to the rebate offered.

Table 6-3
Refrigerator Incentives Offered by Multi Program

Percentage Energy Savings Beyond Federal Standards	Rebate Amount
15%	$25
20%	$50
25% and more	$75

6.3 SUMMARY OF RESULTS

Table 6-4 summarizes the savings estimated by the evaluation.

Table 6-4
Summary of Impact Estimates

	Evaluation Results				Program Claim				
Program	Number of Units	Net kWh/Unit	Net GWh	Net MW	Number of Units	Net kWh/Unit	Net GWh	Net MW	Realization Rate
Rebate	28,736	151	4.35	0.67	28,751	132	3.79	2.06	1.15
SPIFF	27,023	129	3.49	0.53	28,687	105	3.02	1.64	1.16
Multi	5,884	122	0.72	0.11	12,071	125	1.51	0.82	0.48
Combined	61,643	139	8.56	1.31	69,509	120	8.32	4.53	1.03

6.4 METHODOLOGY

This section discusses the methodology used to evaluate PG&E's 1994 new energy efficient refrigerator programs. The method used to calculate gross savings is consistent with the CADMAC *Protocols and Procedures for the Verification of Costs, Benefits and Shareholder Earnings for Demand-Side Management Programs* (Protocols) for residential refrigeration. Net savings were calculated by applying a net-to-gross ratio to gross savings. The methodology employed followed the procedures approved under PG&E's Retroactive Waiver for 1994 Residential Sector Appliance Efficiency Programs High Efficiency Refrigeration. A copy of the waiver is provided in Appendix C.

6.4.1 Gross Impacts

Gross impacts were calculated using an engineering approach. This approach was validated by the CPUC and is consistent the California Protocols for high efficiency refrigerator impact studies. Savings were based on data contained in PG&E 1994 Refrigerator Rebate Programs tracking system.

Gross Energy Savings

The energy savings were calculated for each refrigerator by subtracting the model's annual energy consumption from the annual energy consumption standard for a model of the same size and attributes. Both annual consumption and federal standards were confirmed through the model numbers by comparing the tracking system databases with the data contained in the CEC's Directory of Certified Refrigerators and Freezers. The total energy savings was calculated by summing the annual energy savings for all confirmed rebated refrigerators.

The equation used to calculate the gross energy is as follows:

$$GEI = \sum_{i}^{nr} \left(kWhStd_i - kWhRtd_i \right)$$

where:

GEI = Gross Energy Impact

$kWh\ Std_i$ = the rated kWh per year consumption of units just meeting the Federal DOE standards, computed by using the attribute characteristics and adjusted volume of the rebated unit

$kWh\ Rtd_i$ = the rated kWh per year consumption of rebated unit

i = for rebated unit I

nr = the total number of rebated units

Gross Load Impacts

The gross load impact for each refrigerator was calculated by applying a normalized refrigerator load factor applicable to the peak load hour to the average refrigerator load. The average load was calculated by dividing the gross energy impacts by 8,760 hour per year.

The equation used to calculate the gross load impact is as follows:

$$GLI = GEI * \frac{NRL}{8760 hr / yr}$$

where:

GLI = Gross Load Impact

NRL = Normalized Refrigerator Load, which is a factor relating the load at a given time to the average annual load = 1.34[1]

6.4.2 Net Impacts

Net impacts were calculated by multiplying a net-to-gross ratio to the gross savings. The net-to-gross ratio was developed for the 1994 Southern California Edison and San Diego Gas and Electric residential refrigerator programs[2]. The net-to-gross ratio was calculated following the general method outlined in the Scoping Study conducted for CADMAC in 1994, with some modifications. The method automatically incorporates the calculation of gross spillover effects and free ridership.

---

[1] Source: *Analysis of SCE and PG&E Refrigerator Load Data, AAG & Associates, Inc*., prepared for the California DSM Measurement Advisory Committee, April 5, 1995.

[2] Residential Appliance Efficiency Incentive Program High Efficiency Refrigeration 1994 First Year Statewide Load Impact Study, prepared for Southern California Edison and San Diego Gas & Electric, by XENERGY, February 1996.

The equation used to calculate the net savings is as follows:

$$NS = GS * NTG$$

where:

NS = Net Savings (kW or kWh)
GS = Gross Savings (kW or kWh)
NTG = Net-To-Gross Ratio = .97

6.4.3 Data Attrition

The refrigerator analysis was based on the last data set provided by PG&E. The number of refrigerators used in the analysis was not equal to the number of records provided by PG&E in the final data set. Two reasons for data attrition were as follows: some records were suspected of being duplicates based on matching name, address, and check numbers; some records did not have make and model numbers, hence it was impossible to ascertain their energy savings. Participant records that did not contain the refrigerator make and model number were considered unconfirmed observations and were consequently dropped from the analysis. Table 6-5 shows the number of refrigerators used based relative to the number of records provided. Overall about 11% of the refrigerator records were excluded from the analysis. Almost all of those records were carryovers from the 1993 program year.

Table 6-5
Refrigerator Record Attrition

Program	Initial Number of Records	Suspected Duplicate Records Removed	Records with Model Numbers	Data Attrition Rate
Rebate	29,001	28,993	28,736	1%
SPIFF	28,706	28,643	27,024	6%
Multi	11,824	11,754	5,884	50%
Combined	69,531	69,390	61,644	11%

6.5 GROSS ENERGY SAVINGS

In Table 6-6, total annual energy consumption data are presented for PG&E's efficient new refrigerator incentive programs.

Table 6-6
Annual Energy Consumption for the PG&E 1994 Efficient New Refrigerator Programs

Program	Number of Refrigerators	Base Usage (from Standards) (kWh/year)	Program Refrigerator Usage (kWh/year)	Gross Energy Savings (kWh/year)
Rebate	28,736	23,414,518	18,922,176	4,486,841
SPIFF	27,023	22,662,114	19,061,602	3,597,056
Multi	5,884	3,713,643	2,972,554	741,089
Combined	61,643	49,790,275	40,956,332	8,824,986

The data show that over 60,000 high efficiency refrigerators were purchased as part of PG&E's programs. The combined savings from all three programs was approximately 8.8 million kilowatt-hours per year.

Table 6-7 provides average per-unit savings for three PG&E 1994 efficient refrigerator programs. These data show that the average high efficiency refrigerator purchased through one of the PG&E's programs saved 143 kilowatt-hours per year. The refrigerator consumes about 18 percent less energy than a comparable model that simply complies with federal appliance efficiency standards.

Table 6-7
Average Savings for the PG&E 1994 Efficient New Refrigerator Programs

Program	Average per-unit Energy Consumption Standards for Program Refrigerators (kWh/year)	Average per-unit Energy Consumption for Program Refrigerators (kWh/year)	Average Annual per-unit Gross Energy Savings (kWh/year)	Average per-unit Percentage Savings
Rebate	815	658	156	19.1%
SPIFF	839	705	133	15.9%
Multi	631	505	126	20.0%
Combined	808	664	143	17.7%

6.5.1 Distribution of Gross Savings by Energy Efficiency Level

Table 6-8 shows the distribution of energy savings by the percentage of energy that was saved. The table reveals that about 26,000 program refrigerators saved 20 percent and about 21,000 program refrigerators saved about 15 percent. This table also illustrates that the program

refrigerators that saved the greatest percentage of energy, more than 25 percent, were units for which the base case federal consumption standards were higher. Base case standards of units that saved more than 25 percent were, on average, about 200 kilowatts per year greater than standards for those units that saved 20 percent.

Table 6-8
Distribution of Program Refrigerator Savings by the Percentage of Energy Savings

Refrigerator Category	Number of Units	Average per-unit Energy Consumption Standards for Program Refrigerators (kWh/year)	Average per-unit Energy Consumption for Program Refrigerator (kWh/year)	Average Annual per-unit Energy Savings (kWh/year)	Total Annual Energy Savings (kWh/year)
Units that save 10%	9,199	817	730	88	809,512
Units that save 15%	21,181	782	662	119	2,520,539
Units that save 20%	25,730	785	626	159	4,091,070
Units that save 25%	5,435	996	745	251	1,364,185
Units that save 30%	98	953	670	283	27,734

Figure 6-1 illustrates that 42 percent of the units purchased consumed 20 percent less than that allotted by federal appliance standards and 34 percent of the units sold saved 15 percent beyond standards. Nine percent of the program refrigerators saved at least 25 percent beyond the standards.

Figure 6-1
Distribution of the Number of Program Refrigerators by Savings Percentage

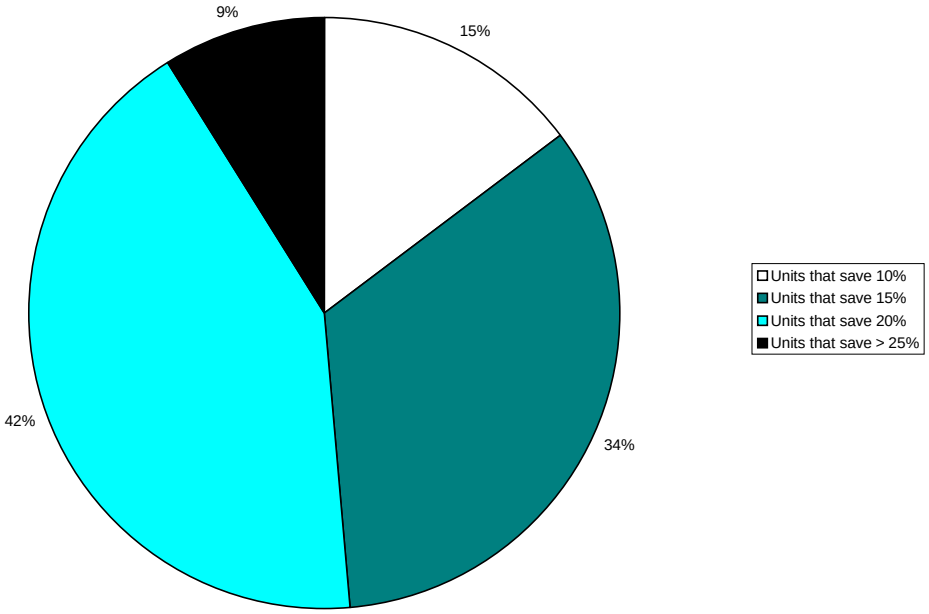
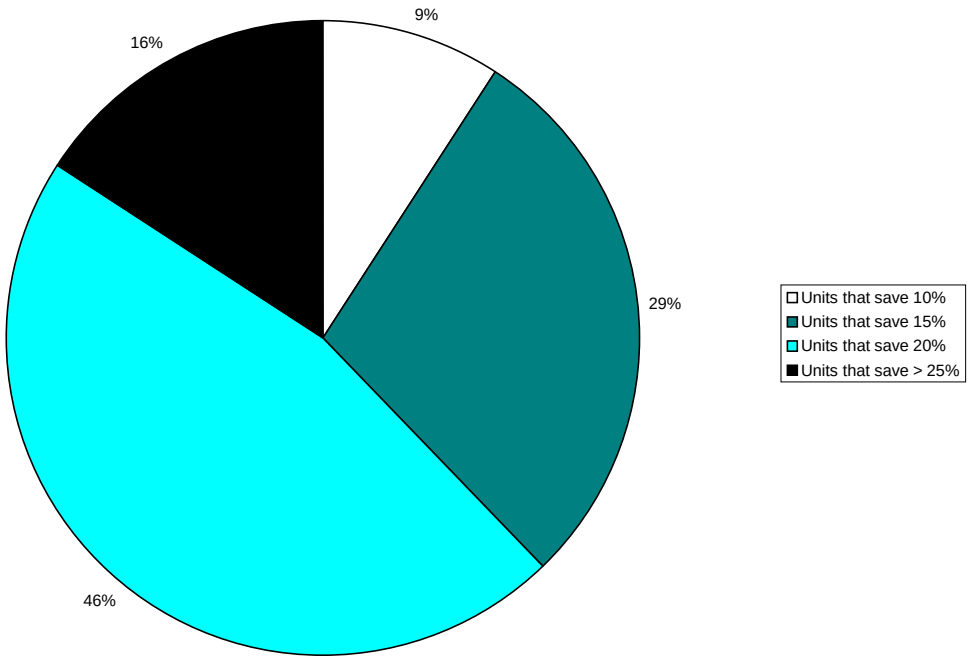


Figure 6-2 illustrates that 46 percent of the energy savings were realized by units that saved 20 percent and that 29 percent of the savings were realized by the units that saved 15 percent beyond federal standards. Sixteen percent of energy savings were realized by the 9 percent of the refrigerators that saved at least 25 percent beyond the federal standards.

Figure 6-2
Distribution of Energy Savings by Savings Percentage



6.5.2 Distribution of Gross Energy Savings by Refrigerator Size Category

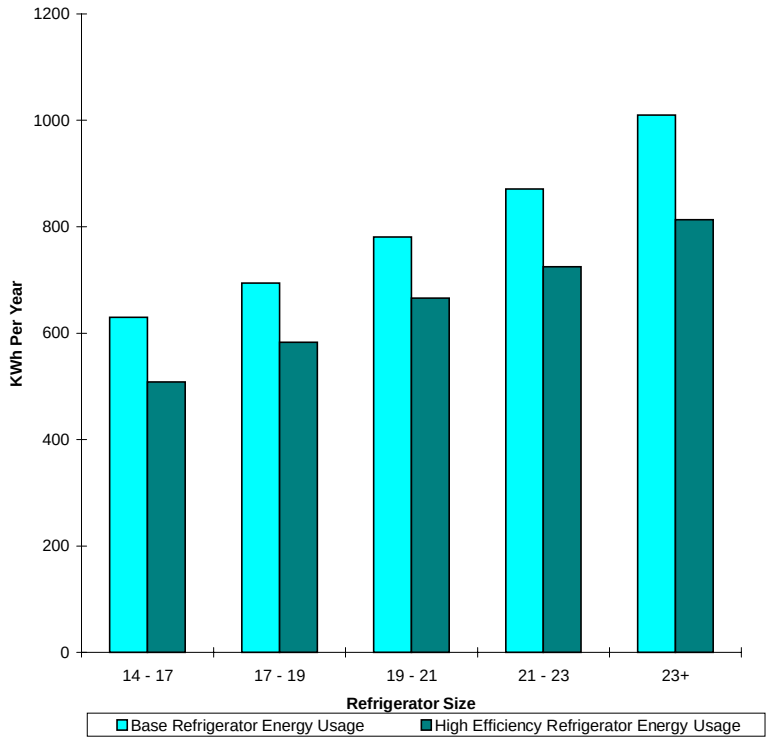
Table 6-9 provides a disaggregation of program energy savings by refrigerator size. As would be expected, the average base case energy consumption increased as size increased, and correspondingly, the average energy savings generally increased as size increased. The greatest percent savings occurs on the largest and smallest units and the least percent savings occurs in the middle sized units 19 - 21 cubic feet. It is interesting to note that there appears to be a loose correlation between the percent of energy savings and the number of units sold in each category.

Table 6-9
Distribution of Program Refrigerator Savings by Refrigerator Size

Refrigerator Size	Number of Units	Average per-unit Energy Consumption Standards for Program Refrigerators (kWh/year)	Average per-unit Energy Consumption for Program Refrigerators (kWh/year)	Average Annual per-unit Gross Energy Savings (kWh/year)	Percentage Energy Savings
14 - 17	14,364	630	508	122	19.4%
17 - 19	10,817	694	583	111	16.0%
19 - 21	9,234	781	666	114	14.6%
21 - 23	10,682	871	725	146	16.8%
23+	16,546	1,010	813	197	19.5%

Figure 6-3 graphically depicts an average energy consumption for program refrigerators relative to standard units of the same size.

Figure 6-3
Average Energy Use Comparison for Program Refrigerators and Relevant Standards



6.6 GROSS LOAD IMPACTS

Table 6-10 presents total peak demand consumption data for PG&E's 1994 new energy efficient refrigerator programs.

Table 6-10
Total Peak Demand Consumption Data for PG&E's 1994 New Efficient Refrigerator Programs

Program	Number of Refrigerators	Standards Base Peak Usage (kW)	Program Refrigerator Peak Usage (kW)	Gross Peak Demand Savings (kW)
Rebate	28,736	3,582	2,894	686
SPIFF	27,023	3,467	2,916	550
Multi	5,884	568	455	113
Combined	61,643	7,616	6,265	1,350

The data show that approximately 61,600 high efficiency refrigerators were purchased as part of PG&E's programs. The peak demand savings is an estimated 1,350 watts.

Table 6-11 provides average per-unit demand savings for PG&E programs. These data show that the average high efficiency refrigerator purchased through one of the programs saved 22 peak watts.

Table 6-11
Peak Demand Savings for PG&E 1994 New Efficient Refrigerator Programs

Program	Average per-unit Standards Based Peak Usage (Watts)	Average per-unit Program Refrigerator Peak Usage (Watts)	Average per-unit Gross Peak Demand Savings (Watts)	Average per-unit Percentage Savings
Rebate	125	101	24	19.1%
SPIFF	128	108	20	15.9%
Multi	97	77	19	20.0%
Combined	124	102	22	17.7%

6.7 NET SAVINGS

Net savings were calculated by applying a net-to-gross ratio of .97 to the gross savings. The net-to-gross ratio was derived by XENERGY under the direction of Southern California by Southern California Edison and San Diego Gas and Electric as part of their joint 1994 residential refrigerator evaluation. The use of the .97 net-to-gross ratio was approved under PG&E's Retroactive Waiver for 1994 Residential Sector Appliance Efficiency Programs High Efficiency Refrigeration.

Applying the 0.97 net-to-gross ratio to the above gross savings estimates produces the results presented in Table 6-12. These data show that the net energy savings for PG&E's new energy efficient refrigerator programs was about 8.56 GWh/year and the peak demand savings was 1.3 MW.

Table 6-12
Net Savings for PG&E's 1994 New Refrigerator Programs

PG&E Programs	Number of Refrigerators	Net Energy Savings (kWh/year)	Average per-refrigerator Net Energy Savings (kWh/year)	Net Peak Demand Savings (kW)	Average per-refrigerator Net Peak Demand Savings (Watts)
Rebate	28,736	4,352,236	151	666	23
SPIFF	27,023	3,489,144	129	534	20
Multi	5,884	718,856	122	110	19
Combined	61,643	8,560,236	139	1,309	21

6.8 MOST POPULAR REFRIGERATORS

Table 6-13 presents the top ten selling refrigerators that were purchased through PG&E's new energy efficient refrigerator programs. The best selling refrigerator was a Hot Point, that saved 129 kWh/year. The second best selling refrigerator was a General Electric, that saved 202 kWh/year. Three of the four best selling models were relatively small, 14.4 cubic feet, with energy savings of about 20 percent beyond federal standards.

Table 6-13
Ten Most Popular Rebated Models in 1994

Rank	Number of Units Purchased	Brand	Manufacturer	Model	Size (Cubic Feet)	Style	Energy Savings (kWh/year)	Percentage Savings
1	3126	Hot Point	GE	CTH14CYT	14.44	TF	129	21%
2	2703	GE	GE	TFH24PRS	23.60	SI	202	20%
3	2316	Hot Point	GE	CTH14CYS	14.40	TF	129	21%
4	1587	Roper	Whirlpool	RT14HD*B*0*	14.38	TF	125	20%
5	1426	GE	GE	TFH22PRS	21.67	SI	191	20%
6	1106	Kenmore	Whirlpool	106.95457**	25.21	SI	262	25%
7	1020	Kitchen Aid	Whirlpool	KSRS25QA**1*	25.09	SI	260	25%
8	1018	Kitchen Aid	Whirlpool	KSRS25QA**0*	25.09	SI	208	20%
9	981	GE	GE	TBH18DAT	18.17	TF	142	20%
10	917	Kitchen Aid	Whirlpool	KTHS20KB**0*	19.92	TF	111	15%

TF = refrigerator-freezer with top mount freezer

SI = side-by-side refrigerator-freezer

6.9 PROGRAM SPECIFIC RESULTS

This subsection provides program specific results disaggregated by refrigerator volume and efficiency level.

6.9.1 Distribution of Gross Energy Savings by Energy Efficiency Level by Program

Table 6-14 shows the distribution of energy saving by percentage of energy that was saved for each program. The table reveals that 85% of the rebate program refrigerators saved 15% or 20% beyond standards. The number of refrigerators purchased at each of those efficiency levels was about the same.

The distribution of refrigerators purchased through the SPIFF program was markedly different with 95% of the refrigerators savings between 10% and 20% beyond standards. The greatest number of refrigerators sold through the SPIFF program saved 10%. As the percent savings increased the number of refrigerators declined. Only 5% of the refrigerators saved over 20%. This result is not unexpected given the incentive structure.

Finally, the multiple refrigerator program had yet another distribution pattern. Almost 92% of the refrigerators acquired through this program were 20% more energy efficient than standards.

Table 6-14
Distribution of Program Refrigerator Savings by the Percentage of Energy Savings

Program	Refrigerator Category	Number of Units	Average per-unit Energy Consumption Standards for Program Refrigerators (kWh/year)	Average per-unit Energy Consumption for Program Refrigerator (kWh/year)	Average Annual per-unit Energy Savings (kWh/year)	Total Annual Energy Savings (kWh/year)
Rebate	Units that save 10%	1	764	684	80	80
Rebate	Units that save 15%	12,195	766	648	117	1,426,815
Rebate	Units that save 20%	12,298	802	639	162	1,992,276
Rebate	Units that save 25%	4,242	994	743	251	1,064,742
SPIFF	Units that save 10%	9,198	817	730	88	809,424
SPIFF	Units that save 15%	8,527	810	686	124	1,057,348
SPIFF	Units that save 20%	8,007	867	692	175	1,401,225
SPIFF	Units that save 25%	1,193	1,005	752	254	303,022
SPIFF	Units that save 30%	98	953	670	283	27,734
Multi	Units that save 15%	459	664	563	102	46,818
Multi	Units that save 20%	5,425	628	500	128	694,400

6.9.2 Distribution of Gross Energy Savings by Refrigerator Size by Program

Table 6-15 shows the distribution of refrigerators as refrigerator volume by program. For the rebate program, the greatest number of refrigerators purchased were large refrigerators, 23 cubic inches or greater. These refrigerators also had the greatest percentage of energy savings at 22% beyond standards. The smallest refrigerators, 14 - 17 cubic inches, also had fairly high energy savings at about 19% beyond standards. Refrigerators in the middle range, 19 - 21 cubic inches, had the lowest percentage energy savings at 16% beyond standards.

The greatest number of refrigerators purchased through the SPIFF program also were large refrigerators, 23 cubic inches or greater. These refrigerators saved 17% beyond standards. Of those refrigerators purchased through the SPIFF program the small refrigerators, 14 - 17 cubic inches, had the greatest percentage savings at 18% beyond standards.

Smaller units, between 14 - 17 cubic inches, representing 96% of the refrigerators purchased, dominated the multiple refrigerator program. These units saved about 20% beyond standards. Most other units saved a much lower percentage of energy relative to standards. Few large units were purchased through this program.

Table 6-15
Distribution of Program Refrigerator Savings by Refrigerator Size

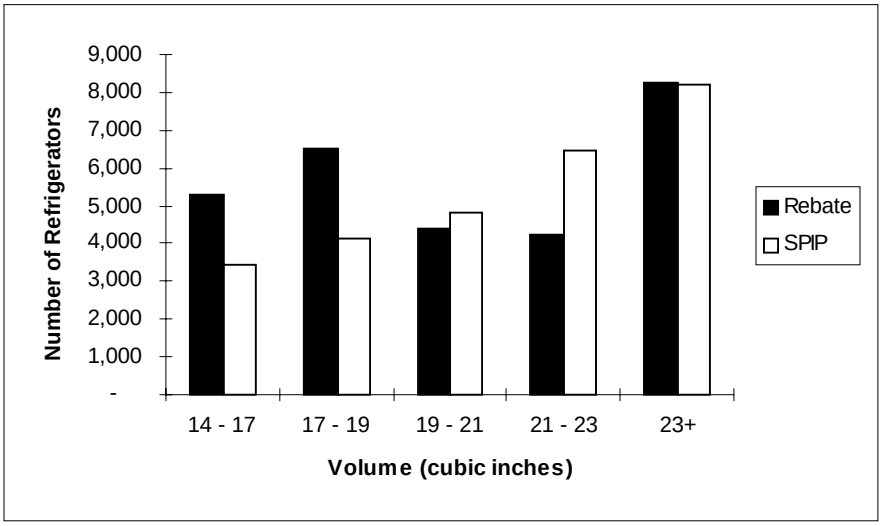
Program	Refrigerator Size	Number of Units	Average per-unit Energy Consumption Standards for Program Refrigerators (kWh/year)	Average per-unit Energy Consumption for Program Refrigerators (kWh/year)	Average Annual per-unit Gross Energy Savings (kWh/year)	Percentage Energy Savings
Rebate	14 - 17	5,309	632	511	122	19%
Rebate	17 - 19	6,486	694	578	116	17%
Rebate	19 - 21	4,393	775	650	125	16%
Rebate	21 - 23	4,239	872	704	168	19%
Rebate	23+	8,309	1018	796	221	22%
SPIFF	14 - 17	3,408	631	516	115	18%
SPIFF	17 - 19	4,124	694	592	102	15%
SPIFF	19 - 21	4,827	786	680	105	13%
SPIFF	21 - 23	6,440	871	739	132	15%
SPIFF	23+	8,224	1003	829	173	17%
Multi	14 - 17	5,647	627	501	126	20%
Multi	17 - 19	207	696	581	115	17%
Multi	19 - 21	14	928	788	140	15%
Multi	21 - 23	3	889	753	136	15%
Multi	23+	13	1005	802	202	20%

6.10 CROSS PROGRAM ANALYSIS

All three PG&E refrigerator programs were very successful in encouraging refrigerator buyers to purchase higher efficiency units. This section looks at the difference in program impacts in an attempt to gain insight that can be applied to future program design.

Most of the comparisons will be made between the Rebate program and the SPIFF program. Both of these programs provided incentives for a similar number of refrigerators over a full range of sizes as shown in Figure 6-4.

Figure 6-4
Number of Refrigerators Purchased by Size for the Rebate and SPIFF Programs



It is important to note that SPIFF type programs grew out of traditional customer rebate programs. SPIFF type programs are designed to ensure that manufactures and distributors continue to make high efficiency refrigerators available during the non “rebate” season. The PG&E customer rebate season in 1994 was during the summer months. Most of the units rebated were purchased in June through August. The SPIFF program refrigerators were purchased during the rest of the year, excluding June through August.

The Multi program was much smaller. Incentives were available throughout the entire year to property managers and builders. Most of the Multi program refrigerators were smaller than those in the other two programs.

The proportion of refrigerators purchased through the Rebate program was 46% of the total and the proportion purchased in the SPIFF program was 44% of the total as illustrated in Figure 6-5. However, as illustrated in Figure 6-6 the portion of total energy savings from the Rebate program was 51% relative to the SPIFF program’s 41% contribution to the total.

Figure 6-5
Portion of Total Refrigerators Purchased by Program

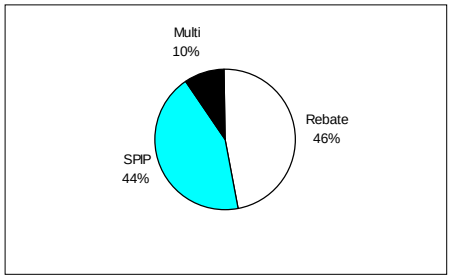


Figure 6-6
Portion of Total Energy Savings by Program

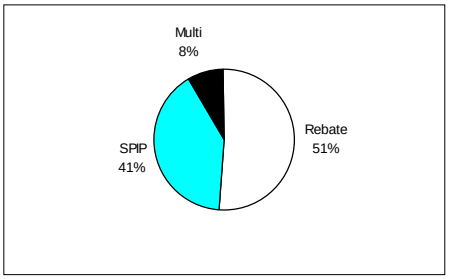
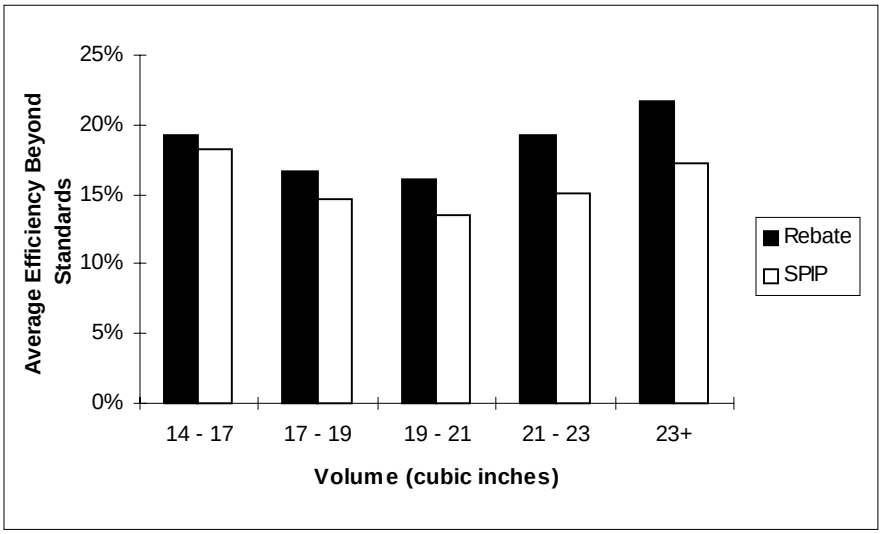


Figure 6-7 show that the Rebate program refrigerators were more energy efficient on average than the SPIFF refrigerators in every size category.

Figure 6-7
Refrigerator Energy Efficiency by Size By Program



These data clearly show that customers will purchase high efficiency refrigerators without direct first cost incentives. They also appear to say that direct customer incentives will purchase more energy efficiency than salesperson/dealer incentives. However, the lower savings from the SPIFF program may have more to do with the incentive structure.

The incentive structure for the Rebate and Multi programs rewards energy efficiency ranging from 15% to 25% above standards. Energy efficiency above 25% beyond standards is given incentives at the 25% level. In contrast, the SPIFF program provided incentives starting at the 10% above standards level and made the maximum incentive available at 20% above standards. Sales people had no additional incentive to sell refrigerators more efficient than 20% above standards. Figure 6-8 shows the number of refrigerators purchased through each program at each incentive level. The figure clearly illustrates why the average per unit savings are lower for the SPIFF program relative to the Rebate program.

Figure 6-8
Refrigerator Purchases by Efficiency Level by Program

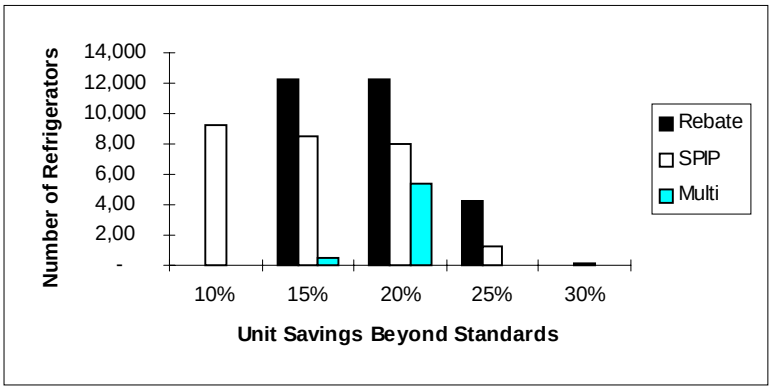


Table 6-16 presents the top five selling refrigerators that were purchased through each of PG&E's new energy efficient refrigerator programs. The table reveals that many of the top selling models were strong performers across programs. The GE Model TFH24PS was the strongest seller in both the Rebate and SPIFF programs. The top two selling Hot Point models in the Multi program were the second best selling models in the Rebate and SPIFF programs. These Hot Point models were the best selling models in their size category.

Table 6-16
Five Most Popular Refrigerator Models Purchased Through Each Program

Program	Rank	Number of Units Purchased	Brand	Manufacturer	Model	Size (Cubic Feet)	Style	Energy Savings (kWh/year)	Percentage Savings
Rebate	1	1,713	GE	GE	TFH24PRS	23.60	SI	202	20%
Rebate	2	1,412	HotPoint	GE	CTH14CYT	14.44	TF	129	21%
Rebate	3	1,149	Roper	Whirlpool	RT14HD*B*0*	14.38	TF	125	20%
Rebate	4	982	KitchenAid	Whirlpool	KSRS25QA**1*	25.09	SI	260	25%
Rebate	5	925	GE	GE	TBH18DAT	18.17	TF	142	20%
SPIFF	1	989	GE	GE	TFH24PRS	23.60	SI	202	20%
SPIFF	2	812	HotPoint	GE	CTH14CYS	14.40	TF	129	21%
SPIFF	3	764	KitchenAid	Whirlpool	KSRS25QA**0*	25.09	SI	208	20%
SPIFF	4	554	GE	GE	TFH22PRS	21.67	SI	191	20%
SPIFF	5	422	Kenmore	Amana	596.95356*	24.90	SI	105	10%
Multi	1	1,531	HotPoint	GE	CTH14CYT	14.44	TF	129	21%
Multi	2	1,312	HotPoint	GE	CTH14CYS	14.40	TF	129	21%
Multi	3	480	Kenmore	Whirlpool	106.93343**	14.38	TF	125	20%
Multi	4	400	Whirlpool	Whirlpool	ET14UK*A*0*	14.38	TF	125	20%
Multi	5	396	Roper	Whirlpool	RT14HD*B*0*	14.38	TF	125	20%

TF = refrigerator-freezer with top mount freezer

SI = side-by-side refrigerator-freezer

The major difference between the Rebate and SPIF program is well illustrated in a comparison of the largest refrigerators. The largest refrigerators offer the greatest opportunity for energy savings on a percentage base, because a greater proportion of high savings units are available at the larger sizes as shown in Table 6-17.

Table 6-17
Number of High Efficiency Refrigerators

Volume (cubic inches)	Number of Efficient Models Available (At Least 10% Beyond Standards)	Number of High Efficiency Models Available (At Least 25% Beyond Standards)	Percentage of High Efficiency Models Relative Efficient Models
14 - 17	114	5	4%
17 - 19	137	11	8%
19 - 21	169	9	5%
21 - 23	257	28	11%
23+	199	40	20%
Combined	876	93	11%

Source: CEC Refrigerator Database

The best selling 23 cubic inch unit is the same for both programs. It saves 20% beyond standards. For those refrigerators with a volume of at least 25 cubic inches, the best selling Rebate program unit was the Kitchen Aid, model number KSRS25QA**1*, made by Whirlpool. It saves 25% beyond standards. The corresponding best selling unit purchased through the SPIFF program was the Kitchen Aid, model number KSRS25QA**0*, also made by Whirlpool. This unit saves 20% beyond standard. Again, incentive structure appears to be an important influence in the degree of savings.

Most of the Multi program refrigerators were 20% more efficient than standards and small. This is not an unexpected result. Smaller refrigerators are typical in rental units. There are very few small refrigerators more efficient than 20% beyond standards in the smaller size range. Finally, the incentive structure probably made the small 20% beyond standards unit less expensive than the base case models. Based on the results of the 1994 CADMAC Measure Cost Studies, the incremental cost for a 20% beyond standards 15 cubic foot refrigerator is about $45. The incentives for the same unit at $50 means that the average incremental cost is negative $5.

More detailed information about the distribution of refrigerator sales throughout the year would provide clearer insight into the importance of customer incentives relative to salesperson/dealer incentives.

A

SURVEY INSTRUMENT

This survey instrument was designed to support impact evaluation of the following programs:

1994

- Central Air Conditioner Rebate Program
- Insulation Rebate Program

1995

- Single Family Energy Management Service Programs (onsite and mail components)
- Home Energy Savings Loan Programs

The evaluation of the 1995 programs is reported separately in a document entitled*: 1995 Residential Direct Assistance and Residential Energy Management Services Impact Evaluation*.

PG&E Residential Programs Impact Evaluation
Survey
(Participants in audit, AC rebate, weatherization rebate, and HESL programs and Nonparticipants)

FINAL

Telephone Survey

Prepared by

XENERGY Inc.

I. INTRODUCTION SECTION

Hello, this is _____, calling from Atlantic Marketing Research. 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 TO CALL LATER. IF ASKED WHO IS SPONSORING THE SURVEY, REPLY, "PG&E."

PSC. PARTICIPANT SCREENER SECTION

PSC1 First, I want to make sure that I reached you at (READ ADDRESS) Is this your correct address?

Yes 1
No (THANK AND TERMINATE)..... 2
Don't know..... 999

PSC2 Is this address your home, a place of business, or both?

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

HH. HOUSEHOLD CHARACTERISTICS SECTION

HH1 How long have you lived at this address [IF NECESSARY, READ LIST] Has it been ..?

- Less than one year 1
- One to two years 2
- Two to three years 3
- Three to five years 4
- Five to ten years 5
- More than ten years 6
- Don't know 999

HH2 Do you plan to move within the next two years?

- Yes 1
- No 2

HH3 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
- Don't Know 999
- Refused 888

HH4 Do you own or rent this residence?

- Own/buying (SKIP TO QUESTION HH6) 1
- Rent/lease 2
- Other (specify)_____ 3
- Refused 888

HH5 Do you pay the electric bill, or is it paid by your building owner/manager?

- Paid by tenant 1
- Paid by building owner/manager 2
- Don't know 3

HH6 Do you have gas service at this location?

- Yes 1
- No (SKIP TO HH8) 2
- Don't know (SKIP TO HH8) 999

HH7 [IF Q. HH4 = '1' SKIP TO Q. HH8] Do you pay the gas bill, or is it paid by your building owner/manager?

Paid by tenant 1
Paid by building owner/manager 2
Don't know 3

HH8 What is the size in square feet of the heated portion of your home?

Number of square feet (SKIP TO SECTION EC) ..... _____
Don't know 1

HH9 What is your best estimate of this area? (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
Don't know 999
Refused 888

EC. ENERGY CONSUMPTION SECTION

EC1 Does your heating system serve only this home or does it serve more than one home or apartment?

- Heating system serves only this home 1
- Heating system serves more than one home or apartment 2
- Don't know 999

EC2 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
- Fuel Oil 4
- Wood, kerosene, or coal 5
- Other (SPECIFY)_____ 6
- Don't know 999

EC3 Do you have a secondary or supplemental heating fuel?

- Yes 1
- No (Skip to EC5) 2
- Don't know 999

EC4 What is your secondary 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
- Fuel Oil 4
- Wood, kerosene, or coal 5
- Other (SPECIFY)_____ 6
- Don't know 999

EC5 What is your water 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
- Electricity 2
- Propane, LPG, or bottled gas 3
- Fuel Oil 4
- Wood, kerosene, or coal 5
- Other (SPECIFY) _____ 6
- Don't know 999

EC6 What type of air conditioning do you usually use in your home?

- Electric central air conditioning (ASK EC7) 1
- Gas central air conditioning (ASK EC7) 2
- Heat pump (ASK EC7) 3
- Electric room or window air conditioning (SKIP TO EC11) 4
- No air conditioning systems in home (SKIP TO EC19) 5
- Other (SPECIFY) _____ (SKIP TO EC19) 6
- Don't know (SKIP TO EC19) 999

EC7 How often do you use your central air conditioner? Would you say it was on ...

- Almost every day during the summer 1
- Most days during the summer 2
- Fewer than half the days during the summer 3
- Only on the very hottest days 4
- Fewer than 10 days per year 5
- Don't know 999

EC8 In the last three years have you used your air conditioner a different amount from what you just told me?

- Yes 1
- No (SKIP TO EC19) 2
- Don't know (SKIP TO EC19) 999

EC9 Approximately in what month and year did you change your use of your central air conditioner?

1. Month **Code example 04 for April** ..... _____
2. Year **Code example 94 for 1994** ..... _____

IF DON'T KNOW, PROBE FOR SEASON AND YEAR. CODE 13 = WINTER, 14 = SPRING, 15 = SUMMER, 16 = FALL. STILL DON'T KNOW = 999

EC10 How often did you use your air conditioner before?

- Almost every day during the summer 1
- Most days during the summer 2
- Fewer than half the days during the summer 3
- Only on the very hottest days 4
- Fewer than 10 days per year 5
- Don't know 999

SKIP TO EC19

EC11 At what cooling level do you typically operate your room air conditioner during the summer? Is it the coolest temperature, medium temperature or warmest temperature?

- Coolest temperature 1
- Medium temperature 2
- Warmest temperature 3
- Don't know (SKIP TO EC15) 999

EC12 In the last three years, have you changed the setting at which you typically operate your room air conditioner?

- Yes 1
- No (SKIP TO EC15) 2
- Don't know (SKIP TO EC15) 999

EC13 Compared to what you said was typical now, how did you used to set your room air conditioner? Was it warmer or cooler than now?

- Used to use a warmer setting 1
- Used to use a cooler setting 2
- Used to use about the same setting (PROBE- inconsistent with EC12) 3
- No air conditioner before 4
- Don't know 999

EC14 Approximately in what month and year did you make that change?

1. Month **Code example 04 for April** ..... _____
2. Year **Code example 94 for 1994** ..... _____

IF DON'T KNOW, PROBE FOR SEASON AND YEAR. CODE 13 = WINTER, 14 = SPRING, 15 = SUMMER, 16 = FALL. STILL DON'T KNOW = 999

EC15 How often do you use your room air conditioner? Would you say it was on ...

- Almost every day during the summer 1
- Most days during the summer 2
- Fewer than half the days during the summer 3
- Only on the very hottest days 4
- Fewer than 10 days per year 5
- Don't know 999

EC16 In the last three years, have you significantly changed the amount that you use your air conditioner during the summer?

- Yes 1
- No (SKIP TO EC19) 2
- Don't know (SKIP TO EC19) 999

EC17 Approximately in what month and year did you change your use of your room air conditioner?

1. Month **Code example 04 for April** ..... _____
2. Year **Code example 94 for 1994** ..... _____

IF DON'T KNOW, PROBE FOR SEASON AND YEAR. CODE 13 = WINTER, 14 = SPRING, 15 = SUMMER, 16 = FALL. STILL DON'T KNOW = 999

EC18 How often did you use your air conditioner before?

Almost every day during the summer 1
Most days during the summer 2
Fewer than half the days during the summer 3
Only on the very hottest days 4
Fewer than 10 days per year 5
Don't know 999

EC19 Now I'd like to ask you to think back to the beginning of 1994. At that time, which of the following appliances or devices did you have in use in your home?

	YES	NO	DK
a. A stand-alone freezer?	1	2	999
b. Two or more refrigerators?	1	2	999
c. An insulating wrap on your water heater?	1	2	999
d. Any compact fluorescent light bulbs?*	1	2	999
e. Any low-flow showerheads?	1	2	999
f. Any standard, non low-flow showerheads?	1	2	999

***[IF NEEDED: These are bulbs that screw into a standard light bulb socket, but are larger with a larger, heavier base, and use about 1/4 as much energy as a standard screw-in light bulb.]

CH. CHANGES SECTION

Complete CH1, CH2, CH3 for each row before going to next row.

CH1 I am going to read you a list of changes that may have occurred in your home that would affect energy use. After each, please tell me whether such a change occurred in the **past three years** (i.e., since the end of 1993).

CH2 FOR EACH 'YES', ASK: Approximately what month and year did that change occur?

CH3 Also ask follow-up before going to next item on list.

	CH1				CH2		CH3
	YES	**NO**	**DK**	**REF**	**Month**	**Year**	**Follow up**
a. Have you acquired a new refrigerator?	1	2	999	888	_____	_____	*
b. Have you acquired a new freezer?	1	2	999	888	_____	_____	*
c. [IF EC6 = 1, 2, or 3] Have you acquired a new central air conditioner, either as a replacement for an old unit or as an addition?	1	2	999	888	_____	_____	*
d. [IF EC6 = 4] Have you acquired a new room air conditioner?	1	2	999	888	_____	_____	*
e. Have you replaced any windows?	1	2	999	888	_____	_____	*
f. [IF EC19a = 'YES'] Have you unplugged a spare refrigerator, or discarded it without replacing it?	1	2	999	888	_____	_____	
g. [IF EC19b = 'YES'] Have you unplugged a freezer, or discarded it without replacing it?	1	2	999	888	_____	_____	
h. Have you replaced any major appliances other than a refrigerator, freezer, or air conditioner?	1	2	999	888	_____	_____	
i. Have you removed or stopped using any other major appliances, without replacing them?	1	2	999	888	_____	_____	
j. Have you installed any ceiling, floor, or wall insulation?	1	2	999	888	_____	_____	*
k. Have you turned down your hot water temperature?	1	2	999	888	_____	_____	*
l. Have you installed any low flow showerheads?	1	2	999	888	_____	_____	*
m. Have you reduced your hot water use in other ways?	1	2	999	888	_____	_____	
n. Have you installed a water heater wrap on your water heater?	1	2	999	888	_____	_____	

o. Have you installed any compact fluorescent light bulbs where you didn't have them before?	1	2	999	888	_____	_____	*
p. Has there been a change in the number of people living in your home at least 6 months out of the year?	1	2	999	888	_____	_____	*
q. Have you changed your main heating fuel?	1	2	999	888	_____	_____	*
r. [IF EC3=1] Have you changed your secondary heating fuel?	1	2	999	888	_____	_____	*
s. Have you changed your water heating fuel?	1	2	999	888	_____	_____	*
t. Have you changed the temperature you keep your home at during the winter?	1	2	999	888	_____	_____	*
u. [IF EC6=1, 2, or 3] Have you changed the temperature you keep your home at during the summer?	1	2	999	888	_____	_____	*
v. Have you added more living space to your home?	1	2	999	888	_____	_____	*

FOLLOW-UP QUESTIONS [ASK FOR EACH 'YES' TO CH1 THAT HAS A STAR ('*') IN THE FOLLOW-UP COLUMN]

a. Did you remove or stop using your old refrigerator at that time?

Yes 1
No 2
Don't Know 999

[GO TO CH1b]

b. [IF EC19a = YES or Don't Know] Did you remove or stop using your old freezer at that time?

Yes 1
No 2
Don't Know 999

[GO TO CH1c]

c. (1) Was this central air conditioner purchased to ...

Replace an existing system 1
Add a new system to your home (SKIP TO CH1c(3)) 2
Other (SPECIFY) (SKIP TO CH1c(3)) _____ 3
Don't know (SKIP TO CH1c(3)) 999

(2) Compared to the old unit, does the new air conditioner have more cooling capacity, less cooling capacity, or the same cooling capacity?

More capacity in new unit 1
Less capacity in new unit 2
Same 3
Don't know 999

(3) Was the new central air conditioner you installed a high efficiency model?

Yes 1
No 2
Don't know 999

(4) What is the new central air conditioner's Seasonal Energy Efficiency Rating (SEER)?

Rating ..... _____
Don't know 999

[GO TO CH1d]

d. (1) Was this room air conditioner purchased to ...

Replace an old unit 1
Add a new unit to your home (SKIP TO CH1d(3)) 2
Other (SPECIFY) (SKIP TO CH1d(3)) _____ 3
Don't know (SKIP TO CH1d(3)) 999

(2) Compared to the old unit, does the new air conditioner have more cooling capacity, less cooling capacity, or the same cooling capacity?

More capacity in new unit 1
Less capacity in new unit 2
Same 3
Don't know 999

(3) Was the new room air conditioner a high efficiency model?

Yes 1
No 2
Don't know 999

(4) What is the new room air conditioner's Seasonal Energy Efficiency Rating (SEER)?

Rating ..... _____
Don't know 999

[GO TO CH1e]

e. Were the new windows a high efficiency type?

Yes 1
No 2
Don't Know 999

[GO TO CH1f]

j. Which type of insulation was it? (CIRCLE ALL THAT APPLY)

Ceiling 1
Wall 2
Floor 3
Don't know 999

[GO TO CH1k]

k. Have you turned it back up since then?

Yes 1
No 2
Don't Know 999

[GO TO CH1l]

l. (1) How many did you add? (Don't know = 999) ..... _____
(2) How many are still in place? (Don't know = 999) ..... _____

[GO TO CH1m]

o. (1) How many did you add? (Don't Know = 999) ..... _____
(2) How many of these are still in place? (Don't Know = 999) ..... _____
(3) Since the installation of the compact fluorescent bulb(s), has your use of the lamps where these bulbs are installed increased, decreased, or remained the same?

Increased 1
Decreased 2
Remained the same 3
Don't know 999

(4) Since the installation of the compact fluorescent bulbs, has your use of the other lamps where these bulbs are NOT installed increased, decreased, or remained the same?

Increased 1
Decreased 2
Remained the same 3
Don't know 999

[GO TO CH1p]

p. (1) Did the number of people increase or decrease?

Increased 1
Decreased 2

(2) By how many people? ..... _____

[GO TO CH1q]

q. What was your main heating fuel before? IF GAS, PROBE: Is that natural gas from a utility, or is it bottled gas such as propane or LPG? DO NOT READ LIST. ACCEPT ONLY ONE RESPONSE.

Natural gas 1
Electric 2
Propane or bottled gas 3
Fuel oil 4
Wood, kerosene, or coal 5
Other (SPECIFY) _____ 6
Don't know 999

[GO TO CH1r]

r. What was your secondary heating fuel before? IF GAS, PROBE: Is that natural gas from a utility, or is it bottled gas such as propane or LPG? DO NOT READ LIST. ACCEPT ONLY ONE RESPONSE.

None 0
Natural gas 1
Electric 2
Propane or bottled gas 3
Fuel oil 4
Wood, kerosene, or coal 5
Other (SPECIFY)_____ 6
Don't know 999

[GO TO CH1s]

s. What was your water heating fuel before? 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
Electricity 2
Propane, LPG, or bottled gas 3
Fuel Oil 4
Wood, kerosene, or coal 5
Other (SPECIFY) _____ 6
Don't know 999

[GO TO CH1t]

t. Is your new temperature setting warmer or colder than the old one?

Warmer 1
Colder 2
Don't know 999
By how many degrees F? ..... _____

[GO TO CH1u]

u. Is your new temperature setting warmer or colder than the old one?

Warmer 1
Colder..... 2
Don't know..... 999
By how many degrees F?..... _____

[GO TO CH1v]

v. How many square feet?..... _____

GO TO SECTION R (Rebate Program Participants), A (Audit Participants with no Rebates), HESL (HESL participants with no rebate or audit) or AM (Nonparticipants)

NONPARTICIPANTS SKIP TO SECTION AM.

QUESTIONS FOR 1994 REBATE PROGRAM PARTICIPANTS ONLY. [OTHERS SKIP TO SECTION AU]

[Questions R1 - R9 for Central Air Conditioner Rebate Participants Only]

Our records indicate that you received a rebate from PG&E in 1994 for a central air conditioner.

R1 Do you recall receiving a rebate for an air conditioner?

Yes 1
No 2
Don't know 999

R2 Prior to hearing of PG&E's rebate program, had you compared the energy efficiency of alternative air conditioners?

Yes 1
No 2
Don't know 999

R3 Prior to hearing of PG&E's rebate program, had you compared the prices of alternative air conditioners?

Yes 1
No 2
Don't know 999

R4 Prior to hearing of PG&E's rebate program, were you planning to buy an air conditioner at all?

Yes 1
No [SKIP TO R7] 2
Don't know 999

R5 Prior to hearing of PG&E's rebate program, were you planning to buy a model with the same cooling capacity, more capacity, or less capacity than the one you bought?

Same 1
More 2
Less 3
Don't know 999

R6 Prior to hearing of PG&E's rebate program, were you planning to buy a model with the same energy efficiency as the one you purchased with the program rebate, or one with a lower efficiency?

Lower 1
Same 2
Don't know 999

R7 If the rebate had not been available would you most likely have ....

- Paid the full price for the same efficient model without the rebate 1
- Purchased a less expensive standard efficiency model..... 2
- Not installed a new model 3
- Don't Know 999

R8 Have you installed your rebated air conditioner at this address?

- Yes [SKIP TO Insulation Rebate questions] 1
- No 2
- Don't know..... 999

R9 Why haven't you installed the rebated air conditioner at this address?

- Never got around to it..... 1
- Didn't need it 2
- Didn't know how 3
- Didn't think it would do much good 4
- Installed it at another address 5
- Other (Specify) _____ 6
- Don't Know 999

[Questions for Insulation Rebate Participants OTHERS SKIP TO SECTION AU]

Our records indicate you received a rebate from PG&E in 1994 for (ceiling/wall/floor) insulation.

R10 Do you recall receiving a rebate for insulation?

- Yes 1
- No..... 2
- Don't know..... 999

R11 Prior to hearing about PG&E's rebate program, were you planning to install insulation that year?

- Yes 1
- No (SKIP TO R13) 2
- Don't know (SKIP TO R13) 999

R12 At that time, had you asked for estimates for this work from a contractor or insulation supplier?

- Yes 1
- No..... 2
- Don't know..... 999

R13 If the rebate had not been available, would you most likely have...

Installed the same amount of insulation anyway, without a rebate, within one year . 1
Installed the same amount of insulation without a rebate more than one year later . 2
Not installed any additional insulation 3
Don't know..... 999

AU. QUESTIONS FOR AUDIT PROGRAM PARTICIPANTS ONLY [OTHERS SKIP TO SECTION HESL]

Our records indicated that you received an Energy Savings Plan Survey from PG&E during 1995.

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.

AU1 Do you recall having that survey done?

Yes 1
No (SKIP TO SECTION AM) 2
Don't know (SKIP TO SECTION AM) 999

COMPLETE EACH COLUMN FOR EACH MEASURE REPORTED ADOPTED AT Q CH1.	**IF CH1a = YES and CH1a Follow-up = YES**	**IF CH1b = YES and CH1b Follow-up = YES**	**IF CH1f or CH1g = YES**	**IF CH1j = YES**	**IF CH1m = YES**	**IF CH1n = YES**
	A. Replacing a Refrigerator	**B. Replacing a Freezer**	**C. Unplugging or discarding refrigerator/ freezer**	**D. Installing Low-Flow Showerheads**	**E. Installing Water Heater Wrap**	**F. Installing Compact Fluorescent Bulbs**
AU2 Did you do [energy efficiency measure] before or after you had the (mail/onsite) survey and recommendations from PG&E?	Before.....1 (Skip to next measure) After.....2 DK 999	Before.....1 (Skip to next measure) After.....2 DK 999	Before.....1 (Skip to next measure) After.....2 DK 999	Before .....1 (Skip to next measure) After .....2 DK 999	Before.....1 (Skip to next measure) After.....2 DK 999	Before .....1 (Skip to next measure) After .....2 DK 999
AU3 Prior to receiving the (mail/onsite) survey from PG&E, were you aware of the energy savings advantages of *[energy efficiency measure]*?	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999
AU4 Prior to receiving the (mail/onsite) survey from PG&E, were you aware of the cost of *[energy efficiency measure]*?	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999
AU5 Prior to receiving the (mail/onsite) survey from PG&E, were you planning on *[energy efficiency measure]*?	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999	Yes .....1 No.....2 DK 999	Yes.....1 No .....2 DK 999
AU6 If you had not received the (mail/onsite) survey from PG&E, what would you most likely have done? *[energy efficiency measure]* at the same time as you did..... 1 *[energy efficiency measure]* within one year of when you did..... 2 *[energy efficiency measure]* more than a year later ..... 3 installed fewer *[energy efficiency measures]* ..... 4 not done *[energy efficiency measure]* at all ..... 5 Don't know ..... 999 [GO TO NEXT MEASURE OR SECTION HESL, IF NONE]	.....1 .....2 .....3 //////////////// 5 999	.....1 .....2 .....3 //////////////// 5 999	.....1 .....2 .....3 //////////////// 5 999	.....1 .....2 .....3 .....4 .....5 999	.....1 .....2 .....3 //////////////// 5 999	.....1 .....2 .....3 .....4 .....5 999

*If had more than one survey, was it before or after the earliest?

HESL. ASK FOR HESL PARTICIPANTS ONLY. OTHERS SKIP TO SECTION AM.

Our records indicate that PG&E assisted you with a loan for efficient (air conditioner/insulation/windows). PG&E provided a loan guarantee and helped you get a lower interest rate.

ASK HELS1-HESL17 FOR HESL AIR CONDITIONER PARTICIPANTS ONLY
HESL INSULATION PARTICIPANTS WITHOUT HESL AIR CONDITIONER SKIP TO HESL 18.
HESL WINDOW PARTICIPANTS WITHOUT HESL AIR CONDITIONER OR INSULATION SKIP TO HESL25.

HESL1 Do you recall receiving loan assistance from PG&E for an air conditioner?

- Yes 1
- No 2
- Don't know 999

HESL2 How did you first hear about PG&E's loan program (ROTATE START)?

- Air conditioning contractor or salesperson 1
- Insert in bill from PG&E 2
- PG&E's SEL phone line 3
- Newspaper, magazine, radio, or TV ads 4
- Friend or acquaintance 5
- Other (specify)_____ 8
- Don't Know 999

HESL3 Prior to hearing of the loan assistance program, were you planning to buy an air conditioner at all that year?

- Yes 1
- No [SKIP TO HESL11] 2
- Don't know 999

HESL4 Prior to hearing of PG&E's loan assistance program, had you compared the <u>energy efficiency</u> of alternative air conditioners?

- Yes 1
- No 2
- Don't know 999

HESL5 Prior to hearing of PG&E's loan assistance program, had you compared the <u>prices</u> of alternative air conditioners?

- Yes 1
- No 2
- Don't know 999

HESL6 Prior to hearing of PG&E's loan assistance program were you planning to obtain a loan for the air conditioner?

Yes 1
No (GO TO HESL9) 2
Don't know 999

HESL7 Had you looked into financing options?

Yes 1
No 2
Don't know 999

HESL8 Why did you choose PG&E's HESL loan assistance? (ROTATE START - ACCEPT MULTIPLE RESPONSES)

Shorter processing time 1
Easy paperwork 2
PG&E certified the contractor 3
Thought I might not be approved for a different loan 4
Lower interest rate 5
Contractor suggested it 6
Already got turned down for a different loan 7
Other (Specify)_____ 8
Don't Know 999

HESL9 Prior to hearing of PG&E's loan assistance program, were you planning to buy an air conditioner of the same size, in tons, or one of more tons or less tons than the one you bought? (Higher tons means it can cool a bigger space.)

Same 1
More 2
Less 3
Don't know 999

HESL10 Prior to hearing of PG&E's loan assistance program, were you planning to buy an air conditioner with the same energy efficiency as the one you purchased with the program loan assistance, or one with a lower efficiency? (Higher efficiency means it uses less energy for the same amount of cooling.)

Lower 1
Same 2
Don't know 999

HESL11 Did your air conditioning contractor or salesperson explain the higher efficiency of the air conditioners that qualified for PG&E's loan assistance compared to other air conditioners?

Yes 1
No 2
Don't know 999

HESL12 At the time you made the decision to purchase this particiular air conditioner, did you understand this efficiency requirement for the loan assistance?

Yes 1
No 2
Don't know 999

HESL13 Did your contractor or salesperson explain the difference in price between the air conditioner that qualified for PG&E's loan assistance and other air conditioners?

Yes 1
No 2
Don't know 999

HESL14 At the time you made the decision to purchase this particular air conditioner, did you understand this price difference?

Yes 1
No 2
Don't know 999

HESL15 If the loan assistance from PG&E had not been available would you most likely have ....

Bought the same efficient air conditioner with a different loan, within one year 1
Bought the same efficient air conditioner without a loan, within one year..... 2
Purchased a less expensive standard efficiency air conditioner..... 3
Not installed a new air conditioner that year 4
Other (Specify)_____ 8
Don't Know..... 999

HESL16 Have you installed your new air conditioner at this address?

Yes [SKIP TO BOX INS]
No 2
Don't know 999

HESL17 Why haven't you installed the new air conditioner at this address?

Never got around to it 1
Didn't need it 2
Didn't know how..... 3
Didn't think it would do much good 4
Installed it at another address..... 5
Other (Specify)_____ 6
Don't Know..... 999

BOX INS
ASK HESL18-HESL25 FOR INSULATION PARTICIPANTS ONLY
HESL WINDOWS PARTICIPANTS WITHOUT INSULATION SKIP TO HESL26.
OTHERS SKIP TO SECTION AM

HESL18 Do you recall receiving loan assistance from PG&E for insulation?

- Yes 1
- No 2
- Don't know 999

HESL19 How did you first hear about PG&E's loan program (ROTATE START)?

- Insulation contractor or salesperson 1
- Insert in bill from PG&E 2
- PG&E's SEL phone line 3
- Newspaper, magazine, radio, or TV ads 4
- Friend or acquaintance 5
- Other (specify)_____ 8
- Don't Know 999

HESL20 Prior to hearing of the loan assistance program, were you planning to buy insulation at all that year?

- Yes 1
- No [SKIP TO HESL25] 2
- Don't know 999

HESL21 Prior to hearing of PG&E's loan assistance program, had you asked for estimates for this work from a contractor or insulation supplier?

- Yes 1
- No 2
- Don't know 999

HESL22 Prior to hearing of PG&E's loan assistance program were you planning to obtain a loan for the insulation?

- Yes 1
- No (GO TO HESL25) 2
- Don't know 999

HESL23 Had you looked into financing options?

- Yes 1
- No 2
- Don't know 999

HESL24 Why did you choose PG&E's HESL loan assistance? (ROTATE START - ACCEPT MULTIPLE RESPONSES)

- Shorter processing time 1
- Easy paperwork 2
- PG&E certified the contractor 3
- Thought I might not be approved for a different loan 4
- Lower interest rate 5
- Contractor suggested it 6
- Already got turned down for a different loan 7
- Other (Specify)_____ 8
- Don't Know 999

HESL25 If the loan assistance from PG&E had not been available, would you most likely have...

- Installed the same amount of insulation anyway, with a different loan within one year 1
- Installed the same amount of insulation anyway, without a loan, within one year 2
- Installed the same amount of insulation more than one year later 3
- Not installed any additional insulation 4
- Other (Specify)_____ 8
- Don't know 999

ASK HESL26-HESL38 FOR WINDOW HESL PARTICIPANTS ONLY - OTHERS SKIP TO SECTION AM

HESL26 Do you recall receiving loan assistance from PG&E for energy efficient windows?

- Yes 1
- No 2
- Don't know 999

HESL27 How did you first hear about PG&E's loan program (ROTATE START)?

- Windows contractor or salesperson 1
- Insert in bill from PG&E 2
- PG&E's SEL phone line 3
- Newspaper, magazine, radio, or TV ads 4
- Friend or acquaintance 5
- Other (specify) _____ 8
- Don't Know 999

HESL28 Prior to hearing of the loan assistance program, were you planning to buy new windows at all that year?

- Yes 1
- No [SKIP TO HESL34] 2
- Don't know 999

HESL29 Prior to hearing of PG&E's loan assistance program, were you planning to install the particular type of energy efficient windows you ended up installing with the loan assistance?

Yes 1
No 2
Don't know 999

HESL30 Prior to hearing of PG&E's loan assistance program, had you asked for estimates from a contractor or window supplier?

Yes 1
No 2
Don't know 999

HESL31 Prior to hearing of PG&E's loan assistance program were you planning to obtain a loan for the windows?

Yes 1
No (GO TO HESL34) 2
Don't know 999

HESL32 Had you looked into financing options?

Yes 1
No 2
Don't know 999

HESL33 Why did you choose PG&E's HESL loan assistance? (ROTATE START - ACCEPT MULTIPLE RESPONSES)

Shorter processing time 1
Easy paperwork 2
PG&E certified the contractor 3
Thought I might not be approved for a different loan 4
Lower interest rate 5
Contractor suggested it 6
Already got turned down for a different loan 7
Other (Specify)_____ 8
Don't Know 999

HESL34 Did your windows contractor or salesperson explain the higher efficiency for the windows that qualified for PG&E's loan assistance compared to other energy efficient windows?

Yes 1
No 2
Don't know 999

HESL35 At the time you made the decision to purchase these particular windows, did you understand this efficiency requirement for the loan assistance?

Yes 1
No 2
Don't know 999

HESL36 Did your contractor or salesperson explain the difference in price between the windows that qualified for PG&E's loan assistance and other energy efficient windows?

Yes 1
No 2
Don't know 999

HESL37 At the time you made the decision to purchase these particular windows, did you understand this price difference?

Yes 1
No 2
Don't know 999

HESL38 If the loan assistance from PG&E had not been available, would you most likely have...

Installed the same high efficiency windows with a different loan within one year? 1
Installed the same high efficiency windows without a loan within one year? 2
Installed lower efficiency windows? 3
Not installed any new windows that year? 4
Other (Specifiy) _____ 8
Don't know 999

AM. ATTITUDE MEASURES FOR USE IN MODEL SECTION

I'd like to ask a few questions about your general preferences and lifestyle. I will read a short series of statements. Using a scale of 1 to 5, where 5 means you strongly agree and 1 means you strongly disagree, please indicate to what extent you agree or disagree with these statements. [ROTATE START]

AM1 I make sure to compare the energy efficiency ratings of different models when I buy a major appliance such as an air conditioner, refrigerator, stove, water heater, clothes washer or dryer.

AM2 I recycle as much material as I can through programs in my community and at my workplace.

AM3 I spend much of my free time doing fix-up projects around the house.

AM4 I like to buy new kinds of home electronics products such as VCRs and compact disc players when they first come out.

AM5 I enjoy telling my friends about new kinds of products I have tried.

AM6 I am very particular about the way my home furnishings look.

AM7 On a scale of 1 to 5 where 1 is never and 5 is almost always, how often do you use coupons when you shop at the supermarket?

1 (never) 1
2 2
3 3
4 4
5 (almost always) 5
Don't Know 98

ANSWER GRID FOR AM1 - AM6

	AM1	AM2	AM3	AM4	AM5	AM6
Strongly disagree	1	1	1	1	1	1
	2	2	2	2	2	2
Neither agree nor disagree	3	3	3	3	3	3
	4	4	4	4	4	4
Strongly agree	5	5	5	5	5	5
Don't Know	99	99	99	99	99	99

D. DEMOGRAPHICS SECTION

These final questions are for comparison purposes only.

D1 Including yourself, how many people live in your home at least six months of the year?

Number of persons..... _____

D2 How many of these persons are children under age 18?

Number of persons..... _____
Don't know..... 999
Refused..... 888

D3 How many of these persons are over 65?

Number of persons..... _____
Don't know..... 999
Refused..... 888

D4 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..... 888

D5 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..... 888

D6. Which of the following categories best describes your total household income during 1995, 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 888

D7 Record gender of respondent

Male 1
Female 2

D8 On a scale of zero to ten, with ten meaning a very favorable feeling and zero meaning a very unfavorable feeling, and five meaning not particularly favorable or unfavorable, I'd like you to rate your feelings towards PG&E.

Record number ..... _____
Don't know 999
Refused 888

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

B

CADMAC PROTOCOL TABLE 6

- Weatherization Retrofit Incentives
  - Heating
  - Heating and Cooling
- Appliance Efficiency Incentives
  - Heating and Cooling
  - Lighting
  - Refrigeration

M&E PROTOCOLS TABLE 6
Residential Weatherization Incentives
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Heating

1. Average Participant Group and Average Comparison Group												
A. Pre-install usage:	Pre-install kW	na										
	Pre-install kWh	na										
	Pre-install Therms	na										
	Base kW	na										
	Base kWh	na										
	Base Therms	na										
	Base kW/ designated unit of measurement	na										
	Base kWh/ designated unit of measurement	na										
	Base Therms/ designated unit of measurement	na										
B. Impact year usage:	Impact Yr kW	na										
	Impact Yr kWh	na										
	Impact Yr Therms	na										
	Impact Yr kW/designated unit	na										
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**				
	Impact Yr Therms/designated unit	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	0	0	0	0	0	0	0	0	0	0	
	A. ii. Load Impacts - kWh	73,854	58,861	18,390	129,317	1,696	116,027	30,641	117,067	14,322	103,400	
	A. iii. Load Impacts - Therms	89,067	70,986	76,851	101,282	50,298	91,675	79,550	98,584	54,868	87,105	
	B. i. Load Impacts/designated unit - kW	0	0	0	0	0	0	0	0	0	0	
	B. ii. Load Impacts/designated unit - kWh	32.7	26.1	8.1	57.3	0.8	51.4	13.6	51.8	6.3	45.8	
	B. iii. Load Impacts/designated unit - Therms	39.4	31.4	34.0	44.9	22.3	40.6	35.2	43.7	24.3	38.6	
	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	0	0	0	0	0	0	0	0	0	0	
	D.A. ii. Load Impacts - kWh, realization rate	0.224	0.192	0.056	0.392	0.006	0.378	0.093	0.355	0.047	0.337	
	D.A. iii. Load Impacts - Therms, realization rate	0.197	0.169	0.170	0.224	0.120	0.218	0.176	0.218	0.131	0.207	
	D.B. i. Load Impacts/designated unit - kW, real rate	0	0	0	0	0	0	0	0	0	0	
	D.B. ii. Load Impacts/designated unit - kWh, real rate	3.919	3.359	0.976	6.863	0.097	6.621	1.626	6.212	0.817	5.900	
	D.B. iii. Load Impacts/designated unit - Therms, real rate	3.456	2.962	2.982	3.930	2.099	3.825	3.087	3.825	2.289	3.634	
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**			
	A. i. Average Load Impacts - kW	na		na	na			na	na			
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na			
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na		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	2,258	Number of Dwelling Units									
	B. Number of measures installed by all program participants in the 12 months of the program year	2,258										
	C. Number of measures installed by Comp Group	na										

7. Market Segment Data A. Distribution by CEC climate zone	**Zone**	**Percentage**
	1	2.93%
	2	6.91%
	3	21.64%
	4	43.73%
	5	11.40%
	6	9.87%
	7	2.85%
	8	0.25%
	9	0.02%
	10	0.40%

Revised

M&E PROTOCOLS TABLE 6
Residential Weatherization Incentives
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Heating and Cooling

1. Average Participant Group and Average Comparison Group											
A. Pre-install usage:	Pre-install kW	na									
	Pre-install kWh	na									
	Pre-install Therms	na									
	Base kW	na									
	Base kWh	na									
	Base Therms	na									
	Base kW/ designated unit of measurement	na									
	Base kWh/ designated unit of measurement	na									
	Base Therms/ designated unit of measurement	na									
B. Impact year usage:	Impact Yr kW	na									
	Impact Yr kWh	na									
	Impact Yr Therms	na									
	Impact Yr kW/designated unit	na									
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	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	588	469	353	823	209	729	405	772	266	671
	A. ii. Load Impacts - kWh	373,026	297,302	223,856	522,195	132,555	462,048	256,804	489,248	168,943	425,660
	A. iii. Load Impacts - Therms	93,426	74,460	80,613	106,239	52,760	96,161	83,443	103,409	57,553	91,368
	B. i. Load Impacts/designated unit - kW	0.222	0.177	0.133	0.311	0.079	0.275	0.153	0.291	0.101	0.253
	B. ii. Load Impacts/designated unit - kWh	140.8	112.2	84.5	197.1	50.0	174.4	96.9	184.6	63.8	160.6
	B. iii. Load Impacts/designated unit - Therms	35.3	28.1	30.4	40.1	19.9	36.3	31.5	39.0	21.7	34.5
	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	0.249	0.220	0.149	0.348	0.098	0.342	0.171	0.326	0.125	0.315
	D.A. ii. Load Impacts - kWh, realization rate	0.225	0.200	0.135	0.316	0.089	0.310	0.155	0.296	0.113	0.286
	D.A. iii. Load Impacts - Therms, realization rate	0.711	0.630	0.613	0.808	0.446	0.813	0.635	0.787	0.487	0.772
	D.B. i. Load Impacts/designated unit - kW, real rate	0.797	0.706	0.478	1.116	0.315	1.097	0.549	1.045	0.401	1.010
	D.B. ii. Load Impacts/designated unit - kWh, real rate	0.722	0.639	0.433	1.011	0.285	0.994	0.497	0.947	0.363	0.915
	D.B. iii. Load Impacts/designated unit - Therms, real rate	2.277	2.016	1.965	2.589	1.429	2.604	2.034	2.520	1.559	2.474
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	na		na	na			na	na		
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na		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	2,650	Number of Dwelling Units								
	B. Number of measures installed by all program participants in the 12 months of the program year	2,650									
	C. Number of measures installed by Comp Group	na									

7. Market Segment Data	A. Distribution by CEC climate zone	**Zone**	**Percentage**
		1	2.93%
		2	6.91%
		3	21.64%
		4	43.73%
		5	11.40%
		6	9.87%
		7	2.85%
		8	0.25%
		9	0.02%
		10	0.40%

Revised

M&E PROTOCOLS TABLE 6
Residential Weatherization Retrofit Incentives
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Misc. Wtr Heat

1. Average Participant Group and Average Comaprison Group											
A. Pre-install usage:	Pre-install kW	na									
	Pre-install kWh	na									
	Pre-install Therms	na									
	Base kW	na									
	Base kWh	na									
	Base Therms	na									
	Base kW/ designated unit of measurement	na									
	Base kWh/ designated unit of measurement	na									
	Base Therms/ designated unit of measurement	na									
B. Impact year usage:	Impact Yr kW	na									
	Impact Yr kWh	na									
	Impact Yr Therms	na									
	Impact Yr kW/designated unit	na									
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	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	0	0	na	na	na	na	na	na	na	na
	A. ii. Load Impacts - kWh	0	0	na	na	na	na	na	na	na	na
	A. iii. Load Impacts - Therms	0	0	na	na	na	na	na	na	na	na
	B. i. Load Impacts/designated unit - kW	na	na	na	na	na	na	na	na	na	na
	B. ii. Load Impacts/designated unit - kWh	na	na	na	na	na	na	na	na	na	na
	B. iii. Load Impacts/designated unit - Therms	na	na	na	na	na	na	na	na	na	na
	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	na	na	na	na	na	na	na	na	na	na
	D.A. ii. Load Impacts - kWh, realization rate	na	na	na	na	na	na	na	na	na	na
	D.A. iii. Load Impacts - Therms, realization rate	na	na	na	na	na	na	na	na	na	na
	D.B. i. Load Impacts/designated unit - kW, real rate	na	na	na	na	na	na	na	na	na	na
	D.B. ii. Load Impacts/designated unit - kWh, real rate	na	na	na	na	na	na	na	na	na	na
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	na	na	na	na	na	na	na	na	na
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	na		na	na			na	na		
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na		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	na									
	B. Number of measures installed by all program participants in the 12 months of the program year	na									
	C. Number of measures installed by Comp Group	na									
7. Market Segment Data											
	A. Distrubution by CEC climate zone	na									

Note: Carry-over measures (e.g., water heater blankets, showerheads) from the 1993 coupon/direct install program were not included in the evaluation.

Revised

M&E PROTOCOLS TABLE 6
Residential Appliance Efficiency Incentives: All Programs
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Heating and Cooling

1. Average Participant Group and Average Comparison Group												
A. Pre-install usage:	Pre-install kW	na										
	Pre-install kWh	na										
	Pre-install Therms	na										
	Base kW	na										
	Base kWh	na										
	Base Therms	na										
	Base kW/ designated unit of measurement	na										
	Base kWh/ designated unit of measurement	na										
	Base Therms/ designated unit of measurement	na										
B. Impact year usage:	Impact Yr kW	na										
	Impact Yr kWh	na										
	Impact Yr Therms	na										
	Impact Yr kW/designated unit	na										
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**				
	Impact Yr Therms/designated unit	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	na	1,226	na	na	879	1,573	na	na	955	1,497	
	A. ii. Load Impacts - kWh	na	1,242,686	na	na	886,558	1,598,814	na	na	965,217	1,520,155	
	A. iii. Load Impacts - Therms	na	13,668	na	na	11,393	15,943	na	na	11,895	15,441	
	B. i. Load Impacts/designated unit - kW	na	0.243	na	na	0.175	0.312	na	na	0.190	0.297	
	B. ii. Load Impacts/designated unit - kWh	na	246.8	na	na	176.1	317.5	na	na	191.7	301.9	
	B. iii. Load Impacts/designated unit - Therms	na	2.71	na	na	2.26	3.17	na	na	2.36	3.07	
	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	na	0.866	na	na	0.621	1.111	na	na	0.675	1.057	
	D.A. ii. Load Impacts - kWh, realization rate	na	0.886	na	na	0.632	1.139	na	na	0.688	1.083	
	D.A. iii. Load Impacts - Therms, realization rate	na	0.554	na	na	0.462	0.647	na	na	0.482	0.626	
	D.B. i. Load Impacts/designated unit - kW, real rate	na	0.913	na	na	0.655	1.172	na	na	0.712	1.115	
	D.B. ii. Load Impacts/designated unit - kWh, real rate	na	0.934	na	na	0.667	1.202	na	na	0.726	1.143	
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	0.585	na	na	0.488	0.682	na	na	0.509	0.661	
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**			
	A. i. Average Load Impacts - kW	na		na	na			na	na			
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na			
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na		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	5,035	Number of Dwelling Units
	B. Number of measures installed by all program participants in the 12 months of the program year	5,035	
	C. Number of measures installed by Comp Group	na	

7. Market Segment Data A. Distribution by CEC climate zone	**Zone**	**Percentage**
	1	4.89%
	2	18.21%
	3	32.01%
	4	30.72%
	5	2.33%
	6	0.73%
	7	8.65%
	8	0.15%
	9	0.14%
	10	0.75%
	13	0.64%

Revised

M&E PROTOCOLS TABLE 6
Residential Appliance Efficiency Incentives: CAC Rebate Program (Subset of "All Programs" Table)
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Heating and Cooling

1. Average Participant Group and Average Comparison Group											
A. Pre-install usage:	Pre-install kW	na									
	Pre-install kWh	na									
	Pre-install Therms	na									
	Base kW	na									
	Base kWh	na									
	Base Therms	na									
	Base kW/ designated unit of measurement	na									
	Base kWh/ designated unit of measurement	na									
	Base Therms/ designated unit of measurement	na									
B. Impact year usage:	Impact Yr kW	na									
	Impact Yr kWh	na									
	Impact Yr Therms	na									
	Impact Yr kW/designated unit	na									
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	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	1,267	1,131	1,257	1,277	784	1,478	1,259	1,275	861	1,401
	A. ii. Load Impacts - kWh	1,299,477	1,160,247	1,256,691	1,342,262	804,384	1,516,110	1,266,141	1,332,812	882,984	1,437,510
	A. iii. Load Impacts - Therms	na	na	na	na	na	na	na	na	na	na
	B. i. Load Impacts/designated unit - kW	0.271	0.242	0.269	0.274	0.168	0.317	0.270	0.273	0.184	0.300
	B. ii. Load Impacts/designated unit - kWh	278.4	248.6	269.3	287.6	172.4	324.9	271.3	285.6	189.2	308.0
	B. iii. Load Impacts/designated unit - Therms	na	na	na	na	na	na	na	na	na	na
	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	0.893	0.798	0.886	0.901	0.553	1.042	0.888	0.899	0.607	0.988
	D.A. ii. Load Impacts - kWh, realization rate	0.927	0.827	0.896	0.957	0.574	1.081	0.903	0.950	0.630	1.025
	D.A. iii. Load Impacts - Therms, realization rate	na	na	na	na	na	na	na	na	na	na
	D.B. i. Load Impacts/designated unit - kW, real rate	0.893	0.798	0.886	0.901	0.553	1.042	0.888	0.899	0.607	0.988
	D.B. ii. Load Impacts/designated unit - kWh, real rate	0.927	0.827	0.896	0.957	0.574	1.081	0.903	0.950	0.630	1.025
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	na	na	na	na	na	na	na	na	na
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	na		na	na			na	na		
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement kWh	na		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	4,667									
	B. Number of measures installed by all program participants in the 12 months of the program year	4,667									
	C. Number of measures installed by Comp Group	na									

7. Market Segment Data A. Distribution by CEC climate zone	**Zone**	**Percentage**
	1	4.89%
	2	19.64%
	3	33.50%
	4	28.63%
	5	2.26%
	6	0.78%
	7	9.33%
	8	0.16%
	10	0.81%

Revised

M&E PROTOCOLS TABLE 6
Residential Appliance Efficiency Incentives: Multifamily Rebate Program (Subset of "All Programs" Table)
Designated Unit of Measurement: Dwelling Unit
ENDUSE: Heating and Cooling

1. Average Participant Group and Average Comaprison Group												
A. Pre-install usage:	Pre-install kW	na										
	Pre-install kWh	na										
	Pre-install Therms	na										
	Base kW	na										
	Base kWh	na										
	Base Therms	na										
	Base kW/ designated unit of measurement	na										
	Base kWh/ designated unit of measurement	na										
	Base Therms/ designated unit of measurement	na										
B. Impact year usage:	Impact Yr kW	na										
	Impact Yr kWh	na										
	Impact Yr Therms	na										
	Impact Yr kW/designated unit	na										
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**				
	Impact Yr Therms/designated unit	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	na	94.8	na	na	79.0	110.6	na	na	82.5	107.1	
	A. ii. Load Impacts - kWh	na	82,439	na	na	68,716	96,162	na	na	71,745	93,133	
	A. iii. Load Impacts - Therms	na	13,668	na	na	11,393	15,943	na	na	11,895	15,441	
	B. i. Load Impacts/designated unit - kW	na	0.258	na	na	0.215	0.300	na	na	0.224	0.291	
	B. ii. Load Impacts/designated unit - kWh	na	224	na	na	187	261	na	na	195	253	
	B. iii. Load Impacts/designated unit - Therms	na	37.1	na	na	31.0	43.3	na	na	32.3	42.0	
	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	na	0.420	na	na	0.350	0.490	na	na	0.366	0.474	
	D.A. ii. Load Impacts - kWh, realization rate	na	0.550	na	na	0.458	0.642	na	na	0.479	0.621	
	D.A. iii. Load Impacts - Therms, realization rate	na	0.550	na	na	0.458	0.642	na	na	0.479	0.621	
	D.B. i. Load Impacts/designated unit - kW, real rate	na	0.420	na	na	0.350	0.490	na	na	0.366	0.474	
	D.B. ii. Load Impacts/designated unit - kWh, real rate	na	0.550	na	na	0.458	0.642	na	na	0.479	0.621	
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	0.550	na	na	0.458	0.642	na	na	0.479	0.621	
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**			
	A. i. Average Load Impacts - kW	na		na	na			na	na			
	A. ii. Average Load Impacts - kWh	na		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	na		na	na			na	na			
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na		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	368										
	B. Number of measures installed by all program participants in the 12 months of the program year	368										
	C. Number of measures installed by Comp Group	na										

7. Market Segment Data A. Distribution by CEC climate zone	**Zone**	**Percentage**
	1	5.46%
	3	14.75%
	4	64.21%
	5	3.55%
	9	2.19%
	13	9.84%

Revised

M&E PROTOCOLS TABLE 6
Residential Appliance Efficiency Incentives
Designated Unit of Measurement: Participant
ENDUSE: Lighting

1. Average Participant Group and Average Comaprison Group												
A. Pre-install usage:	Pre-install kW	na										
	Pre-install kWh	na										
	Pre-install Therms	na										
	Base kW	na										
	Base kWh	na										
	Base Therms	na										
	Base kW/ designated unit of measurement	na										
	Base kWh/ designated unit of measurement	na										
	Base Therms/ designated unit of measurement	na										
B. Impact year usage:	Impact Yr kW	na										
	Impact Yr kWh	na										
	Impact Yr Therms	na										
	Impact Yr kW/designated unit	na										
	Impact Yr kWh/designated unit	na			**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	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	na	776		na	na	647	905	na	na	675	877
	A. ii. Load Impacts - kWh	na	10,880,902		na	na	9,069,685	12,692,119	na	na	9,469,364	12,292,440
	A. iii. Load Impacts - Therms	na	na		na	na	na	na	na	na	na	na
	B. i. Load Impacts/designated unit - kW	na	0.00980		na	na	0.00817	0.01143	na	na	0.00853	0.01107
	B. ii. Load Impacts/designated unit - kWh	na	137		na	na	114	160	na	na	120	155
	B. iii. Load Impacts/designated unit - Therms	na	na		na	na	na	na	na	na	na	na
	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	na	0.440		na	na	0.367	0.513	na	na	0.383	0.497
	D.A. ii. Load Impacts - kWh, realization rate	na	0.629		na	na	0.525	0.734	na	na	0.548	0.711
	D.A. iii. Load Impacts - Therms, realization rate	na	na		na	na	na	na	na	na	na	na
	D.B. i. Load Impacts/designated unit - kW, real rate	na	0.521		na	na	0.434	0.608	na	na	0.453	0.589
	D.B. ii. Load Impacts/designated unit - kWh, real rate	na	0.745		na	na	0.621	0.870	na	na	0.649	0.842
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	na		na	na	na	na	na	na	na	na
3. Net-to-Gross Ratios		**RATIO**			**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	na			na	na			na	na		
	A. ii. Average Load Impacts - kWh	na			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	na			na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	na			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	79,227
	B. Number of measures installed by all program participants in the 12 months of the program year	79,227
	C. Number of measures installed by Comp Group	na

7. Market Segment Data	A. Distribution by CEC climate zone	**Zone**	**Percentage**
		1	2.10%
		2	3.16%
		3	6.98%
		4	48.73%
		5	24.59%
		6	7.47%
		7	1.82%
		8	3.55%
		9	0.60%
		10	0.66%
		11	0.32%

Revised

M&E PROTOCOLS TABLE 6
Residential Appliance Efficiency Programs
Designated Unit of Measurement:
ENDUSE: Refrigerators

1. Average Participant Group and Average Comaprison Group											
A. Pre-install usage:	Pre-install kW	na									
	Pre-install kWh	na									
	Pre-install Therms	na									
	Base kW	na									
	Base kWh	na									
	Base Therms	na									
	Base kW/ designated unit of measurement	na									
	Base kWh/ designated unit of measurement	na									
	Base Therms/ designated unit of measurement	na									
B. Impact year usage:	Impact Yr kW	na									
	Impact Yr kWh	na									
	Impact Yr Therms	na									
	Impact Yr kW/designated unit	na									
	Impact Yr kWh/designated unit	na		**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	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	1,350	1,309	na	na	na	na	na	na	na	na
	A. ii. Load Impacts - kWh	8,824,986	8,560,236	na	na	na	na	na	na	na	na
	A. iii. Load Impacts - Therms	na	na	na	na	na	na	na	na	na	na
	B. i. Load Impacts/designated unit - kW	0.0220	0.0213	na	na	na	na	na	na	na	na
	B. ii. Load Impacts/designated unit - kWh	143	139	na	na	na	na	na	na	na	na
	B. iii. Load Impacts/designated unit - Therms	na	na	na	na	na	na	na	na	na	na
	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	0.284	0.289	na	na	na	na	na	na	na	na
	D.A. ii. Load Impacts - kWh, realization rate	1.011	1.029	na	na	na	na	na	na	na	na
	D.A. iii. Load Impacts - Therms, realization rate	na	na	na	na	na	na	na	na	na	na
	D.B. i. Load Impacts/designated unit - kW, real rate	0.322	0.328	na	na	na	na	na	na	na	na
	D.B. ii. Load Impacts/designated unit - kWh, real rate	1.139	1.159	na	na	na	na	na	na	na	na
	D.B. iii. Load Impacts/designated unit - Therms, real rate	na	na	na	na	na	na	na	na	na	na
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	0.97		na	na			na	na		
	A. ii. Average Load Impacts - kWh	0.97		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	0.97		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	0.97		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	61,643									
	B. Number of measures installed by all program participants in the 12 months of the program year	na									
	C. Number of measures installed by Comp Group	na									
7. Market Segment Data		na									

Revised

C

WAIVERS

PACIFIC GAS & ELECTRIC COMPANY
APPLICATION FOR A RETROACTIVE WAIVER FOR
1994 RESIDENTIAL WEATHERIZATION PROGRAM
AND
1994 RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES PROGRAM

Approved by CADMAC on February 21, 1996

BACKGROUND

PG&E is requesting an exception to the Protocols in the form of a retroactive waiver for the 1994 Residential Weatherization and 1994 Residential Appliance Efficiency Incentives Programs.

Measurement and evaluation of energy efficiency programs are covered by *ex post* protocols starting with the 1994 program year. The Protocols[1] describe how measurement and evaluation should be conducted for those DSM programs qualifying for shareholder incentives. In 1994, PG&E's residential weatherization and appliance programs failed to qualify for shareholder incentives.

Due to a series of misunderstandings, PG&E has not begun an evaluation of the residential weatherization and appliance efficiency programs. Given the volume of other evaluations ongoing at this time, it is impossible for PG&E to complete a study by the March 1st filing date for completed evaluation studies. As a result, PG&E respectfully requests that the requirement to satisfy the protocols be postponed for one year.

CONCLUSION

PG&E should be granted a retroactive waiver, similar to that granted for the Nonresidential New Construction Program, postponing until March 1, 1997 the requirement to satisfy the Protocols for the 1994 Residential Weatherization Program and the 1994 Residential Appliance Efficiency Program.

PG&E respectfully requests that CADMAC approve this Retroactive Waiver.

[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 and revised July 21, 1994, pursuant to Decision 94-05-063.

PACIFIC GAS & ELECTRIC COMPANY
REQUEST FOR RETROACTIVE WAIVER FOR
1994 RESIDENTIAL SECTOR APPLIANCE EFFICIENCY PROGRAMS
HIGH EFFICIENCY REFRIGERATION

Approved by CADMAC on September 19, 1996

Program Background

In 1994, Pacific Gas & Electric Company (PG&E) fielded DSM programs to the Commercial, Industrial, Agricultural and Residential Sectors. In the Residential Appliance Efficiency Incentives category, high efficiency refrigerators and freezers for residential customers were rebated under three programs. Incentives were offered directl to customers through the Efficient Refrigerator Program; the Refrigerator Salesperson/Dealer Incentive Program incented appliance retailers to stock and sell high-efficiency refrigerators; and finally, the Multiple Refrigerator Rebate Program made incentives available to property managers, owners and builders purchasing units in quantities of two or more. These programs were designed to increase the purchase of high efficiency refrigerators and were primarily promoted through appliance manufacturers and retailers. The impact evaluation associated with this waiver is designed to assess the actual load impacts resulting from these programs.

Summary of PG&E Request

In this waiver, PG&E requests permission to estimate net savings using results from an evaluation of similar residential refrigerator rebate programs offered in 1994 by Southern California Edison (SCE) and San Diego Gas and Electric Company (SDG&E). [1] The overall approach was developed in a scoping study prepared for CADMAC[2] and has been incorporated into the *Protocols*. As in the SCE/SDG&E study, PG&E intends to calculate gross energy savings using engineering estimates for unit savings applied to program participation data. Rather than initiate primary data collection to develop an estimate specific to PG&E service territory, PG&E seeks approval to estimate net program savings using a 0.97 net-to-gross ratio based on the results of the SCE/SDG&E evaluation. PG&E has arranged to share the cost of the SCE/SDG&E study as a condition for using the results.

Parameters and Protocol Requirements

(1) Table C-3B, item 1 recommends "To the extent possible and reasonable, the estimates used for per unit measure costs and load impacts shall be obtained through a single statewide activity."

(2) Table C-3B, Items B-4 and B-5 state:
(B-4) Data from net program impacts will be based on product-specific data from a mix of data sources that capture refrigerator penetration rates. Sources shall include program

[1] *Statewide Impact Evaluation of 1994 Residential High Efficiency Refrigerator Rebate Programs*. Xenergy, Inc. Prepared for the California DSM Measurement Advisory Committee (in care of Southern California Edison and San Diego Gas & Electric Company), January, 1996.
[2] *Scoping Study of Efficient Refrigerator Impact Parameters and Evaluation Methods*. HBRS, Inc. Prepared for the California DSM Measurement Advisory Committee, July 1994.

records and (a) customer and general consumer surveys of program participants and program non-participants, (b) retail sales and store audit data, or (c) product shipment data. (B-5) Acceptable methods to estimate first year net impacts include: (a) Modeling pre and post-program sales trends with regression-based time series methods; (b) quasi-experimental design control area/program treatment area comparisons; or, (c) discrete choice models.

Proposed Waiver

PG&E seeks CADMAC approval to:

Allow net savings to be estimated using a net-to-gross adjustment based on the results of the SCE/SDG&E evaluation without collecting/incorporating primary data from telephone surveys of participants and non-participants in PG&E's service territory

Rationale

The reasons for PG&E request is as follows:

Several of PG&E's Appliance Efficiency Incentive and Weatherization Programs for the Residential Sector in 1994 failed to meet the Minimum Performance Standard (MPS), and were eliminated. Since these programs did not result in shareholder earnings claims, PG&E planned to request a waiver to be excused from further measurement and evaluation obligations for the canceled programs.

Preliminary discussions with CADMAC indicated that there was support for this request, provided that as an alternative to the impact evaluations, PG&E would conduct research in several areas of interest to CADMAC. As an interim step, PG&E requested and received a waiver to delay first year load impact evaluations of the 1994 programs for one year in order to develop the alternative research proposals. Circumstances unique to this situation complicated PG&E's efforts to prepare the second waiver request. Therefore, in order to fulfill its regulatory obligations, PG&E plans to evaluate the programs and report the results by March 1, 1997 (the deadline specified in the first waiver).

SCE and SDG&E conducted a joint study to evaluate their 1994 residential refrigerator programs. The SCE/SDG&E study used engineering estimates to calculate gross savings, and developed a net-to-gross ratio for energy savings by comparing efficiency levels of refrigerators purchased through the program vs. those purchased outside the program in the utilitys' respective service territories. The ratio from within each utility's service territory was compared to efficiency levels for new refrigerators in a comparable service territory (outside California) where no utility-sponsored refrigerator rebate programs had been active. Since PG&E was engaged in a process to propose alternatives for the 1994 residential refrigerator program impact evaluations, PG&E did not participate the joint study.

In order to evaluate the 1994 residential refrigerator programs PG&E plans to use a methodology nearly identical to the one employed in the SCE/SDG&E study. Engineering estimates will be used to estimate gross savings to apply a net-to-gross ratio based on results from the SCE/SDG&E study. PG&E requests permission to use a 0.97 net-to-gross adjustment based on results from the SCE/SDG&E evaluation rather than collect primary survey data in PG&E service territory.

Surveys of 10,815 residential customers in the SCE and SDG&E service territories were completed to obtain information from 866 who had purchased a new refrigerator in 1994. Of the 866, only 413 were able to provide valid model numbers which could be matched with manufacturer's information and mapped to estimates employed in this study to calculating gross savings. The net-to-gross ratio developed from these responses was 0.97, with a 90 percent confidence interval ranging from 0.35 to 1.62.

The response proportions and accuracy are expected to be similar in PG&E's service territory (perhaps degraded somewhat due to the 12-month delay in fielding the surveys). Approximately one respondent in 11 will have made a purchase in 1994, and about half will be able to provide a valid model number. Collecting primary data in PG&E service territory would reduce the potential for introducing "transfer bias" that might result from using data collected in the other utilities' service territories. However, compared to the potential inaccuracy in the net-to-gross estimate due to sampling variation in the original study, the potential for inaccuracies resulting from transfer bias is negligible. And since the sampling error is expected to be equivalent with data collected in PG&E service territory, the overall accuracy of the estimate would not be substantially improved b eliminating potential transfer bias.

Surveys for the 1995 residential program evaluations are priced at approximately $20 per complete. At this price, obtaining 5,000-10,000 completed surveys to derive net-to-gross estimates for the 1994 refrigerator programs would cost $100,000-$200,000. This estimate represents just the cost for data collection and does not include the cost of analyzing the new survey data. This would be a great deal to spend for negligibl improving the accuracy of impact estimates for programs that have been cancelled and were not responsible for any shareholder earnings claims. As an alternative, PG&E requests permission to use a net-to-gross ratio of 0.97 based on results from the SCE/SDG&E study.

As a condition for using the study results, PG&E has arranged to share the cost of the SCE/SDG&E study equally with the other utilities if this waiver is granted. The total cost of the SCE/SDG&E study was approximately $115,000 ($38,000 for each participating utility in a three-way division).

Conclusion

PG&E requests permission to estimate net savings for its 1994 residential refrigerator rebate programs using results from a similar study conducted by Southern California Edison (SCE) and San Diego Gas and Electric Company (SDG&E) rather than collect primary data from customers in PG&E service territory. The price to collect survey data in PG&E service territory would exceed $100,000, but would not likely improve the accuracy of an analysis based on the net-to-gross estimate borrowed from the SCE/SDG&E study. As a condition for using the results, PG&E will share the cost of the SCE/SDG&E study.