IMPACT EVALUATION OF PACIFIC GAS AND ELECTRIC COMPANY'S PRE-1998 RESIDENTIAL NEW CONSTRUCTION PROGRAM CARRY OVER

PG&E Study ID number: 402

March 1, 2000

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

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Purpose of Study

This study 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", as adopted by California Public Utilities Commission Decision 93-05-063, revised June, 1999, pursuant to Decisions 94-05-063, 94-10-059, 94-12-021, 95-12-054, 96-12-079, 98-03-069, and 99-06-052.

This study measured the gross and net energy savings at the whole building level for a total of 3,418 homes for which rebates were paid in 1998 under the PG&E Residential New Construction Program, also referred to as the Comfort Home Program, which was offered during the 1993-1997 period.

Methodology

On-site surveys were conducted for 159 participant and 153 nonparticipant homes to collect information about the structure and factors affecting end use energy consumption. Duct tests were conducted on a subset of 149 sites to provide data on the efficiency of the air distribution systems. Builders associated with the surveyed homes were then interviewed via the telephone to collect information about their building practices and the effect of the PG&E Program on their installations of efficient technologies.

An engineering analysis utilizing on-site survey data was used to develop initial estimates of as-built and reference energy consumption (defined as energy use at Title 24 compliance efficiencies) for each home in the study. Micropas building simulations were used to develop the space conditioning loads. Non-space-conditioning algorithms, based on customer appliance holdings and reported usage levels, were used to develop loads for other end uses.

Next, statistical models were used to calibrate engineering results to customer bills and develop gross savings estimates. These models, referred to as SAE (Statistically Adjusted Engineering) models, use regression equations to relate actual billed consumption to engineering estimates of consumption. Weather variables are included in the equations to account for differences between bill energy use that relates to actual weather and engineering estimates that rely on normal weather.

Net Program savings were developed using three different approaches: statistical modeling, simple comparisons of participants and nonparticipants, and builder self-report data. The statistical model, referred to as an efficiency choice model, was used for the space conditioning end use. In this approach, differences in site energy efficiency are related to Program participation, site characteristics and builder characteristics. The model isolates the component of energy efficiency that is attributable to the Program while controlling for other. Final net savings estimates were based on: (1) the efficiency choice analysis for the heating and cooling end uses, and (2) builder self-report data for the cooking and clothes drying end uses.

Study Results

Evaluation estimates of Program Impacts, relative to PG&E's initial estimates, are summarized in the following table. Overall, the Program is estimated to be saving 2,111 kW, 2,756,271 kWh, and 37,098 therms on an annual basis. Approximately 99% of PG&E ex ante kW savings, 83% of the ex ante kWh savings and 69% of the ex ante therm savings are being realized.

PG&E Pre-1998 Residential New Construction Program Carry Over
Summary of Evaluation Gross and Net Load Impacts
Whole Building

	Gross Savings	Gross Realization Rate	Net-to-Gross Ratio[1]	Net Savings	Net Realization Rate
EX ANTE					
kW	2,312.0		0.92	2,129.6	
kWh	4,034,713		0.82	3,318,783	
Therms	20,235		2.66	53,843	
EX POST					
kW	2,925.6	1.265	0.72	2,110.6	0.991
kWh	5,768,315	1.430	0.48	2,756,271	0.831
Therms	-129,424	-6.396	-0.29	37,098	0.689

[1] The net-to-gross method used for this study did not separate out free-ridership and spillover.

Regulatory Waivers and Filing Variances

No regulatory waivers were filed for this study.

Program tracking system data used to support this evaluation differed from information filed in the E-Tables. The E-Tables indicated that Program accomplishments were 3,742 homes while the tracking system reported 3,418 homes. The correct number of homes from the tracking system were used as the basis for this evaluation. Since ex post per-home impacts are determined independently in the evaluation, energy impact discrepancies between the tracking system and E-Tables are not an issue. Comparisons between ex ante estimates and ex post results contained in this report utilize the ex ante energy impacts from the E-Tables as the basis for the comparison.

IMPACT EVALUATION OF PACIFIC GAS AND ELECTRIC COMPANY'S PRE-1998 RESIDENTIAL NEW CONSTRUCTION PROGRAM CARRY OVER

PG&E STUDY ID NUMBER: 402

Final Report

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March 1, 2000

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1 EXECUTIVE SUMMARY

This report presents final impact evaluation results for the PG&E Pre-1998 Residential New Construction Program Carry Over (Pre-1998 RNC). Both gross and net Program impacts were developed for electric consumption (kWh), electric demand (kW) and natural gas consumption (therms). The evaluation approach was designed to meet the requirements of the Measurement and Evaluation Protocols. Engineering estimates of energy impacts for a sample of Program participants and a nonparticipant control group were statistically calibrated to billed energy use, and then were compared against each other to provide estimates of net Program savings.

1.1 PROGRAM DESCRIPTION

The Pre-1998 RNC Program, referred to as the PG&E Comfort Home Program, provided financial incentives to builders who constructed energy-efficient homes exceeding Title 24 standards. Energy efficiency measures addressed in this evaluation were installed in Program years 1993 through 1998 and were rebated in calendar year 1998 under versions of the Comfort Home Program offered in years 1993 through 1997. The Program focused on homes built in California Energy Commission (CEC) climate zones 11, 12, and 13 and on four key energy efficiency measures (in addition to Title 24 compliance):

- High efficiency air conditioning (11.5 SEER or better);
- Efficient duct systems installed to PG&E's Program standards;
- Natural gas cooking; and
- Natural gas dryer stubs.

A total of 3,418 Comfort Homes qualified for rebates in 1998. For 1993 and 1994, builders could choose which measures to install in their homes and were rebated accordingly. For 1995 through 1998, installation of all four key measures by the builder of a development was a mandatory condition for Program participation. Table 1-1 shows the frequency of measure installations in the 3,418 qualifying homes. As the table indicates, all four of the key measures, along with a code enforcement requirement, are installed in the vast majority of Program homes. Measures for the lighting and water heating end uses represent a very small portion of Program accomplishments and are carry-overs from the 1993 program year.

For the 3,418 homes rebated in 1998, PG&E had initially estimated net first year savings to be: 3.3 GWh, 2.1 MW, and 0.05 million therms.

Table 1-1
Measures Installed in Comfort Home Program Homes

Measures Installed	Frequency	Percent
Improved ducts	3,418	100.0%
Efficient AC	3,407	99.7%
Code enforcement	3,407	99.7%
Gas drying	3,400	99.5%
Gas cooking	3,329	97.4%
Efficient furnace	11	0.3%
Efficient water heater	10	0.3%
CFLs	4	0.1%
Efficient windows	3	0.1%

1.2 EVALUATION APPROACH

The primary objectives of the residential new construction impact evaluation project were to:

- Assess the gross annual energy and demand savings for installed program measures; and
- Assess the net energy impacts due to the Program;

Secondary objectives were to:

- Analyze differences between evaluation results and PG&E-estimated impacts;
- Investigate, explain, and estimate market spillover effects.

The impact evaluation utilized multiple approaches to assess both gross and net impacts. The methodology provides impact results that are consistent with the Measurement and Evaluation Protocols[1] (Protocols). Key components of the evaluation include:

- Development of sample design used to select 159 homes built by Program builders and an additional sample of 153 nonparticipating homes for the study;
- Data collection involving on-site surveys of homes and telephone surveys of builders;
- Engineering analysis of home energy consumption at the end use level, including the use of Micropas simulations to determine estimates of space conditioning usage;
- Statistical calibration of initial engineering estimates to customer bills using an SAE (Statistically Adjusted Engineering) approach; and
- A free-ridership analysis that analyzed participant and nonparticipant energy efficiency using three alternative methods: (1) a simple comparison of energy efficiency in participant and nonparticipant homes; (2) a decision analysis model that compares participants and nonparticipants while controlling for nonprogram factors; and (3) a self

[1] Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings for Demand-Side Management Programs, as adopted by California Public Utilities Commission Decision 93-05-063, revised June 1999.

report free-ridership analysis that gauges what portion of increased participant efficiency is attributable to the Program.

Program tracking data and PG&E billing data were utilized to develop a sample frame of participant homes with adequate billing histories to support the statistical billing analysis used in the study. A comparable group of nonparticipants was developed using the PG&E billing system, including information on meter set dates and dates when the customer was first served at a given residential premise.

On-site surveys were then conducted for a sample of selected homes to collect detailed structure, equipment, and operations data. Duct blaster tests were performed at a subset of 149 sites to provide data on the efficiency of the air distribution systems for use in analyzing savings attributable to enhanced duct installation procedures. Builders associated with the surveyed homes were then interviewed to collect information about the effect of the PG&E Program on their building practices.

Engineering analysis and simulations were conducted to determine energy impacts relative to a baseline (set at Title 24 compliance levels) for both participant and nonparticipant homes. After statistical calibration of engineering results to bills using a regression approach, participant and nonparticipant efficiencies were compared to arrive at net Program Savings. Builder-reported data was also used to assess what action may have been taken in the absence of the Program.

1.3 KEY FINDINGS

Evaluation estimates of Program Impacts, relative to PG&E's initial estimates, are summarized in Table 1-2. Overall, the Program is estimated to be saving 2,111 kW, 2,756,271 kWh, and 37,098 therms on an annual basis. Approximately 99% of PG&E ex ante kW savings, 83% of the ex ante kWh savings and 69% of the ex ante therm savings are being realized.

Table 1-2
Summary of Program Impacts

	Gross Savings	Gross Realization Rate	Net-to-Gross Ratio[1]	Net Savings	Net Realization Rate
EX ANTE					
kW	2,312.0		0.92	2,129.6	
kWh	4,034,713		0.82	3,318,783	
Therms	20,235		2.66	53,843	
EX POST					
kW	2,925.6	1.265	0.72	2,110.6	0.991
kWh	5,768,315	1.430	0.48	2,756,271	0.831
Therms	-129,424	-6.396	-0.29	37,098	0.689

[1] The net-to-gross method used for this study did not separate out free-ridership and spillover.

Ninety-percent confidence intervals are ± 31% for net kW impacts, ± 25% for net kWh impacts, and ± 229% for net therm impacts. The large therm impact confidence interval is the result of a large variation in the heating efficiency of nonparticipant homes that made it difficult to calculate accurate efficiency differences between participants and nonparticipants in determining net heating savings.

In order to gain an additional understanding of Program performance, end use level impacts are discussed next. As Figures 1-1 and 1-2 show, the HVAC end use comprises the largest component of Net Program Savings. Cooling savings, due primarily to installation of efficient air conditioners and enhanced duct installation, comprises almost two-thirds of Program electric savings. Heating savings, from enhanced duct installations and a combination of other measures including code enforcement, accounts for essentially all of the positive gas savings.

Figure 1-1
Distribution of Evaluation Net kWh savings

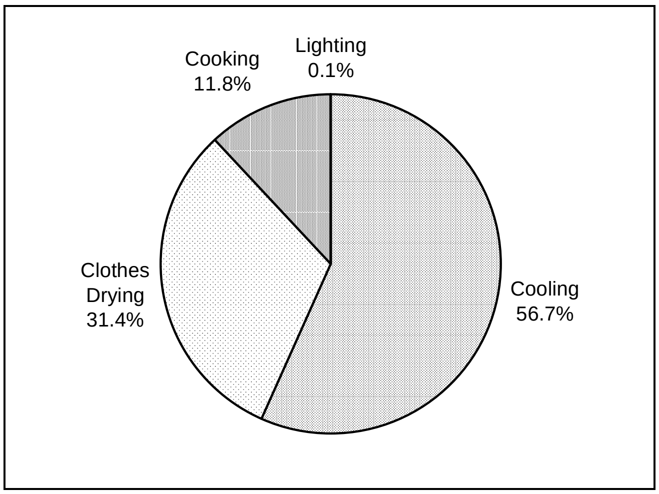
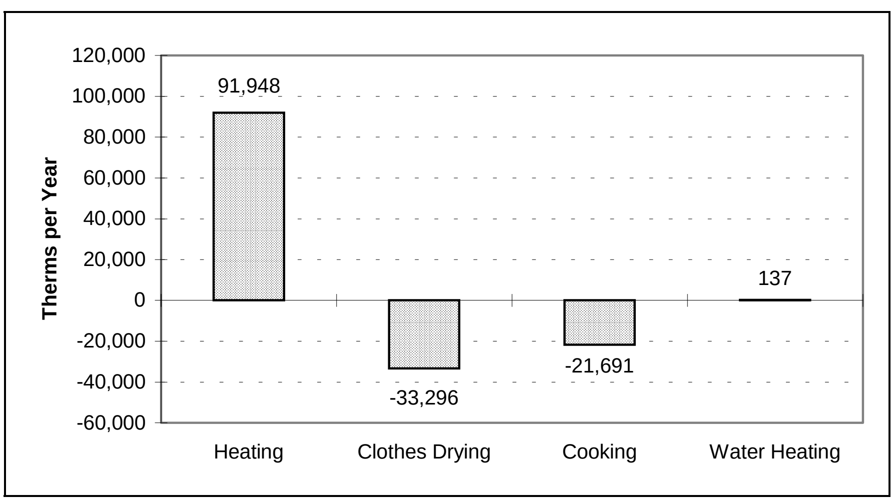


Figure 1-2
Evaluation Net Therm Savings



HVAC

Heating and cooling impacts are presented and compared to PG&E estimates in Table 1-3. As the table indicates, evaluation net impacts are just under 80% of PG&E estimates for energy consumption (kWh and therms) and 105% of the PG&E estimate for peak demand (kW). Gross kWh impacts for the evaluation are similar to PG&E estimates due to offsetting factors. Air conditioner impacts are greater than expected, reflecting above-average cooling loads for participant home, while duct and "other" savings are lower than expected. Gross therm impacts are lower than the PG&E estimates, because building shell construction was found to be less efficient (with respect to heating) than Title 24 standards. Since nonparticipant homes were also found to be less efficient (by a larger amount), this effect is reversed in the calculation of net savings that utilizes a comparison for participant homes against nonparticipant homes.

Table 1-3
HVAC Impacts

	Gross Savings	Gross Realization Rate	Net-to-Gross Ratio	Net Savings	Net Realization Rate
EX ANTE					
kW	1,928.7		0.98	1,888.0	
kWh	2,073,889		0.98	2,030,104	
Therms	115,106		1.00	115,039	
EX POST					
kW	2,523.5	1.308	0.79	1,983.4	1.051
kWh	1,987,795	0.958	0.79	1,562,407	0.770
Therms	54,536	0.474	1.69	91,948	0.799

Clothes Drying

Impacts of the gas clothes drying element of the program are presented in Table 1-4. A major reason gross impacts from the evaluation are high relative to ex ante levels is that PG&E discounts gross impacts to reflect the fact that only a fraction of homeowners install gas dryers despite the availability of gas dryer plugs in the laundry area. The evaluation found that 58% of participant homes had gas drying versus the PG&E estimate of 35%. The other major difference in gross savings is a higher evaluation estimate of clothes dryer energy consumption.

The low evaluation net-to-gross ratios result because only 36% of surveyed builders indicate that they would not have installed gas dryer plugs without the program. Overall, evaluation results for this measure exceed PG&E ex ante estimates.

Table 1-4
Gas Clothes Drying Impacts

	Gross Savings	Gross Realization Rate	Net-to-Gross Ratio	Net Savings	Net Realization Rate
EX ANTE					
kW	32.7		0.74	24.2	
kWh	602,280		0.74	445,687	
Therms	-20,076		0.74	-14,856	
EX POST					
kW	257.7	7.882	0.36	93.0	3.845
kWh	2,405,112	3.993	0.36	868,247	1.948
Therms	-92,232	4.594	0.36	-33,296	2.241

Gas Cooking

Table 1-5 presents gas cooking measure impacts. Lower than expected net energy impacts are primarily the results of a lower estimated net-to-gross ratio for the evaluation. Net-to-gross ratios, based on builder-reported data are significantly lower than the PG&E assumption. Peak kW savings are also different because of differences in PG&E's assumed coincidence factors versus coincidence factors developed in the evaluation from electric cooking load shapes. In addition, PG&E's assumed gas-to-electric conversion factors are larger that those used in the evaluation. Evaluation impacts are based on a relative gas efficiency/electric efficiency ratio of 0.51, derived from U.S. Department of Energy cooking efficiency estimates published in the E-SOURCE Residential Appliances Technology Atlas.

Table 1-5
Impacts from Gas Cooking Measures

	Gross Savings	Gross Realization Rate	Net-to-Gross Ratio	Net Savings	Net Realization Rate
EX ANTE					
kW	350.5		0.62	217.3	
kWh	1,356,559		0.62	841,067	
Therms	-74,978		0.62	-46,486	
EX POST					
kW	144.3	0.412	0.24	34.1	0.157
kWh	1,373,423	1.012	0.24	324,128	0.385
Therms	-91,912	1.226	0.24	-21,691	0.467

2 STUDY DESIGN

2.1 OVERVIEW

This section presents an overview of the evaluation analysis method used for this project and a description of the sample design. The study methodology is discussed in more detail in succeeding sections of this report.

2.2 METHODOLOGY

Figure 2-1 provides an overview of the evaluation project design. To begin the project, a sample of participant homes was extracted from the PG&E Program tracking system. A matching nonparticipant sample was then extracted from the PG&E billing system.

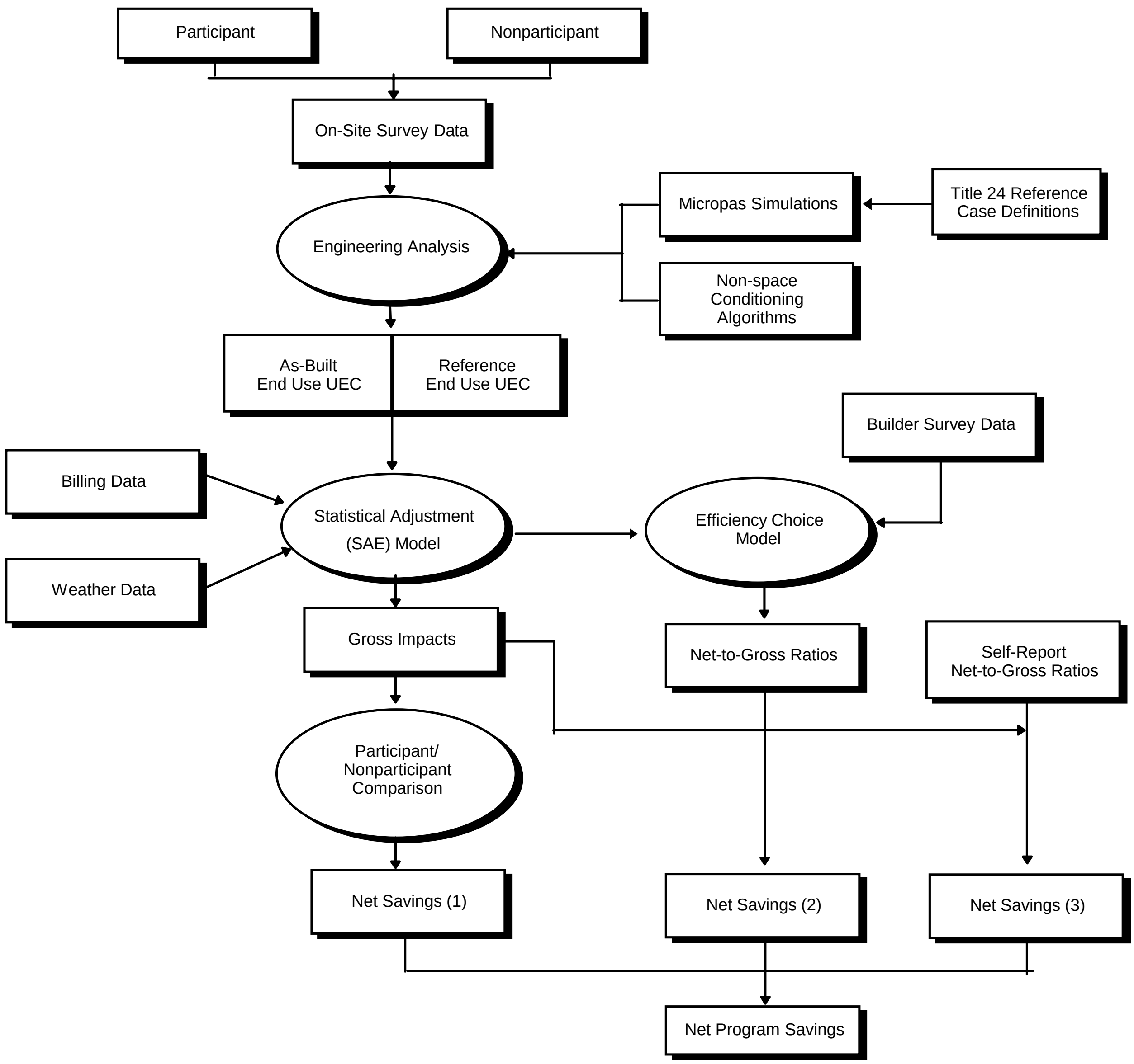
On-site surveys were conducted for 159 participant and 153 nonparticipant homes to collect information about the structure and factors affecting end use energy consumption. Duct tests were conducted on a subset of 149 sites to provide data on the efficiency of the air distribution systems. Builders associated with the surveyed homes were then interviewed via the telephone to collect information about their building practices and the effect of the PG&E Program on their installations of efficient technologies.

An engineering analysis utilizing on-site survey data was used to develop initial estimates of as-built and reference energy consumption (defined as energy use at Title 24 compliance efficiencies) for each home in the study. Micropas building simulations were used to develop the space conditioning loads. Non-space-conditioning algorithms, based on customer appliance holdings and reported usage levels, were used to develop loads for other end uses.

Next, statistical models were used to calibrate engineering results to customer bills and develop gross savings estimates. These models, referred to as SAE (Statistically Adjusted Engineering) models, use regression equations to relate actual billed consumption to engineering estimates of consumption. Weather variables are included in the equations to account for differences between bill energy use that relates to actual weather and engineering estimates that rely on normal weather.

Finally, net Program savings were developed using three different approaches: statistical modeling, simple comparisons of participants and nonparticipants, and builder self-report data. The statistical model, referred to as an efficiency choice model, was used only for the space conditioning end use. In this approach, differences in site energy efficiency are related to Program participation, site characteristics and builder characteristics. The model isolates the component of energy efficiency that is attributable to the Program while controlling for other

Figure 2-1
New Construction Evaluation Project Overview



factors. Net savings results from each approach were carefully reviewed and integrated to provide the most appropriate measure of net savings.

2.3 SAMPLING PLAN

This section presents the sampling plan used to select homes for inclusion in the impact evaluation study group. The goals of the sample design are:

1. To provide a representative sample of participating homes and a comparable sample of nonparticipating homes for inclusion in the engineering and statistical impact analyses; and
2. To comply with the sample size and relative precision requirements of the M&E Protocols.

Because calibration to billing data is an important component of the analysis, all customers were screened for adequate billing histories before inclusion in the study. The remainder of this section describes the screening of customers for data adequacy and the development of the sample.

2.3.1 Sampling Frames

Initial sampling frames for participants and nonparticipants are as follows:

- Participant homes: homes that were built under the Program and were rebated in 1998 under the shared savings option; this group contains homes that were included in Program applications during program years 1993 through 1998, a total of 3,418 homes;
- Nonparticipant homes: single family homes with meter set dates after December 31, 1996, located in the same PG&E meter route areas as participating homes.

Before the sample was developed, customers identified above were screened for data adequacy. This screening process is discussed below.

Participant Screening

The following process was used to screen participating homes:

1. All Program homes under the shared savings option with incentive payment dates in 1998 were selected from the tracking system;
2. Homes were matched to the PG&E billing system data using the PG&E Control number;
3. Home addresses in the tracking system were matched against service addresses from the billing system and homes with matched addresses were retained;
4. Homes were screened for adequate billing data (consistent read dates, billed usage greater than zero, and meter reads dating back to at least November 1998), and "good" homes were retained;
5. Finally, homes identified as "multifamily" in the PG&E billing system were dropped.

The participant screening process is summarized in Table 2-1. Overall 2,444 homes with adequate billing data were available after the screening process.

Table 2-1
Participant Screening Summary

	Remaining Homes	Screened Homes
Total homes with 1998 Rebate	3,418	
Unique control code in tracking system	3,358	60
Single family homes matched to billing system	3,320	38
Tracking system address, service address match	3,235	85
Homes with an electric account with PG&E	3,225	10
Homes with adequate billing data	2,444	781

To facilitate the on-site surveys, several remote areas with limited program activity were dropped from the study. These areas included: cities north of Chico, the areas around Grass Valley, Rio Vista, Coalinga, Los Banos, Wasco, and Newman. After exclusion of these areas, 2,225 homes remained available for on-site surveys.

Tables 2-2 and 2-3 compare the 3,358 homes that received rebates in 1998 with the screened homes available for on-site surveys. As Table 2-2 shows, the distributions of homes across Program application year are similar. Table 2-3 shows that measure distributions in the screened homes are very similar to the population.

Table 2-2
Comparison of Participant Population to Sample, by Program Year

	All Homes		Screen Homes	
Program Year	Frequency	Percent	Frequency	Percent
1993	11	0.3%	0	0.0%
1994	62	1.9%	52	2.3%
1995	8	0.2%	7	0.3%
1996	1,068	31.8%	671	30.2%
1997	1,694	50.5%	1,250	56.2%
1998	515	15.3%	245	11.0%
Total	3,358	100.0%	2,225	100.0%

Table 2-3
Comparison of Participant Population to Sample, by Measures Installed

	All Homes		Screened Homes	
Measures Installed	Frequency	Percent	Frequency	Percent
Improved ducts	3,418	100.0%	2,225	100.0%
Efficient AC	3,407	99.7%	2,225	100.0%
Code enforcement	3,407	99.7%	2,225	100.0%
Gas drying	3,400	99.5%	2,210	99.3%
Gas cooking	3,329	97.4%	2,204	99.1%
Efficient furnace	11	0.3%	0	0.0%
Efficient water heater	10	0.3%	0	0.0%
CFLs	4	0.1%	0	0.0%
Efficient windows	3	0.1%	1	0.0%

Nonparticipant Screening

Nonparticipant screening was conducted using the PG&E billing system as follows:

1. All identified participants from paid years 1994-1998 were screened out (using the PG&E Control number);
2. All homes with meter-set-dates and dates-on-premise prior to 1997 were screened out;
3. All single-family, individually-metered homes located on the same PG&E meter route (first 5 characters of the PG&E account number) were retained;
4. Remaining sites were screened for adequacy of billing data.

Using this screening process, 4,147 nonparticipant homes were selected. After additional geographical screening (similar to the participants) and further matching of nonparticipants to participants by PG&E meter route, a total of 3,306 nonparticipant homes remained available for on-site surveys.

2.3.2 Sample Design

To comply with the M&E Protocols, studies utilizing on-site data collection require minimum participant and nonparticipant sample sizes of 150 each. For this study, we targeted participant and nonparticipant sample sizes of 158 each, to allow for some attrition due to factors such as problematic billing data and contradictory survey results.

In addition, the project design called for “duct blaster” duct testing at 150 sites. We targeted duct testing for 75 participant sites and 75 nonparticipant sites.

It was decided that a cluster sampling technique would be most efficient for the on-site surveys. This technique ensures that sampled sites are “clustered” in areas that are scheduled for surveys by the same surveyor on a given day. The geographically diverse sample segmentation used in the cluster approach also will ensure that the final sample of surveyed homes will contain variation by builder, home type, and home size.

To implement the sample design, using the cluster sampling technique, the available homes were divided into geographical nodes - areas that could be reached by a single surveyor in a given day. In several cities, initial nodes were further disaggregated by PG&E meter route in order to better match participant and nonparticipant homes. Next, a random sample of 53 participants was drawn. This sample of participants determined how many surveys would be conducted in a given node. For each participant selected in a node, a total of six surveys would be conducted (3 participant and 3 nonparticipant). Overall, 27 nodes were targeted for surveys, providing a random and diverse sample.

2.4 COMPLETED SURVEYS

Table 2-4 shows the distribution of available sites, targeted surveys, and completed surveys by CEC climate zone. As the table indicates, completed surveys match up reasonably well with initial targets. In limited cases, targets were adjusted to facilitate the survey schedule. The nonparticipant sample was matched relatively closely with the participants. Sample disposition reports are provided in Appendix B.

Table 2-4
Summary of Targeted and Completed Surveys

Participants						
			Survey		Duct Test	
CEC Climate Zone	Population	Available	Target	Complete	Target	Complete
11	563	322	25	26	9	9
12	1,989	1,345	82	81	43	37
13	864	558	51	52	23	25
Total	3,418	2,225	158	159	75	71
Nonparticipants						
			Survey		Duct Test	
CEC Climate Zone		Available	Target	Complete	Target	Complete
11		665	22	21	8	8
12		1,484	84	86	40	47
13		1,157	52	46	27	23
Total		3,306	158	153	75	78

2.4.1 Coverage of Rebated Measures

Table 2-5 compares rebated program measures in the survey group with measures in the program population. Overall, the sample mirrors the population reasonably well in terms of rebated measures. Given the limited penetration of measures in the water heating, windows, and lighting end uses, these end uses were not focused on for the evaluation.

Table 2-5
Rebated Measure Comparison for Population and Surveyed Homes

	Population		Surveyed Homes	
	# Homes	Percent	# Homes	Percent
Improved ducts	3,418	100.0%	159	100.0%
Efficient AC	3,407	99.7%	159	100.0%
Code enforcement	3,407	99.7%	159	100.0%
Gas drying	3,400	99.5%	159	100.0%
Gas cooking	3,329	97.4%	158	99.4%
Efficient furnace	11	0.3%	0	0.0%
Efficient water heater	10	0.3%	0	0.0%
CFLs	4	0.1%	0	0.0%
Efficient windows	3	0.1%	0	0.0%

Table 2-6 compares average ex ante estimates for the population and the sample of surveyed homes. As the table shows, average impacts are very similar for all measures studied.

Table 2-6
Average Ex Ante Gross Savings Estimates for Population and Surveyed Homes

	Population		Surveyed Homes	
	kWh	Therms	kWh	Therms
Improved ducts	365	31	375	33
Efficient AC	303	--	323	--
Code enforcement	49	9	51	8
Gas drying	210	-7	210	-7
Gas cooking	481	-27	487	-27
Efficient furnace	--	30	--	--
Efficient water heater	--	18	--	--
CFLs	397	--	--	--
Efficient windows	294	-7	--	--

2.5 BUILDER SURVEYS

Interviews were targeted towards builders of all homes that received on-site surveys. For participating homes, the PG&E tracking data provided information about who built the home and the appropriate contact person. For nonparticipants, builders were identified using information provided by the homeowner and information provided by PG&E new construction representatives. Overall, 38 builder surveys were completed, accounting for 174 of the 312 homes that received on-site surveys. A sample disposition report is provided in Appendix B.

2.6 ANALYSIS SAMPLE SIZES

A summary of the number of homes available for surveys and included in the various stages of the project analysis is provided in Table 2-7. Gas model sample size was limited because customers without gas bills (electric-only customers) were not screened out of the participant sample frame; otherwise, excluding electric-only customers may have introduced bias into the study. Efficiency choice model sample sizes and self-report sample sizes were limited by the availability of builder surveys.

Table 2-7
Homes Surveyed and Included in the Analysis

	Participants	Nonparticipants	Total
Participant Population	3,418		
Screened Sites Available for Surveys	2,225	3,306	5,531
On-site Surveys	159	153	312
Duct Tests	71	78	149
Builder Surveys[1]	109(23)	65(22)	174(38)
Electric SAE Model	159	153	312
Gas SAE Model	133	130	263
Electric Efficiency Choice Model[2]	101	60	161
Gas Efficiency Choice Model[2]	84	49	133
Self Report NTG Analysis[2]	103		103

[1]Number of builders are included in parentheses. Builder counts do not sum to total because of overlap of builders in the two categories.
[2]Two builders did not respond to survey questions that were used in the efficiency choice model and the self report analysis.

2.7 EXPANSION WEIGHTS

In order to generalize study impacts to the Program population, expansion weights were developed using ex ante impact estimates from the Program tracking system. Weights were calculated by CEC climate zone (z), fuel type (f), and end use (e) as follows:

$$Weight_{z,f,e} = \frac{\sum_{N} Impacts_{z,f,e}}{\sum_{n} Impacts_{z,f,,e}}$$

where N indicates all homes in the participant population, and n indicates homes in the study.

3 DATA COLLECTION

3.1 OVERVIEW

The data requirements for the new construction evaluation and sources of data are discussed in this section. Key data elements used in the impact analysis include the following:

- program tracking data,
- billing data,
- weather data,
- on-site survey data,
- telephone builder survey data, and
- secondary source data.

3.2 PROGRAM TRACKING DATA

Program data was provided by PG&E in electronic format. A number of data elements useful for the evaluation were included in the datasets, including:

- identification of rebated homes,
- Program measures installed in those homes and the expected savings, and
- builders associated with each home.

The tracking data varied somewhat from PG&E's filed accomplishments. The following table summarizes the differences. During the course of the evaluation, it was found that PG&E's filed accomplishments overstated the number of homes completed under the Program by about 300 units. Per-unit impacts were adjusted downward for the filed accomplishments, but these adjustments were not carried back to the electronic tracking data.

Table 3-1
Comparison of Electronic Tracking Data with Filed Program Accomplishments

		Electronic Tracking Data	Filed Accomplishments
Number of Homes		3,418	3,742
Gross Impacts	kW	2,730	2,312
	kWh	4,765,907	4,034,713
	Therms	23,584	20,235
Net Impacts	kW	2,515	2,130
	kWh	3,920,147	3,318,783
	Therms	63,244	53,843

It should be noted that the evaluation per-unit impacts are derived independently from PG&E's ex ante estimates. The evaluation impacts are expanded to a Program population of 3,418 homes. In Sections 5 and 6, evaluation results are compared to PG&E's filed accomplishments.

3.3 BILLING DATA

Billing data for the statistical impact analysis was pulled from the PG&E mainframe during the first half of November 1999. The datasets used for the analysis are the "Elec Fix" and "Gas Fix" datasets maintained by PG&E's rate department. For each home, data are available for the last 12 read cycles for the following key billing analysis components:

- energy use (kWh, therms),
- meter read dates, and
- the number of days in the read cycle.

Additional billing system data (from the "Demog" file) used in the sample design and on-site recruitment process included:

- customer account number,
- customer name,
- service address, and
- residential class (single family vs. multifamily, individual meter vs. master meter).

Billing system data were linked to tracking data using the PG&E Control number identifier.

Table 3-2 summarizes collected billing data by key participation group. As the table indicates, the nonparticipants tend to use slightly more energy than the participants.

Table 3-2
Average Annual Energy Consumption

	Participants	Nonparticipants
kWh	7,945	8,119
Therms	571	595

3.4 WEATHER DATA

Two weather data sources were used for the study:

- *average year* weather data for each of the three CEC climate zones in the study (zones 11, 12, and 13) that comes from typical meteorological year (TMY) data developed by the CEC for Title 24 compliance use; and
- *actual weather* data that comes from a PG&E weather database containing 30-minute temperature and humidity data for 25 locations in the PG&E service area. This data goes back to 1983.

3.5 ON-SITE SURVEY DATA

On-site surveys of 312 new homes provide the primary data used for the study. The surveys support the building simulation, engineering, and statistical analyses that were used to develop gross kW, kWh and therm savings estimates for the Program. In addition, on-site data were used in the net-to-gross analysis, when combined with data from the telephone builder survey.

Data collected in the on-site survey include building shell data, equipment/appliance data, customer demographic data, and equipment usage patterns. Several questions were included in the survey to address customer awareness of energy efficiency and awareness of the PG&E energy efficiency programs. For 149 of the surveyed sites, “duct blaster” duct testing was conducted. These tests measure the efficiency of a home’s ducts with respect to leakage. The equipment used for this study was the Minneapolis Duct Blaster Systems’ Series B units with DG-3 digital gauges.

3.5.1 Survey Instrument

The on-site survey instrument was developed to capture both detailed engineering *and* household behavior information for all major end uses. Capturing discretionary customer behavior patterns (e.g., for thermostat setpoints and schedules, showers/week, meals/week, laundry loads/week, etc.) is important to developing accurate end use consumption estimates and related program measure impacts. The on-site survey instrument for this project was designed to address each of the key issues listed below.

1) The instrument had to enable the collection of all data necessary to perform the specific analyses required. For this project, the key analytic considerations were:
    - Data were required to provide evidence and documentation of as-built energy efficiency levels. In particular, it was necessary to collect equipment nameplate data, building shell characteristics (insulation R-values, infiltration levels, window characteristics, etc.), and duct characteristics.
    - Data were required to provide all of the necessary inputs for the Micropas building simulation analyses, which in addition to the elements noted above included building geometry, shading, zoning, internal loads, equipment schedules, and construction characteristics.
    - Data were required to support the non-space conditioning engineering algorithms for lighting, refrigerators, dishwashing, water heating, cooking, clothes drying, spas, pools, etc. In addition to the equipment data noted above, these algorithms required occupant behavior information such as number of showers, meals, loads of laundry, etc., per week.
    - Data were required to support the net-to-gross and spillover analyses, including customer awareness of energy efficiency and increased efficiency practices at the home not directly related to the Program (that may have been instituted after the homeowner moved in and contributed to lower bills).

2) The survey instrument was designed for ease and efficiency of use by the surveyor. This promoted completeness, reduced potential errors, and maximized the cost-effectiveness of the data collection tasks.

3) The survey instrument was designed with an understanding of how the data would be entered into the survey database and how it would be used for the subsequent analyses.

4) The survey was designed with the homeowner in mind. It maintained an order and structure that helped the homeowner respond accurately to the questions, and it was designed to be as expeditious as possible to reduce the burden on the homeowner's time (maximum of 20 minutes for the homeowner questionnaire portion of the survey).

A copy of the on-site survey instrument is provided in Appendix A.

3.5.2 On-site Data Collection

The on-site data collection portion of the project consisted of a number of steps: survey instrument pre-testing, surveyor training, customer recruitment, and survey implementation (including survey database development). These steps are discussed below.

Survey Instrument Pre-Test

To ensure the survey instrument was easy to use and was providing the required data, the instrument was pretested by senior surveyors at three homes. No major modifications were made to the instrument. However, the allotted time for each survey was extended somewhat to allow for adequate on-site survey time.

Surveyor Training

Surveyor training was conducted in a three-level training session. Level one training consisted of a classroom session focusing on equipment and structure identification techniques and familiarization with the survey instrument. Level two consisted of a session on customer relations, interpersonal communication skills, and client sensitivity. Level three entailed in-field training.

Homeowner Recruitment and Incentives

Recruitment consisted of two activities. The first activity involved sending a project introduction letter to all potential homes for the survey. The letter helped the recruiting team establish credibility with the homeowner. The next activity involved contacting the homeowner by telephone to obtain general information and to schedule a convenient time for the survey. At this time we ensured that we have contacted the correct home and that the home had been built in the past few years. The telephone recruitment process included: (1) a brief project introduction (including reiteration of participation incentives discussed below), (2) obtaining general information about the home and occupants, (3) scheduling an appointment for the survey, and (4) providing a description of the type of information that would be gathered and the estimated survey duration.

A PC-based project tracking and reporting system was used in the field management of this project. Priority action notification, various sort filters, notation fields, and other mechanisms provided immediate and complete reports on the customer recruitment, surveying, and data management status by customer site and sample cell.

To facilitate customer participation in the projects, homeowners were offered cash incentives: $25 for a standard survey and $50 for a survey that included duct testing.

On-site Implementation

The data collection process followed seven key steps: (1) collecting general building and dwelling type characteristics, (2) conducting a homeowner interview (collecting occupancy, thermostat/ equipment schedules, net-to-gross and spillover information), (3) collecting equipment, appliance, duct, and building shell data, (4) conducting a first-cut quality assessment (5) conducting a technical quality assessment, (6) performing accurate data entry, and (7) implementing statistical quality control checks.

Step one was performed when the homeowner was recruited for the survey. Basic information was collected on the dwelling type (i.e., standard tract, custom tract, or custom), approximate size of the home, number of stories, number of occupants, and the name of the survey contact. The recruiter also prepared the homeowner for the type of information to be collected.

Step two was performed at the customer's home. General information on the building was obtained from the homeowner and occupancy and energy usage schedules were gathered. Step three was to collect a thorough inventory of the building shell, duct, HVAC, and other appliances and equipment at the home. Other data that were then collected included building envelope characteristics (construction type, % glazing, shading, and fenestration levels), duct conditions (signs of leakage, gaps, general installation quality, length of ducts, insulation levels), appliance inventory, and miscellaneous loads such as spas or pools.

The next four steps of the data collection process insure high-quality data. Step four, the first-cut quality assessment phase, involved a review of the completed survey to insure that the forms were filled out correctly and completely. Surveys that do not pass this process were returned to the surveyor for correction. Step five was a technical review of the survey data by a XENERGY engineer. During this review, the responses were checked for technical reasonableness. Step six consisted of accurate data entry, and in step seven, final quality control activity involved a data validation assessment of the collected and entered data using statistical procedures.

Nested Duct Blaster Tests

For a sub-sample of 149 homes, a "duct blaster" duct test was performed. For this test, the home's duct system was sealed off and the system was pressurized to 25 pascals. Reads from the duct blaster equipment indicated how much air leakage there was in the duct system.

The results of the duct blaster tests were used to develop duct efficiency estimates for the Program and non-Program homes.

3.5.3 Onsite Survey Results

Table 3-3 presents selected statistics developed from the on-site survey data. As the table indicates, nonparticipant homes tend to be similar to participant homes. As expected, participant homes are more efficient. Participant homeowners earn slightly lower income than nonparticipants and were more interested in buying an energy efficient home. Awareness of the U.S. Environmental Protection Agency's Energy Star New Home Program is generally low.

Table 3-3
Selected Statistics Developed from On-site Survey Data

	Participants	Nonparticipants
Average House Price	$185,616	$179,225
Part of a Subdivision	91.9%	89.3%
Conditioned Square Footage	1,936	1,936
Number of Stories	1.3	1.4
Number of Rooms	6.5	6.6
Window-Floor Area Ratio	0.139	0.144
Ceiling R-value	29.7	27.0
Duct Leakage Flow CFM	110	163
AC SEER	12.21	10.96
Furnace AFUE	81.5	80.7
Number of Occupants	3.2	3.4
Average Annual Income	$64,349	$71,766
Have College Degree	38.4%	49.0%
Energy Effic. Important for Purchase	73.2%	60.5%
Aware of Energy Star Program	3.9%	5.4%

3.6 TELEPHONE SURVEY DATA

A telephone survey of Program and non-Program builders was used to support the net-to-gross and spillover analyses. The survey was targeted to the builders of homes that received on-site surveys.

3.6.1 Telephone Survey Instrument

The survey instrument was designed to collect basic information about the builders, such as the size of their operations, the fraction of their homes that are built under the Program, the HVAC contractors they use, and the factors motivating them to build certain types of homes (energy efficient, low cost, customer comfort, etc.). Other key issues addressed in the survey instrument are determination of:

- the Program effect on measures installed by participants,
- the Program effect on measures installed in nonparticipant homes (nonparticipant spillover),
- spillover of non-Comfort Home measures *within* participant homes,

- changes in builders' awareness of measures, changes in builders' knowledge of measures, changes in builders' decision-making processes, etc., and
- effects on code compliance.

A copy of the telephone survey instrument is provided in Appendix A.

3.6.2 Telephone Survey Implementation

Locating and contacting the appropriate builder decision maker was a significant component of the survey. There was often only one person who was qualified to complete the survey in each builder office, and more often than not, this person was seldom around. Once the builder was contacted, it was important to maintain their interest in the survey in order to get a complete set of responses. Survey response rates were lower than for a similar survey completed two years ago as part of a prior evaluation of PG&E's Comfort Home Program. It appears that builders are much busier this time around and are not willing to take the time to complete the survey.

3.6.3 Telephone Survey Results

Tables 3-4 through 3-10 present selected results from the telephone survey of builders. Key findings include:

- the sample of builders was fairly evenly split between small builders and large builders;
- the participant and non-participant average number of homes built was similar;
- most builders average home selling price is under $200,000;
- most builders concentrate on building entry-level and mid-range homes;
- almost all builders were aware of the Comfort Home Program;
- PG&E and other builders/contractors were the primary source of their awareness; and
- the majority of builders knew of the Environmental Protection Agency's Energy Star New Home Program. This was a significant increase in awareness from that found in a similar evaluation conducted two years ago. In the previous evaluation, only 18% of the builders were aware of the Energy Star Program.

Table 3-4
Distribution of Number of Homes Built: 1994-1996

	Number of Builders	Percent of Builders
Under 100	13	34%
100-199	5	13%
200-299	4	11%
300-499	2	5%
500-999	6	16%
1000 or more	8	21%

Table 3-5
Average Number of Homes Built: 1994-1996

	Average Number of Homes
Builders of Participant Homes	471
Builders of Nonparticipant Homes	535

Table 3-6
Distribution of Average Home Prices

Price Range	Percent of Builders
Under $125,000	14%
$125,000-149,999	21%
$150,000-174,999	21%
$175,000-199,999	14%
$200,000-249,999	14%
$250,000-299,999	14%
$300,000-499,999	10%
$500,000 or higher	7%

Table 3-7
Types of Homes Built

	Percent of Builders
Entry Level	50%
Mid Level	82%
Luxury	21%

Does not sum to 100% due to overlap

Table 3-8
Aware of the PG&E Comfort Home Program?

	Percent of Builders
Yes	89%
No	11%

Table 3-9
First Source of Comfort Home Program Awareness

	Percent of Builders
Approached by PG&E	29%
Saw PG&E Literature	18%
Other Builder/Subcontractor	24%
General Knowledge	3%
Don't Recall	11%

Table 3-10
Aware of EPA Energy Star New Home Program?

	Percent of Builders
Yes	61%
No	39%

3.7 Secondary Source Data

Secondary source data used for the study mainly consisted of load shape data, PG&E appliance saturation data, and equipment efficiency data.

3.7.1 Load Shape Data

The primary use of load shape data was to disaggregate energy savings into time-of-use impacts. Data for this analysis came from two sources:

1. PG&E's ongoing end-use research projects (for cooking and clothes drying); and
2. air conditioner metering data from the previous new construction program evaluation (data collected from June through October of 1993).

Figures 3-1 through 3-3 present the load shapes used for the analysis.

In addition to time-of-day fractions shown in Figures 3-1 through 3-3, the load shape was used to develop allocation factors to separate average daily usage into weekday, weekend, and peak day usage. The type-of-day distinction was required to provide impact estimates by PG&E costing period. Daily usage factors are presented in Table 3-11.

Figure 3-1
Air Conditioning Load Shapes

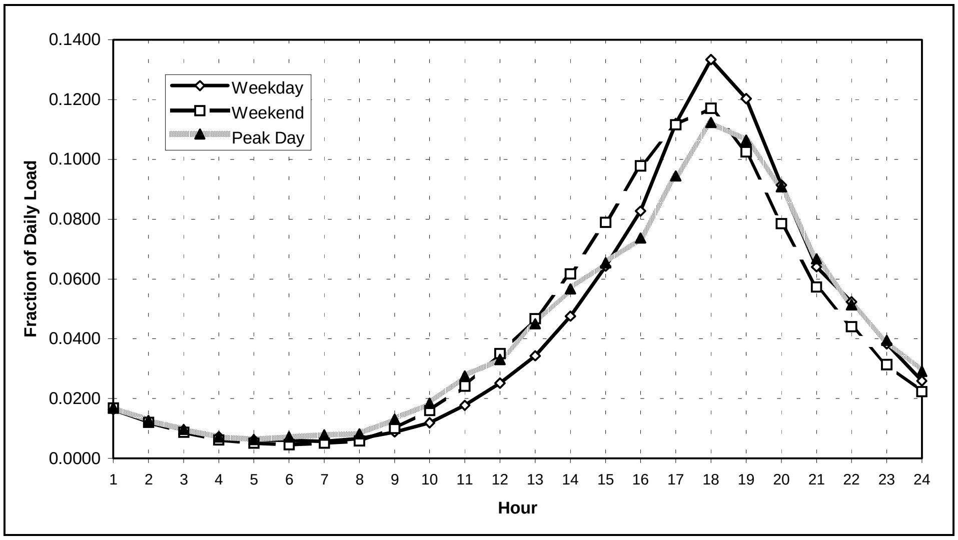


Figure 3-2
Clothes Drying Load Shapes

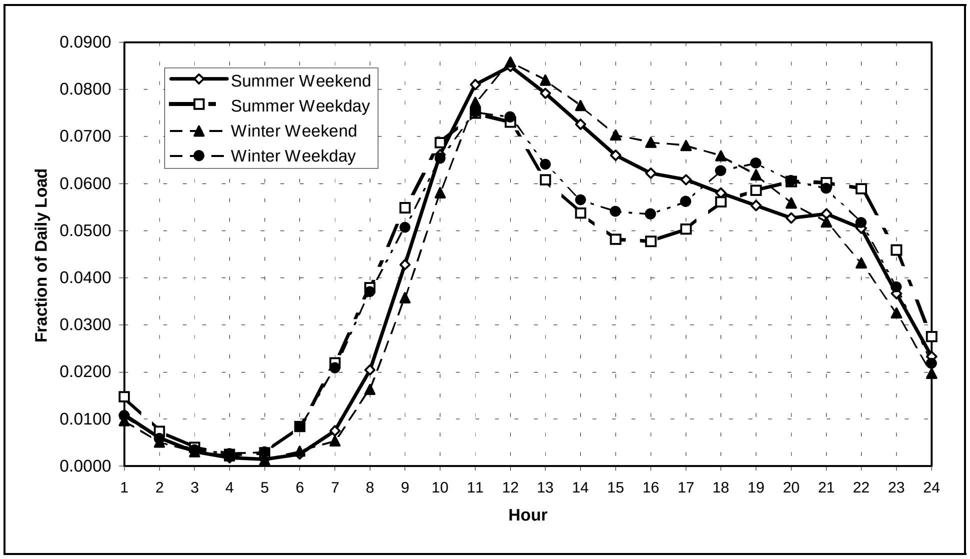


Figure 3-3
Cooking Load Shapes

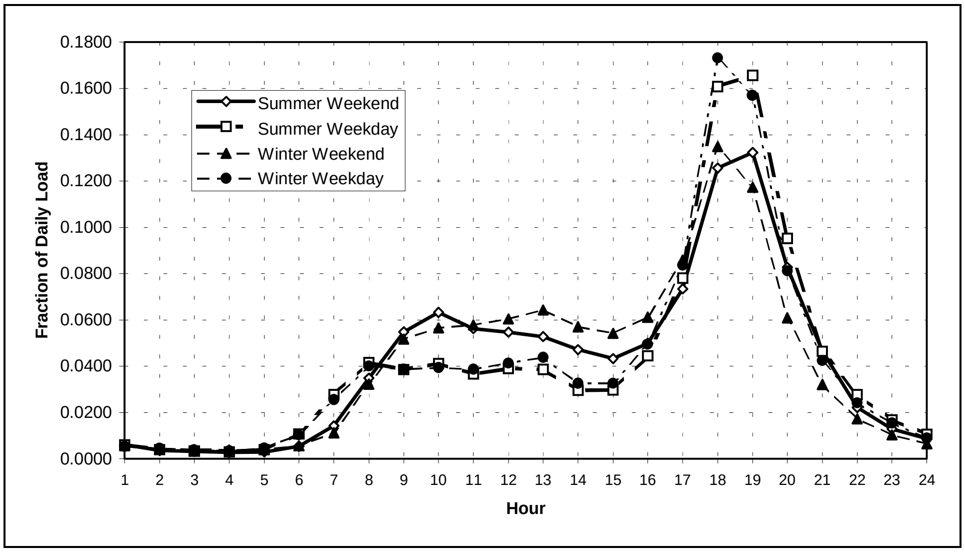


Table 3-11
Daily End-Use Usage Factors - Using Loadshape Data

End Use and Day Type	Average Daily kWh from Load Shape Data	Fraction of Average Daily Use by Season
Cooling		
Summer Weekday	5.192	0.927
Summer Weekend	6.620	1.182
Summer Peak Day[1]	17.426	3.112
Clothes Drying		
Summer Weekday	1.535	0.935
Summer Weekend	1.909	1.163
Winter Weekday	1.939	0.918
Winter Weekday	2.546	1.205
Cooking		
Summer Weekday	0.736	0.961
Summer Weekend	0.839	1.097
Winter Weekday	0.887	0.939
Winter Weekday	1.088	1.152

[1] Based on an average of the 5 peak usage weekdays covered by the load shape data.

3.7.2 Other Data

Other secondary source data that was used in the project include: (1) the most recent PG&E residential appliance saturation survey (RASS) to assess the reasonableness of net impacts calculated for gas cooking and gas clothes drying measures, and (2) various equipment literature and efficiency databases that were used to identify the energy efficiency ratings of key appliances.

4 ENGINEERING ANALYSIS

4.1 OVERVIEW

Engineering calculations utilize the information about the homes gathered during the on-site survey to calculate end-use energy consumption. Estimates of end-use energy consumption were calculated for all buildings in the study under two scenarios: as-built and reference. The reference case calculations were used to calculate gross energy savings relative to a fixed reference point (Title 24 standards) for both program participant and nonparticipant buildings.

In order to develop site-by-site savings estimates for each program component, the following two types of engineering analyses were employed:

1. Building simulation modeling and associated analysis for space conditioning measures; and
2. Engineering equations for non-space conditioning measures.

In addition, an analysis of secondary source data was utilized to develop allocation factors to assign impacts to the appropriate time-of-use periods. A description of each approach is presented below, followed by a section presenting engineering analysis results.

4.2 SPACE CONDITIONING USAGE

Site-specific building simulations were utilized to develop estimates of space cooling and space heating energy usage for both as-built and reference scenarios. The Micropas building simulation model was used for the analysis. Micropas is one of the most popular methods used to assess Title 24 compliance in new residential homes, and therefore, this approach is consistent with the requirements of the M&E Protocols (Table C-7) that call for use of a "Building Simulation Model approved by the CEC to set Title 24 building standards."

One of the major elements of the PG&E Program being evaluated involved enhanced duct installation procedures. The analysis of duct impacts was developed outside the Micropas model using the ASHRAE Standard 152P: Method. Duct analysis results (in the form of distribution system efficiency) were then combined with Micropas load calculations and system efficiency parameters to develop space conditioning energy usage estimates for each home in the study. An overview of the energy consumption calculation and energy savings approach are presented next, followed by a description of the load simulation process and the duct efficiency analysis.

4.2.1 Energy Consumption Calculations

Because Micropas does not internally model cooling, heating, and duct system efficiencies, energy usage for cooling and heating was calculated externally for each site as follows:

$$Energy_i = \frac{load_i}{systeff_i \times ducteff_i} \times conv_i \qquad (1)$$

where:

$Energy_i$ = energy (kWh or therms) for end use i (cooling or heating)
$load_i$ = Micropas load estimate in kBtus for cooling or heating
$systeff_i$ = system efficiency for cooling (SEER) or heating (AFUE)
$ducteff_i$ = duct efficiency (fraction between 0.0 and 1.0)
$conv_i$ = conversion factor to translate from kBtu to kWh or therms

System efficiencies were obtained from the on-site survey.

4.2.2 Energy Savings Calculations

The engineering estimates of energy savings, from a Title 24 reference basecase, were determined by subtracting "as-built" energy usage from reference energy usage. Using Equation 1 above, as-built energy usage reflects the as-built loads from Micropas, the actual system efficiencies (SEER and AFUE), and the calculated duct efficiencies. Reference energy use reflects the Micropas reference loads, standard system efficiencies (10 SEER and 0.78 AFUE), and reference duct efficiencies (based on the nonparticipant average for cooling and heating). Given the parameters of Equation 1, HVAC savings can be broken out into duct savings, air conditioner savings, and other savings.

Two sets of Micropas simulations were developed for the analysis, one set using compliance thermostat schedules and another set using customer-reported thermostat schedules.

Customer-reported schedule loads were used:

- In the SAE analysis to develop calibration coefficients for the engineering results, and
- In the gross savings analysis for development of gross measure impacts.

Compliance schedule loads were used:

- To assess compliance with Title 24 energy budgets, and
- In the net savings analysis to determine net impacts through a comparison of participant and nonparticipant efficiencies.

The compliance schedule loads were used in the net savings analysis because they eliminated behavioral differences between participants and nonparticipants, therefore, enhancing the effectiveness of the nonparticipants as a control group for the participants.

4.2.3 Loads Simulation Process

Building geometry information from the on-site surveys was used to create computer simulation models of every home in the study. These Micropas simulations yielded the heating and cooling load estimates for the homes that were later used to calculate total energy use. This section describes the process taken to obtain the heating and cooling loads.

The first step was to review the paper surveys and the electronic survey database. This database includes such survey information as the heating and cooling thermostat setpoints and the location of the home. The paper surveys show physical dimensions of the structures.

Next, a new database was created and populated with takeoffs from the survey drawings of the areas of walls, floors, ceilings, windows, and skylights. Other site data taken from the surveys includes the building orientation (azimuth), the climate zone, and the attributes for each of the construction types. These attributes describe the building element with u-value, mass properties, and shading coefficient.

A VisualBasic program was written to pull this geometric data out of the new database and the thermostat setpoint data from the initial survey database to create four Micropas input files for each site, referred to as cases A through D:

A. Actual geometry with actual schedules
B. Actual geometry with compliance schedules
C. Standard geometry with actual schedules
D. Standard geometry with compliance schedules

For each simulation of the A and B cases, Micropas generates a reference input file that has a standard geometry. This file is normally used for determining compliance. In this case, the standard geometry section created by Micropas is copied into the A and B files to create the C and D cases.

The monthly heating and cooling loads are extracted from the Micropas output files. The load data are then used to calculate energy consumption.

4.2.4 Duct Efficiency Analysis

The Micropas model does not specifically address duct efficiency. Rather, default efficiencies, reflecting CEC and ASHRAE assumptions, are assigned to a home based on home type (single-story vs. Multi-story) and duct location (attic, crawlspace). The same duct efficiencies are used for “proposed design” and compliance scenarios.

To assess duct efficiency for the evaluation, a separate duct efficiency model based on the ASHRAE 152 Forced Air Calculation was used. The model was developed by Ian Walker and Mark Modera of LBL to better determine actual duct efficiencies utilizing site-specific data. Inputs to the model include:

- Duct insulation levels;
- Duct blaster test results;

- House size; and
- Duct dimensions and locations.

Duct Blaster Basics

Forced air distribution systems can have a significant impact on the energy consumed in residences. It is common practice to place such duct systems outside the conditioned space, typically in attics, crawlspaces and garages. This results in the loss of energy by air leakage and conduction. In cases where the ducts are located in the conditioned space, air lost from the ducts helps condition the space, so it is not a loss.

There are several diagnostic procedures, which are used to perform quantitative leakage measurements. The most often recommended method is the "Duct Blaster Method". The procedure is performed using a calibrated air flow measurement system called a "duct blaster". It consists of the following major components: a fan, a digital pressure measurement gauge, a fan speed controller and a flexible extension duct. The duct blaster system chosen for the study is manufactured by the Energy Conservatory in Minneapolis, and meets the flow calibration specifications of the standards. It is capable of moving up to 1,350 CFM against 50 Pa of back pressure and has a flow accuracy of +/-3%.

Pressurization Test Procedure

Duct leakage is measured by first connecting the duct blaster system to the ducts at either a central return grill or at the air handler access door. After sealing off all the supply and return registers, and combustion or ventilation air inlets, the duct blaster is used to pressurize the entire duct system to a standard testing pressure. The duct pressure at which the test is conducted is representative of the average actual duct operating pressure and is typically predetermined by the program test protocol (e.g. 25 Pa or 50 Pa). The air flow needed to generate the test duct pressure (reference pressure) is measured by a calibrated pressure gauge connected to the fan. Once the reference pressure is established and maintained, it is then possible to measure the fan pressure needed to pressurize the duct system to the reference pressure. This pressure reading is converted to CFM and represents the measurement of total duct leakage (in CFM) at the duct reference pressure. The total duct leakage value consists of leakage to the outside of the conditioned space plus leakage to the inside.

Duct Leakage Results Utilization

Once the total duct leakage is recorded it is possible to utilize the "ASHRAE Standard 152P: Method of Test for Determining the Design and Seasonal Efficiency of Residential Thermal Distribution Systems, 1999" to provide an estimate of the efficiency of thermal distribution systems. The calculation procedure requires inputs, which include information about the supply and the return duct location, the ambient conditions, duct surface area, duct insulation level, heating and cooling system capacities and system fan flow. The results provide seasonal thermal distribution system efficiencies for both heating and cooling systems that are used in computing energy consumption.

Duct Efficiency Modeling Assumptions

To determine the efficiency of the studied residential thermal distribution systems, XENERGY used the form-based website program developed by the Lawrence Berkeley National Laboratory (LBNL). The program is based entirely on the most recent version of ASHRAE Standard 152P: Method of Test For Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems, 1999.

Input data for the web form come from measurements and observations in actual buildings, building plans and default values. Calculated parameters are calculated from the input data and represent intermediate information required to determine the duct efficiencies. The web program calculates delivery effectiveness and distribution system efficiency for heating and cooling, under both design and seasonal conditions.

Input Parameters

A host of input data are required for the LBNL duct model. Some data were collected during the on-site surveys while others were calculated based on surveyed data or assumed from standard practice and ASHRAE protocols. In addition, standard CEC climate data are utilized for weather-related inputs. The following table lists each input and its source. For a more detailed explanation of each input, see Appendix C.

Table 4-1
Duct Efficiency Model Input Parameters

Parameter	Surveyed	Calculated or Lookup[1]	Assumed
Conditioned Floor Area, and House Volume	✓		
Supply & Return Duct Surface Areas		✓	
Fraction of Ducts in Conditioned Space			✓
Supply & Return Duct R-values	✓		
Thermostat Setpoint, Heating & Cooling	✓		
Heating & Cooling Design Temperatures		✓	
Design Wetbulb Temperature		✓	
Indoor Wetbulb Temperature		✓	
Attic Solar Gain Reduction [y/n]	✓		
Equipment Heating & Cooling Capacity	✓		
Heating & Cooling Fan Flow		✓	
Heating & Cooling Supply & Return Duct Leakages	✓		
Equipment Efficiency Correction	✓		
Is The Attic Vented?	✓		
Is There A Thermostatic Expansion Valve?		✓	
Is Heating System A Heat Pump?	✓		

[1]Calculated values are based on survey data or lookup part numbers in Manufacturer's literature.

Duct Efficiencies for Non-tested Homes

Since duct test results are available for only about half of the homes included in the study, efficiency estimates were required for the remaining homes. Average efficiencies by participant and nonparticipant category were applied to obtain estimates for homes that didn't receive duct tests.

Average duct leakage and duct efficiency estimates are presented in Table 4-2. As the table indicates, the participants performed better than the nonparticipants both in terms of duct leakage (lower) and duct efficiency (higher). Duct efficiency differences between participants and nonparticipants were statistically significant at the 99% confidence level, as were duct leakage and duct leakage per square foot.

Table 4-2
Duct Efficiency Parameters

	Participants	Nonparticipants
Duct leakage, cfm	110	163
Duct leakage, cfm/sf	0.060	0.091
Cooling efficiency	0.890	0.818
Heating efficiency	0.916	0.798

4.3 DEVELOPMENT OF ENGINEERING-BASED ESTIMATES FOR NON-SPACE CONDITIONING

Building simulation models do not generally provide any advantageous capabilities in modeling non-space conditioning end uses such as refrigeration, water heating, cooking, clothes drying, spas, and pools. As a result, it is more efficient to determine the reference and as-built consumption of these other end uses using stand alone engineering models that can be calculated directly off of the customer survey data. The key to accurate estimation of the non-space conditioning end uses is capturing customer behavior. Water heating, cooking, dryer, spa, and pool usage are all driven by occupant behavior. We used the customer survey data to develop unique non-space conditioning end use estimates for each home in the study. These estimates will then enter the statistical model in the same manner as the building simulation results. Table 4-3 shows some of the site-specific factors that affect key end uses.

Table 4-3
Site Factors Influencing End Use Consumption

End Use	Influencing Factors
Refrigerators/Freezers	Type, Size, Age, Location
Television	Number of Sets, Hours of Use
Cooking	Number of Residents, Number of Meals, Microwave Use
Lighting	Number of Residents, Square Footage, Number of Rooms
Laundry	Number of Residents, Number of Loads
Water Heating	Number of: Residents, Showers, Meals, Wash Loads
Pool/Spa	Pump Size, Reported Usage, Use of Heaters

4.3.1 Equivalent kWh Usage for Cooking and Clothes Drying

In addition to direct engineering calculations of electric usage for cooking and clothes drying for use in the SAE analysis, equivalent cooking and clothes drying estimates were developed from gas usage estimates using the following conversions:

$$Equivalent\_kWh = Therms \times \frac{100{,}000}{3{,}413} \times \frac{GasEfficiency}{ElectricEfficiency} \qquad (2)$$

Where relative gas-efficiency-to-electric-efficiency ratios of 0.51 for cooking and 0.89 for clothes dryer were developed from U.S. Department of Energy information provided in the E-SOURCE Residential Appliances Technology Atlas, October 1994 Edition.

The equivalent kWh usage estimates (after SAE calibration) are used for calculation of Program electric impacts due to the installation of gas cooking and clothes drying measures. For measures that influenced the installation of gas appliances instead of electric appliances , electric savings impacts are positive while gas savings impacts are negative (reflecting a reduction in electric use and an increase in gas use). This approach of using equivalent kWh usage estimates was taken so that Program impacts would reflect behavioral patterns associated with the impacted homes.

4.4 TIME OF USE ALLOCATION

Allocation factors were developed to assign annual energy savings to PG&E cost periods using the load shapes discussed in Section 3 together with monthly space conditioning usage profiles from the Micropas simulation analysis. Allocation factors, expressed as a percent of annual energy use, are presented in Table 4-4.

Table 4-4
Time of Use Allocation Factors - Relative to Annual Usage

<table>
<tr><th></th><th></th><th>Summer Peak</th><th>Summer Partial Peak</th><th>Summer Off Peak</th><th>Winter Partial Peak</th><th>Winter Off Peak</th></tr>
<tr><td rowspan="2">Cooling</td><td>Peak kW</td><td>0.001269</td><td>0.001830</td><td>0.000883</td><td>0.000000</td><td>0.000000</td></tr>
<tr><td>kWh</td><td>0.309470</td><td>0.235692</td><td>0.444313</td><td>0.005860</td><td>0.004666</td></tr>
<tr><td>Heating</td><td>Therms</td><td colspan="3">0.014166</td><td colspan="2">0.985835</td></tr>
<tr><td rowspan="3">Cooking</td><td>Peak kW</td><td>0.000105</td><td>0.000391</td><td>0.000065</td><td>0.000447</td><td>0.0000439</td></tr>
<tr><td>kWh</td><td>0.117935</td><td>0.141381</td><td>0.192557</td><td>0.313346</td><td>0.234781</td></tr>
<tr><td>Therms</td><td colspan="3">0.451873</td><td colspan="2">0.548127</td></tr>
<tr><td rowspan="3">Clothes Drying</td><td>Peak kW</td><td>0.000107</td><td>0.000132</td><td>0.000132</td><td>0.000204</td><td>0.000020</td></tr>
<tr><td>kWh</td><td>0.093170</td><td>0.133124</td><td>0.215534</td><td>0.293633</td><td>0.264539</td></tr>
<tr><td>Therms</td><td colspan="2">0.441828</td><td></td><td colspan="2">0.558172</td></tr>
</table>

4.5 SUMMARY OF ENGINEERING RESULTS

Results of the engineering analysis are summarized in this subsection. First, compliance with Title 24 allowance budgets are addressed. Next, space conditioning energy usage and energy efficiency impacts are presented. Finally, unit energy consumption (UEC) values developed from the on-site survey and the non-space conditioning algorithms are shown.

4.5.1 Title 24 Budget Compliance

Table 4-5 presents Title 24 compliance calculation averages based on the Micropas simulation results that utilized compliance thermostat schedules and duct efficiencies. For participants and prior participants, the air conditioner SEER level was set to 10 in order to approximate budget compliance prior to Program effects. As the table indicates, participants were below budget by 0.39 kBtu/ft^2 on average, prior to accounting for the effects of increased air conditioner efficiencies. The table also shows that nonparticipants were, on average, slightly higher than the Title 24 budgets by about 0.37 kBtu/ft^2. For all groups, budget compliance is realized primarily through the water heating end use. This is not surprising, given an almost negligible cost different between efficient and standard water heaters (0.60+ EF water heaters versus 0.54 EF water heaters).

Table 4-5
Title 24 Compliance Calculations - kBtu/ft^2-yr

	End Use	As-built	Budget	Difference
Participants @ SEER=10	Space Heating	20.77	18.47	2.30
	Space Cooling	9.82	10.87	-1.05
	Water Heating	10.79	12.43	-1.64
	Total	41.38	41.77	-0.39
Nonparticipants @ Actual	Space Heating	19.34	17.24	2.10
	Space Cooling	10.53	10.57	-0.04
	Water Heating	10.70	12.39	-1.69
	Total	40.57	40.20	0.37

4.5.2 Space Conditioning

Average space conditioning consumption and impacts, based on the engineering analysis, are presented in Table 4-6. For comparison purposes, usage based on Micropas compliance schedules are presented alongside usage based on customer-reported schedules. Nonparticipant results are also shown. Results are unweighted simple averages of study sites.

Table 4-6
Average per Home Engineering Results (Unweighted) - Space Conditioning

	Compliance Schedules		Reported Schedules	
	Participants	Nonparticipants	Participants	Nonparticipants
Cooling - kWh/year				
Baseline Cooling	2,078	2,092	2,183	2,144
As-built Cooling	1,752	2,085	1,823	2,149
Total Savings	327	7	360	-5
Duct Savings	171	-8	182	-13
AC Savings	387	188	400	198
Other Savings	-231	-173	-222	-190
Heating - Therms/year				
Baseline Heating	270.5	271.5	391.3	371.6
As-built Heating	278.3	316.7	389.2	418.7
Total Savings	-7.8	-45.2	2.1	-47.1
Duct Savings	37.6	-5.7	54.6	-5.2
Furnace Savings	11.2	11.5	15.1	15.1
Other Savings	-56.7	-50.9	-67.7	-57.1

Key findings of the space conditioning engineering analysis include:

- Average results using compliance schedules differ somewhat from results using reported schedules for space heating; also, variation across homes is much greater when using the reported schedules;
- Duct savings for nonparticipants are, by design, close to zero;
- Positive participant savings for ducts and air conditioning are partially offset by negative savings in other areas - primarily involving the building envelope; nonparticipants also show negative "other" savings;
- Key factors driving the negative "other" savings results include the propensity for homes to be built with larger window areas than the compliance design and possible problems modeling garage insulation discussed further in Section 5;
- Negative "other" savings for space heating are somewhat compensated for by increased furnace efficiency.

4.5.3 Other End Uses

Engineering estimates of UECs (unit energy consumption) for non-space conditioning end uses are presented in Table 4-7. Results are simple unweighted averages of study sites. Appliance saturations are also presented to provide an indication of how many homes the UEC estimates are based on. In general, the UECs appear reasonable in light of other published usage estimates.

Table 4-7
Engineering Estimates of Non-space Conditioning Unit Energy Consumption
(Unweighted Average of Participants and Nonparticipants)

Electric End Uses	kWh/year	Saturation
Refrigeration	1,030	1.000
Freezers	773	0.240
Televisions	456	0.994
Stovetops	271	0.096
Ovens	181	0.308
Microwave Ovens	114	0.910
Lighting	1,721	1.000
Clothes Drying	1,127	0.423
Clothes Washing	125	0.994
Dish Washing	212	0.946
Pools	1,193	0.128
Spas	1,815	0.099
Miscellaneous	1,550	1.000
Gas End Uses	**Therms/year**	**Saturation**
Water Heating	177	0.987
Stovetops	19	0.897
Ovens	16	0.692
Clothes Drying	46	0.561
Pool Heating	296	0.029
Spa Heating	162	0.035
Gas Fireplace	36	0.561

As discussed in Section 4.3, Program electric impacts for cooking and clothes drying are imputed from participant gas usage estimates using appropriate conversion factors. Table 4-8 shows gas UECs and the associated equivalent-electric UECs for the participants. These results are simple unweighted averages before applying the SAE adjustments discussed in the next section of this report.

Table 4-8
Gas and Equivalent-electric Cooking and Clothes Drying UECs
(Unweighted Participant Average)

End Uses	Therms/year	Equivalent kWh/year
Stovetops	18.8	281
Ovens	15.6	233
Clothes Drying	48.2	1,257

5 STATISTICAL CALIBRATION AND GROSS IMPACTS

5.1 OVERVIEW

This section presents the method used to statistically calibrate engineering usage and savings estimates to customer bills. Model results, including calibration coefficients and their statistical precision, are presented. Application of the calibration coefficients to engineering savings estimates is also shown, and calibrated estimates of gross program savings are presented.

5.2 STATISTICAL CALIBRATION OF ENGINEERING RESULTS

For the statistical analysis portion of this project, an SAE (statistically adjusted engineering) approach was utilized. Regression models were specified using engineering estimates of end-use energy consumption (discussed in Section 4) to estimate monthly energy usage (from bills) for the surveyed sample of homes.

The SAE modeling approach has some distinct advantages over simpler conditional demand models that use binary end use and program indicator variables interacted with other survey data. The SAE models impose an engineering-based structure to the regression model, making it easier to delineate energy usage among the various end uses. This structure is especially important for addressing multicollinearity among gas space heating and water heating that occurs because almost all homes utilize gas for both of these end uses. In addition, by providing engineering structure to program savings estimates, the SAE models are better able to identify measure savings that can get lost in the "noise" of purely statistical models.

Key SAE model inputs include billing data, weather data, and end-use consumption estimates (UECs) from the engineering analysis portion of the project (all developed on a monthly basis and expressed in use per day). The key outputs are calibration coefficients that can be applied to the engineering results to provide realized usage and savings estimates. The adjustment coefficients are often referred to as realization rates because they relate realized usage and savings to the initial engineering savings estimates.

5.2.1 Model Specification

The SAE model is based on the fact that the total energy use in a home is equal to the sum of energy use across all of the end uses. The basic form of the SAE model is:

$$Energy_{it} = \sum_{j=1}^{n} (\beta_j \times AB\_ENGIN_{jit}) + \varepsilon_{it} \qquad (2)$$

where:

$Energy_{it}$ = Billed electric or gas use for customer *i*, in period *t*

AB_ENGIN_{jit} = As-built engineering estimates of energy use for end-use *j*, for customer *i*, in period *t*

β_j = Estimated adjustment parameters

ε_{it} = Error term

If the *AB_ENGIN* values are perfectly accurate, all of the parameters β would be equal to one and the error term would be zero. If a parameter value is greater than one, this implies that the engineering estimates are too low on average. The engineering estimates are too high on average if the parameter value is less than one. The further the parameter estimate is from one, the larger the error in the engineering estimate

Next, for the end uses of interest, the basic SAE model can be modified by decomposing the engineering estimates into two components, base case use (*BASE_ENGIN*) and the difference between base-case use and as-built use (*BASE_ENGIN - AB_ENGIN*):

$$Energy_{it} = \sum_{j=1}^{n} [\alpha_j \times BASE\_ENG_{jit} - \beta_j \times (BASE\_ENGIN - AB\_ENGIN)_{jit} + \varepsilon_{it}] \qquad (3)$$

As it applies to this evaluation *BASE_ENGIN* is energy use under Title 24 standards and (*BASE_ENGIN - AB_ENGIN*) represents energy savings over the standards that occur for both participants and nonparticipants. The addition of the term α in equation (3) indicates that the adjustment parameters can be allowed to vary between the base-case usage estimate (adjustment parameter α) and the energy savings estimate (adjustment parameter β). Using this equation, realized savings are estimated as:

$$Realized\ Gross\ Savings_{jit} = \beta_j \times (BASE\_ENGIN_{jit} - AB\_ENGIN_{jit}) \qquad (4)$$

β_j in equation (4) is referred to as the realization rate, the fraction of gross engineering savings realized in customer bills. Sometimes modeling limitations preclude the estimation of separate adjustment for savings and base-case usage. This is especially true when savings are small relative to total end-use consumption or when savings are highly correlated with total end-use consumption. In these instances equation (2) is utilized instead of equation (3) and the same realization rate parameter is estimated for both the base case usage and the savings.

Cooking and Clothes Drying Impacts

In addition to the development of realized savings for HVAC measures that are determined by the difference between baseline and as-built use, the evaluation also requires impact estimates for measures promoting gas cooking and gas clothes drying. For these end uses, realization rates were developed in the gas SAE model. These realization rates are then applied to engineering estimates of gas cooking and clothes drying consumption to determine realized gross impacts. As discussed in Section 4, equivalent electric impacts are then derived from the gas impact estimates.

5.2.2 SAE Model Results

Specific variables that were used in the electric and gas SAE models are presented next, along with the estimated equations.

Electric Model

In specifying the electric SAE model, monthly electric usage (expressed on a kWh per day basis) was modeled as a function of the following variables (developed from the engineering analysis and also expressed on a kWh per day basis):

1. base-case cooling usage (reflecting Title 24 compliance usage, 10 SEER air conditioner efficiency, and average nonparticipant duct efficiency of 0.818);
2. high efficiency air conditioner savings due to increased efficiency above 10 SEER;
3. duct savings based on the difference between site duct efficiency and the nonparticipant average of 0.818;
4. other cooling savings based on differences between compliance and as-built envelope construction;
5. pool and spa electric usage; and
6. electric usage from all other end uses.

All space cooling variables were interacted with the ratio of actual-to-normal cooling degree days (65 degree base) to account for differences between billed consumption that reflect actual weather and the engineering cooling estimates that reflect normal weather. When developing realized impact estimates, the actual-to-normal degree day ratios are set to one, thereby providing impact under normal weather conditions. Finally, the coefficients for air conditioner savings and duct savings variables were restricted to be equal, but in the opposite direction, to the base cooling usage estimate [i.e., duct parameter = AC-parameter = - (base-cooling-parameter)]. This restriction was made for two reasons: first, savings for air conditioner efficiency improvements should be proportional to loads; and second, there was a high degree of multicollinearity between base usage and air conditioner and duct savings, making it difficult to get an accurate estimate for the duct and air conditioner adjustment coefficients.

The electric model was estimated using a generalized least squares procedure to correct for autocorrelation (the correlation of model residuals over time for each home). Autocorrelation is a typical problem in time-series analyses, and its presence was confirmed by the examination of site-specific Durbin-Watson statistics that were generally outside the acceptable range. Five customers whose observations were outliers (with studentized t-statistic greater than 4 in absolute value) were removed from the final model.

The electric model results are presented in Table 5-1. As the table indicates, all variables have the appropriate signs (savings variables have negative coefficients indicating a reduction in usage) and are statistically significant at very high confidence levels. The adjusted R^2 is reasonable for these types of models. The coefficients for base-case cooling, ducts and efficient

AC variables indicate that engineering results for these components are, on average, somewhat low. The "other" savings coefficient of -0.291 indicates the engineering estimate of "other" savings is overstated significantly. The pool and spa coefficient reflects that the engineering estimates were high on average. Realization rates for the other end uses are close to 1.0, indicating a good fit between the engineering estimates and billed usage.

Table 5-1
Electric SAE Model, Dependent Variable: Billed Consumption

Variable	Parameter Estimate	t-statistic
Base case cooling use	1.197	73.2
Efficient AC savings	-1.197	-73.2
Duct savings	-1.197	-73.2
Other cooling savings	-0.291	-6.0
Pool/Spa use	0.678	8.1
Other end use consumption	1.052	97.1
Number of observations	3,644	
Adjusted R^2	0.8004	

Possible explanations of the low "other" savings parameter were developed from a review of the building simulation results. Recall from Section 4 that other cooling savings were negative, indicating that building envelopes tended to be less efficient that Title 24 reference values. Key factors that were likely to lead to an underestimate of building envelope efficiency during the building simulation analysis include window U-values and garage insulation values:

- Windows: assumed U-values for the study are CEC defaults for reported construction types (as defined in the Title 24 compliance manual); it is likely that actual U-values are lower that these defaults, by 10%-15%.
- Garage insulation: surveyors tended to report no insulation between garage ceilings and second story rooms and between garage walls and connected rooms. Subsequent discussions with builders revealed that these areas were, in fact, insulated.

It was discovered in the space conditioning modeling effort that assumptions regarding above-garage floor insulation and garage wall insulation were most likely incorrect. Surveyors generally assumed there was no insulation between garage ceilings second-story floors for customers with multi-level homes (119 customers) and between garage walls and attached dwelling spaces (60 customers). These assumptions resulted in higher than expected estimates of space conditioning energy usage as compared to the compliance estimates.

XENERGY performed sensitivity testing to ascertain the effect of the incorrect modeling assumptions and found the following:

- The 152 customers whose space conditioning engineering estimates were affected were equally distributed between participant and non-participants groups, and

- Participants' and non-participants' negative gross savings were of the same magnitude, for those 152 customers.

These findings led to the conclusion that the difference between participant and non-participant gross space conditioning savings were not significantly affected by the incorrect modeling assumptions. Furthermore, the SAE calibration approach adjusts the engineering estimates according to customers' bills, thus constraining the engineering estimates to reality. To confirm that this problem wasn't biased towards participants or non-participants, two regression parameters were added to the SAE equation to account for any effect these problems had on estimates, and neither parameter was statistically significant.

Also note in the table above that the coefficient for the "other" cooling savings variable has a fairly low value, but it still has the appropriate sign and is statistically significant. This fact means that although, on average, the engineering analysis may have overestimated the difference between as-built and reference building envelope efficiency, it is still likely that as-built envelopes are less efficient than the Title 24 reference values.

Gas Model

The gas SAE model specification is similar to the electric model. Monthly gas consumption, on a therm per day basis, is modeled as a function of:

1. Base case heating usage (reflecting Title 24 compliance usage, 0.78 AFUE furnace efficiency, and average nonparticipant duct efficiency for heating of 0.798);
2. High efficiency furnace savings due to increased efficiency above 0.78 AFUE;
3. Duct savings based on the difference between site duct efficiency and the nonparticipant average of 0.798;
4. Other heating savings based on differences between compliance and as-built envelope construction;
5. Cooking and clothes drying gas usage;
6. Pool and spa gas usage; and
7. Gas usage from all other end uses.

All space heating variables were interacted with the ratio of actual-to-normal heating degree days (65 degree base), and the coefficient for the furnace savings variable was restricted to be equal, but in the opposite direction, to the base heating usage estimate. The clothes dryer and cooking estimates were constrained to be equal, because of unreasonable parameter estimates obtained when the end uses were modeled separately. The gas model was not estimated using a generalized least squares procedure to correct for autocorrelation. The model that corrected for serial correlation returned unreliable parameter estimates. Most notably, the water heating adjustment parameter dropped to an unreasonably low level. As with the electric model, outlier observations were examined, and four customers' observations were removed from the final model.

The gas model results are presented in Table 5-2. All variables have the appropriate signs and are statistically significant at high confidence levels. The adjusted R^2 is reasonably high for this type of model. The coefficients for base case heating and efficient furnace variables indicate that engineering results for these components require an adjustment to 74% of the original engineering estimate. One factor probably contributing to high original engineering estimate is the use of customer reported heating schedules in calculating heating loads. Review of Table 4-6 shows that estimated heating usage increases considerably when customer-reported heating schedules are used in the Micropas simulation runs.

The duct savings coefficient of -0.61 and the "other" heating savings coefficient of -0.38 indicate the engineering estimates are higher than the realized estimates. The factors discussed above that contribute to the low electric "other" savings parameter (garage insulation and window U-values) also apply to the gas "other" savings parameter. The engineering-based cooking and clothes drying estimates are adjusted up by only 3%.

Table 5-2
Gas SAE Model, Dependent Variable: Billed Consumption

Variable	Parameter Estimate	t-statistic
Base case heating use	0.742	66.7
Efficient furnace savings	-0.742	-66.7
Duct savings	-0.617	-11.3
Other savings	-0.384	-11.9
Cooking use	1.026	7.3
Clothes drying use	1.026	7.3
Pool and spa use	0.665	8.2
Water heater use	0.777	18.2
Number of observations	3,040	
Adjusted R^2	0.6710	

5.3 CALIBRATED LOADS AND GROSS IMPACTS

Program level gross impacts are calculated by applying the SAE adjustments to site-level engineering estimates of usage and savings and then weighting up participant site-level results to Program totals using the expansion weights discussed in Section 2. Gross impact results are discussed next.

5.3.1 Space Conditioning Impacts

Gross impacts for the space conditioning end uses are presented in Table 5-3. All impacts are measured relative to Title 24 standards. Cooling impacts are estimated to be 582 kWh per home and 1,987,795 kWh for the Program. Heating impacts are estimated to be 16.0 therms per home and 54,536 therms for the Program. Note for space heating, the furnace savings include impacts for all furnaces with efficiencies above 0.78 AFUE. In many cases, increased furnace efficiency may be used by builders to offset deficiencies in building envelop efficiency (as noted by the negative "other" heating savings).

Table 5-3
Gross Program HVAC Impacts

Cooling	Average kWh	Total kWh
Baseline Cooling	2,416	8,259,326
As-built Cooling	1,835	6,271,531
Total Savings	582	1,987,795
Duct Savings	201	686,668
AC Savings	453	1,548,967
Other Savings	-73	-247,840
Heating	Therms/home	Total therms
Baseline Heating	275.6	942,148
As-built Heating	259.7	887,612
Total Savings	16.0	54,536
Duct Savings	32.5	111,039
Furnace Savings	10.8	36,941
Other Savings	-27.3	-93,443

Table 5-4 compares evaluation gross impacts with PG&E ex ante estimates. For space cooling, evaluation results are slightly lower than PG&E estimates. Offsetting factors cause this result. Air conditioner impacts are greater than expected, reflecting above-average cooling loads for participant homes. Duct and "other" savings are lower than expected. Evaluation space heating results are much lower than the PG&E estimates. Duct savings are slightly lower than expected, but large negative "other" savings drives down the total heating impact.

In reviewing results, one should keep in mind that a comparison of gross impacts is not always very useful because impacts only reflect differences between as-built homes and Title 24 reference energy use, and there are trade-offs among measures and end uses in complying with Title 24 and in constructing a home that is energy efficient. The key to evaluating savings is to compare participant impacts relative to nonparticipants. This analysis is presented in the next section that addresses net savings.

Table 5-4
Comparison of Gross HVAC Impacts to PG&E Ex Ante Estimates

	Evaluation	PG&E Ex Ante	Realization Rate
Cooling Savings kWh/year	1,987,795	2,073,889	0.96
Heating Savings Therms/year	54,536	115,106	0.47

5.3.2 Clothes Drying and Cooking

Cooking and clothes drying impacts are presented in Table 5-5. These impacts are the calibrated gas usage estimates and equivalent electric usage estimates for homes in the sample that received rebates for gas cooking and clothes drying measures. Results are weighted to the participant population using the expansion weights described in Section 2. Average savings differ from UECs reported at the end of Section 4 because impacts are weighted averages over all participant homes, whereas the UECs in Section 4 reflect energy use averaged over only the homes that have the particular end use.

Table 5-5
Gross Program Impacts for Gas Clothes Drying and Cooking Measures

	Average		Total	
	Therms	kWh	Therms	kWh
Clothes Drying	-27.0	704.0	-92,232	2,405,112
Stovetop	-16.5	247.0	-56,392	842,656
Oven	-10.4	155.0	-35,520	530,767
Cooking Total	-26.9	402.0	-91,912	1,373,423

Evaluation gas clothes drying and cooking impacts are compared to PG&E estimates in Table 5-6. Evaluation clothes dryer impacts are much higher than PG&E estimates. This reflects the relatively high penetration of gas dryers in rebated participant homes in the study (58%) and higher annual dryer usage than predicted by PG&E. PG&E rebates builders who install gas dryer stubs in the wash area but assumes only a fraction of the homeowners (35%) will install gas dryers. These impacts are incorporated into the tracking system as lower gross impacts rather than through a lower net-to-gross ratio. Evaluation cooking therm impacts are somewhat larger PG&E's estimates (in absolute terms), and evaluation kWh impacts are slightly higher. For both clothes drying and cooking, it appears that PG&E is assuming different gas-to-electric conversion factors than those determined by the evaluation (and based on efficiency comparisons from the E-SOURCE Appliance Technology Atlas).

Table 5-6
Comparison of Gross Clothes Drying and Cooking Impacts to PG&E Ex Ante Estimates

	Evaluation		PG&E ex ante		Realization Rate	
	Therms	kWh	Therms	kWh	Therms	kWh
Clothes Drying	-92,232	2,405,112	-20,076	602,280	4.59	3.99
Cooking	-91,912	1,373,423	-74,978	1,356,559	1.23	1.01

5.3.3 Other End Uses

Two end uses covered by the Program were not included in the evaluation: water heating and lighting. Impacts for these end uses were small. For these end uses, the Program tracking estimate for savings was assumed to be correct.

Table 5-7
Savings for Measures Not Evaluated, Based on Tracking System Data

	kWh	kW	Therms
Lighting	1,985	0.10	-
Water Heating	-	-	183

5.3.4 Gross Impacts by Costing Period

Using the allocation factors developed from load shape data and discussed in Section 4, impacts were calculated for the PG&E costing periods. Results are presented in Table 5-8.

Table 5-8
Gross Impacts by PG&E Costing Period

	PG&E Costing Period				
	Summer Peak	Summer Partial Peak	Summer Off Peak	Winter Partial Peak	Winter Off Peak
kWh Impacts					
Cooling	615,346	468,647	883,467	11,321	9,014
Clothes Drying	224,084	320,179	518,383	706,220	636,245
Cooking	161,975	194,176	264,46	430,356	322,454
Lighting	378	360	598	346	304
Total	1,001,783	983,362	1,666,911	1,148,243	968,017
kW Impacts					
Cooling	2,523.5	3,639.1	1,757.9	0.0	0.0
Clothes Drying	257.7	316.3	318.0	489.6	48.2
Cooking	144.3	536.9	89.8	613.6	60.4
Lighting	0.10	0.15	0.06	0.05	0.01
Total	2,925.6	4,492.5	2,165.8	1,103.2	108.6
Therm Impacts					
Heating	844			53,693	
Clothes Drying	-40,751			-51,481	
Cooking	-41,532			-50,379	
Water Heating	92			92	
Total	-81,348			-48,076	

5.3.5 Gross Impact Confidence Intervals

Using statistical output from the SAE models, confidence intervals were developed by end use. Program-level confidence intervals are calculated as the sum of the end use intervals. Results are shown in Table 5-9.

Table 5-9
Gross Impact Confidence Intervals

	Point Estimate	90% Confidence Interval			80% Confidence Interval		
		Percent	Lower bound	Upper bound	Percent	Lower bound	Upper bound
kWh Impacts							
Cooling	1,987,795	24%	1,510,724	2,350,369	19%	1,610,114	2,365,476
Clothes Drying	2,405,112	43%	1,370,914	2,994,605	34%	1,587,374	3,222,850
Cooking	1,373,423	43%	782,851	1,710,049	34%	906,459	1,840,387
Lighting	1,985	0%	1,985	1,985	0%	1,985	1,985
Total	5,768,315	36%	3,666,474	7,057,008	42%	4,105,932	7,430,698
Peak kW Impacts							
Cooling	2,523.5	24%	1,918	2,984	19%	2,044	3,003
Clothes Drying	257.7	43%	147	321	34%	170	345
Cooking	144.3	43%	82	180	34%	95	193
Lighting	0.1	0%	0.1	0.1	0%	0.1	0.1
Total	2,925.6	27%	2,147.1	3,484.4	34%	2,309.5	3,541.7
Therm Impacts							
Heating	54,536	53%	25,632	68,121	41%	32,176	76,896
Clothes Drying	-92,232	43%	-52,572	-114,838	34%	-60,873	-123,591
Cooking	-91,912	43%	-52,390	-114,439	34%	-60,662	-123,162
Water Heating	183	0%	183	183	0%	183	183
Total	-129,424	39%	-79,147	-160,973	45%	-89,175	-169,673

6 NET SAVINGS ANALYSIS

6.1 OVERVIEW

The calculation of net savings involves determining the portion of realized gross savings that is attributable to the Program. In this study, three approaches to estimating net savings were investigated and integrated to provide the most appropriate estimate of net savings for the Program. The three approaches are:

1. Self-report estimates based on participant builder survey data of what they would have done in the absence of the Program;
2. A simple comparison of participant and nonparticipant efficiency levels; and
3. An efficiency choice model-based comparison of participant and nonparticipant efficiencies to correct for endogeneity of savings and program participation.

A discussion of each of the net savings approaches is provided next followed by a summary of the results. Then the issue of program spillover is addressed. Findings from the builder survey regarding spillover are presented and impacts on net savings are discussed. Finally, program net savings are presented and compared to PG&E ex ante estimates.

6.2 SELF-REPORT NET-TO-GROSS ANALYSIS

The self-report net-to-gross analysis was used to estimate free-ridership ratios based on builder responses to survey questions. Following is a brief review of the survey questions used to assess free-ridership, followed by a description of the free-ridership ratio assignment.

6.2.1 Free-Ridership Survey Results

Three key survey questions were used in the assignment of free-ridership. Tables 6-1 through 6-3 tabulate builder responses to these questions.

Table 6-1 shows the results of the questions about how the builders first learned about high efficiency air conditioning and enhanced duct installation procedures. The table shows that about one quarter of builders (24%) were introduced to efficient air conditioning by PG&E, and over half (59%) learned about enhanced duct installation from PG&E.

Table 6-1
Source of Builder Information for Efficient Air Conditioners and Enhanced Duct Installation

Source of Information	Efficient AC	Enhanced Duct Installation Procedures
From PG&E representative	10%	38%
From PG&E Literature	14%	21%
From other builders or sub-contractors	29%	13%
From architect or designer	5%	4%
From manufacturers' rep or literature	14%	4%
From trade literature	0%	0%
From consultants	10%	17%
Other	19%	4%

* Results do not include missing responses

Table 6-2 presents the ranking of PG&E rebates among various factors influencing the builder to install program measures. Other factors included in the importance ranking were: information from program literature, past experience with the measures, information from vendors or designers, home buyers' request for measures, and meeting Title 24 compliance budgets. As the table indicates, PG&E rebates were important factors for the efficient air conditioner and enhanced duct efficiency measures, but less important for the gas appliance measures.

Table 6-2
Ranking of PG&E Rebates Among Reasons for Installing Program Measures

	Program Measure			
	High SEER AC	Enhanced Duct Installation	Gas Cooking	Gas Dryer Stubs
Rebates ranked first	58%	54%	25%	29%
Rebates ranked second	8%	13%	13%	8%
Rebates ranked third	8%	8%	0%	0%
Not ranked 1st, 2nd or 3rd	25%	25%	63%	63%

Table 6-3 shows a tabulation of builder responses regarding likely measure installation practices without the rebates. The responses show that most builders say that they would not have installed the HVAC measures and conducted duct testing but would have still included the gas appliance measures.

Table 6-3
Likelihood of Measure Installation Without Rebates

	Program Measure				
	High Efficiency AC System	Duct Testing	Enhanced Duct Installation	Gas Cooking	Gas Dryer Stubs
Definitely would have done it anyway	4%	0%	0%	67%	67%
Probably would have done it anyway	8%	8%	17%	13%	8%
Probably would not have done it anyway	42%	50%	46%	17%	17%
Definitely would not have done it anyway	46%	42%	38%	4%	8%
Don't Know	0%	0%	0%	0%	0%

6.2.2 Self-Reported Free-Ridership Ratios

Using the survey results described above, free-ridership ratios were calculated. The approach is described below, followed by the free-ridership results.

Self-Reported Free-Ridership Ratios

First, initial free-ridership ratios were developed based on builders' stated intentions about what they would have done in the absence of the Program rebates. Table 6-4 shows the ratio assignment used for this study. The intermediate free-ridership values (0.67 and 0.33) were judgmentally assigned to reflect uncertainty in the builders' stated intentions given a "probably" response.

Table 6-4
Initial Free-ridership Ratio Assignment Based on Stated Intentions

Install Measures Without Program?	Free-Ridership Ratio
Definitely would install anyway	1.00
Probably would install anyway	0.67
Probably would not install anyway	0.33
Definitely would not install anyway	0.00

Next, a set of consistency checks were implemented to adjust the initial free-ridership ratio based on questions regarding the source of the builders' knowledge of efficiency measures and the builders' importance ranking of the rebate in their decision to install measures. The consistency checks are important because simple self-report net-to-gross studies tend to produce biased results; respondents often give themselves credit for installing program measures despite being significantly influenced by the Program. The consistency checks used for this study are shown in Table 6-5.

Table 6-5
Self-report Consistency Checks

Consistency Check	Assigned Free-ridership Probability Limit
If customer first heard of efficient AC and ducts from PG&E	Maximum of 50%
If PG&E rebates were most important reason for installing Program measures	Maximum of 33%
If PG&E rebates were not one of the top three reasons for installing Program measures	Minimum of 67%

6.2.3 Self-Report Results

Using the approach outlined above, free-ridership ratios were assigned to each participant builder who responded to the survey. Weighted averages of the results were then developed and are presented in Table 6-6. Weights were based on the number of homes associated with each builder, estimated savings for each home, and the site expansion weights (described in Section 2). Implied net-to-gross ratios (*NTGR*s) are calculated as one minus the free-ridership ratio.

Table 6-6
Self-report Free-ridership and Implied Net-to-Gross Ratios

	Without Consistency Checks		With Consistency Checks	
Measure	Free-Ridership Ratio	Implied *NTGR*	Free-Ridership Ratio	Implied *NTGR*
Efficient AC	0.260	0.740	0.338	0.662
Enhanced Ducts	0.222	0.778	0.266	0.734
Gas Dryer Stubs	0.672	0.328	0.639	0.361
Gas Cooking	0.783	0.217	0.764	0.236

As Table 6-6 shows, free-ridership is lowest and implied *NTGR*s are highest for the air conditioner and duct measures. Free-ridership ratios increased by 30% for the air conditioner measure, and by about 20% for the duct measure, when the consistency checks are included. This is due to several builders (4 for air conditioning and 6 for ducts) indicating that PG&E rebates were not one of the top three reasons for installing Program measures. For these builders the free-ridership ratio was adjusted upward to 0.67.

Free-ridership ratios decreased slightly for the gas cooking and drying measures when the consistency checks are included. Very few (1 for drying; 2 for cooking) builders' ratios were increased to 0.67 because rebates were not one of the top three reasons for installing Program measures, while more (4 for drying; 3 for cooking) builders' ratios were decreased to 0.33 because rebates were the most important reason for installing Program measures.

6.3 Simple Efficiency Comparison

The first step in the efficiency comparison analysis is to define energy efficiency improvements for participants and nonparticipants using components of the gross savings developed in Section 5 of this report. For this analysis, efficiency improvements are defined as realized savings divided by calibrated base case usage. Using the impacts developed in the engineering analysis (using compliance thermostat schedules) and the calibration coefficients developed in the SAE analysis, cooling and heating efficiencies are calculated for each home in the study as follows:

$$CoolingEfficiency = \frac{1.197 \times ACSavings + 1.197 \times DuctSavings + 0.291 \times OtherSavings}{1.197 \times BaseCoolingUse} \quad (1)$$

$$HeatingEfficiency = \frac{0.742 \times FurnaceSavings + 0.617 \times DuctSavings + .384 \times OtherSavings}{0.742 \times BaseHeatingUse} \quad (2)$$

Next, a comparison of participant and nonparticipant efficiency improvements is used to calculate net-to-gross ratios (*NTGR*s) as follows:

$$NTGR_{Cooling,Heating} = \frac{(Participant\_Efficiency - Nonparticipant\_Efficiency)}{Participant\_Efficiency} \quad (3)$$

The *NTGR* then can be multiplied by the gross realized savings to provide estimates of net savings.

For the clothes drying and cooking measures, efficiency changes are not the major focus. Instead, increases in the penetration of gas appliances is the major target of the program. For these measures, the *NTGR* is developed by comparing appliance saturations for participants (who received rebates for cooking and drying) and nonparticipants as follows:

$$NTGR_{Drying,Cooking} = \frac{(Participant\_Gas\_Saturation - Nonparticipant\_Gas\_Saturation)}{Participant\_Gas\_Saturation} \quad (4)$$

*NTGR*s based on the simple comparisons are presented in Table 6-7. The *NTGR* for cooling is 0.77, and 2.05 for heating. The very high value for heating is a result of negative savings for nonparticipants; adjusted duct and other savings are negative, outweighing the positive furnace savings. Gas appliance *NTGR*s are very low due to high saturation of gas appliances in the nonparticipant sample.

Table 6-7
Net-to-Gross Ratios Based on Efficiency and Saturation Comparisons

	Participant Efficiency	Nonparticipant Efficiency	Difference	*NTGR*
Cooling	0.2396	0.0551	0.1845	0.770
Heating	0.0615	-0.0646	0.1261	2.050
	Participant Saturation	Nonparticipant Saturation	Difference	*NTGR*
Clothes Drying	0.5823	0.5490	0.0333	0.057
Stovetop	0.9245	0.8824	0.0421	0.046
Oven	0.7044	0.6797	0.0247	0.035

Table 6-8 compares evaluation gas saturations with results from an evaluation that was performed 2 years ago and with comparable numbers from PG&E's most recent Residential Appliance Saturation Survey (1994). As the table indicates, both participant *and* nonparticipant homes in this study show much higher penetrations of gas appliances versus other groups. Saturations are now even higher than found in the last evaluation project which had already indicated high gas saturations relative to other residential groups.

Table 6-8
Comparison of Evaluation Gas Saturations to PG&E Residential Appliance Saturation Survey (RASS) Results

	Current Study		1996 Comfort Home Evaluation		Comparable RASS Numbers - After Adjusting Out Other Fuels		
End Use	Participants	Non-participants	Participants	Non-participants	Single Family	Newest Homes	Central Valley
Clothes Drying	0.582	0.549	0.524	0.474	0.331	0.302	0.190
Stovetop	0.925	0.882	0.899	0.737	0.414	0.498	0.364
Oven	0.704	0.680	0.630	0.495	0.352	0.379	0.331

It is clear there is a trend toward the use of gas appliances in the markets being served by the PG&E Comfort Home Program. This trend may be the result of many factors, including: quality improvements in gas appliances, a general push by PG&E and others to educate customers about the energy cost savings associated with gas appliances, and Program spillover that has caused a general change in builder practices toward installing gas cooking appliances and gas dryer stubs.

The simple comparison approach outline above is consistent with the Protocols in that it utilizes differences between participants and nonparticipants to develop net savings. To the extent that the nonparticipant sample group provides a good control group for the participants, this approach will provide a fairly accurate estimate of net savings. However, variations in the groups can introduce bias.

6.4 Efficiency Choice Modeling

There are a number of reasons why participants and nonparticipants may differ, thus limiting the accuracy of the simple comparison technique described above. Differences may be due to:

- random effects, such as the size of the homes included in the sample (in square footage) or the number of stories in the home (as discussed above);
- systematic effects, such as the tendency of the program to focus marketing efforts on certain types of builders; and
- self-selection bias resulting from participating builders self selecting themselves into the program.

The efficiency choice modeling approach can help to correct for differences between participants and nonparticipants in the calculation of net savings. This approach uses data collected for the engineering and load impact regression models and additional data collected during the survey of participant and nonparticipant builders to estimate a multi-equation efficiency choice (decision analysis) model.

The efficiency choice model is estimated using two types of equations: a binary discrete choice equation of program participation, and a regression equation to explain efficiency improvement. The general form of these equations is:

$$Participation = f_1(Efficiency, INC, MKT, DEC, SITE) \quad (5)$$

$$Efficiency = f_2(Participation, INC, MKT, DEC, SITE) \quad (6)$$

where:

Efficiency	= efficiency improvements as calculated in equations (1) and (2) above
Participation	= a binary variable indicating program participation
INC	= a variable representing the incentive rate facing builders
MKT	= a set of market conditions facing builders
DEC	= a set of features relating to decision-making at the site
SITE	= a set of site characteristics

As the above equations (5) and (6) indicate, there is an endogeneity problem as both *Participation* and *Efficiency* enter into both equations. Program participation is expected to affect home efficiency but, in addition, builders who are likely to increase their homes' efficiency are also more likely to participate in the program.

The general approach to estimating the above system of equations is to use a two-stage process. First, a participation decision model is estimated using only the exogenous variables (excluding the *Efficiency* variable). Second, results of the participation model are included in the *Efficiency* regression model to help correct for self-selection bias. For this study, selectivity correction terms, known as Mills ratios, that are a function of the estimated probability of participation are included as explanatory variables in equation (6) in addition to the binary *Participation* variable.

The discrete choice participation model for this project is specified as a logit model with the following functional form:

$$Prob[Part] = \frac{e^{\beta' z}}{(1+e^{\beta' z})} \tag{7}$$

where:

Prob[Part]	=	probability that a customer participates in the Program
z	=	vector of independent variables explaining customer participation
β	=	vector of parameters

The dependent variable in the estimated equation takes on the value of "1" for participant homes and "0" otherwise. The model is estimated using Maximum Likelihood Estimation (MLE). Table 6-9 presents results of the participation model. Most of the variables in the model are reasonably significant (t-statistics close to 2.0 or more in absolute terms) and the log likelihood ratio is fairly high for this type of model.

Table 6-9
Participation Decision Model
Dependent Variable: Program Participation

Variable	Parameter Estimate	t-statistic
Intercept	2.869	2.7
Number of homes	-0.001	-1.8
Climate Zone 12 indicator	2.028	2.9
Energy efficiency was an important home purchase factor	0.891	1.8
Average price of builders' homes	-0.000009	-2.0
Builder constructs luxury homes	-3.890	-4.4
Construction costs not important to builder	2.254	4.1
Number of rooms in home	-0.350	-2.4
Number of observations	161	
Log likelihood ratio	0.4052	

Using the results of the participation decision model, two Mills ratios are calculated using the following formulas:

Mills Ratio one (MR1): For participants:

$$\text{MR1} = -\left[\frac{(1-\boldsymbol{P})\times\ln(1-\boldsymbol{P})}{\boldsymbol{P}} + \ln(\boldsymbol{P})\right]$$

For nonparticipants:

$$\text{MR1} = \frac{\boldsymbol{P}\times\ln(\boldsymbol{P})}{1-\boldsymbol{P}} + \ln(1-\boldsymbol{P}) \tag{8}$$

Mills Ratio two (MR2):

$$\text{MR2} = \text{MR1}\times\text{Part} \tag{9}$$

where ***P*** equals the estimated participation probability and ***Part*** is a binary variable equal to 1.0 for participants and 0.0 for nonparticipants.

The Mills ratios are then included in the efficiency regression model to control for self selection bias. The cooling and heating efficiency models are presented in Tables 6-10 and 6-11.

Table 6-10
Cooling Efficiency Model
Dependent Variable: Efficiency Relative to Base Case Usage

Variable	Parameter Estimate	t-statistic
Intercept	-1.348164	-4.85
Participation indicator	0.187474	6.95
Mills Ratio 1	-0.028705	-2.12
Mills Ratio 2	0.013719	0.60
Customer is college-educated	0.025052	1.44
Number of levels in home	0.034353	1.75
Percentage of single family homes of builder	0.013498	4.73
Builder targets the entry level market	-0.023062	-1.27
Energy efficiency makes home a better sell according to builder	0.069601	2.54
Climate zone 11 indicator	-0.006057	-0.19
Climate zone 12 indicator	-0.056445	-2.50
Number of observations	161	
Adjusted R^2	0.4377	

Table 6-11
Heating Efficiency Model
Dependent Variable: Efficiency Relative to Base Case Usage

Variable	Parameter Estimate	t-statistic
Intercept	-0.649703	-1.47
Participation indicator	0.072418	1.41
Mills Ratio 1	0.000266	0.01
Mills Ratio 2	-0.027632	-0.82
Number of levels in home	-0.05521	-2.06
Housing purchase price	0.000397	2.11
Energy efficiency was an important home purchase factor	0.073239	2.91
Percentage of single family homes of builder	0.008763	1.86
Average price of builders' homes	-0.0000006	-2.89
Builder targets the entry level market	-0.051111	-1.36
Window floor ratio	-0.556019	-1.58
Climate zone 11 indicator	-0.090133	-1.88
Climate zone 12 indicator	-0.072945	-1.91
Number of observations	133	
Adjusted R^2	0.3636	

Once the electric and gas equations were estimated, they were used to estimate what the participant comparison efficiency improvement should be for the net-to-gross calculations (assuming absence of the program) by simulating the *Efficiency* equation, Equation (6) and

Tables 6-10 and 6-11, over participants while setting the value of the *Participation* variable to zero. Setting the participation to zero impacts the Participation indicator and Mills Ratio 2 variables shown in Tables 6-10 and 6-11.

The modified net-to-gross calculation is [see Equation (3) for the simple calculation]:

$$NTGR = \frac{(Participant\_Efficiency - Participant\_Base\_Efficiency)}{Participant\_Efficiency} \quad (10)$$

where the Participant_Base_Efficiency variable is the estimated value from Equation (6) after removing the effects of program participation.

The *NTGR*s are calculated and applied to gross savings estimates on a site-specific basis to determine net savings for each participant home. Results are then weighted up to population totals to provide estimates of net Program savings for the space conditioning end use. Program *NTGR*s for space conditioning are calculated by dividing net savings by gross savings.

Results from the efficiency choice modeling effort are summarized in Table 6-12.

Table 6-12
Net-to-Gross Ratios Based on the Efficiency Choice Model

	Participant Efficiency[1]	Adjusted Participant Efficiency	Difference	*NTGR*
Cooling	0.23873	0.06122	0.17752	0.744
Heating	0.03674	-0.01500	0.05174	1.408

[1] Results differ from the efficiencies reported in Table 6-7 because a somewhat smaller sample was included in the efficiency choice modeling.

Since the estimation of Equations (5) and (6) utilizes differences between participants and nonparticipants, in addition to the impacts of Program participation, to quantify changes in efficiency improvements, the efficiency choice approach is entirely consistent with the M&E Protocols.

6.5 NET-TO-GROSS INTEGRATION

Results of the three net savings approaches implemented above are summarized by end use in Table 6-13. A comparison of the methods reveals:

- Cooling *NTGR*s from the three approaches are fairly similar.
- The heating and cooling *NTGR*s from the efficiency choice model fall in between the *NTGR*s estimated using the self report method and the simple comparison method. The efficiency choice model accounts for differences between the participants and nonparticipants, adjusts for self-selection bias, and is more likely to incorporate spillover effects than either of the other two methods.

- Clothes drying and cooking *NTGR*s from self reports are higher than *NTGR*s from the simple comparison method.

Table 6-13
Summary of Different Net-to-Gross Ratios

	NTGR by Analysis Method		
	Self Report	Simple Comparison	Efficiency Choice Model
Cooling	0.662	0.770	0.744
Heating	0.734	2.050	1.408
Clothes Drying	0.361	0.057	-
Cooking	0.236	0.041	-

NTGRs from the efficiency choice model provide the most robust estimates. The model is able to control for differences between participants and nonparticipants and provides the best estimate of what participants would have done without the program.

For clothes drying and cooking, the simple comparison *NTGRs* are somewhat questionable, due to the very high gas saturations for both participants and nonparticipants (compared to overall PG&E saturations of gas clothes drying and cooking). The self report *NTGRs* indicate that a number of builders would not have installed gas cooking or gas dryer stubs had they not participated in the PG&E Program. Given this evidence, it is difficult to accept that the Program had almost no impact on the increase in gas appliance saturations in participant homes. There may be some inherent differences between participant and nonparticipant builders that is limiting the effectiveness of the simple comparison of saturations (although attempts to model these differences provided results that were not meaningful).

Because of these factors, cooling and heating *NTGR*s from the efficiency choice model and clothes drying and cooking *NTGR*s from the self report method were deemed most appropriate to use in computing net savings for the program. The *NTGR*s used in developing net Program savings for clothes drying and cooking are summarized in Table 6-14. The base cooling and heating *NTGRs* are also presented, and are adjusted in the next section due to spillover effects.

Table 6-14
Selected Net-to-Gross Ratios

	Selected *NTGRs*
Cooling	0.744
Heating	1.408
Clothes Drying	0.361
Cooking	0.236

6.6 SPILLOVER

Both the simple efficiency comparison and the efficiency choice modeling approaches discussed above account for participant spillover because total end use savings (Program-related and otherwise) are included in the analysis. However, nonparticipant spillover (where the Program has induced builders to install efficiency measures in nonparticipant homes) is not captured, particularly in the simple comparison analysis. In fact, nonparticipant spillover counts against the Program by narrowing the efficiency difference between participants and nonparticipants.

As part of the builder survey, spillover issues were explored. Ten of the 23 builders who had built homes outside of the Comfort Home Program during the 1994-1998 period indicated that the Program influenced their decision to install energy efficiency measures outside of the Program. Three of these builders claimed the Program had a significant influence on their decisions, while the remainder indicated the Program had influenced their decision "somewhat."

Using builder-supplied data, nonparticipant spillover was quantified use the following equation:

$$NPSpillover = \%Affected \times \%Homes \times \%Savings \times ProgEffect \quad (11)$$

where:

%Affected	=	Percent of builders who built homes outside of the Program and who said the Program influenced their decision to improve efficiency in nonprogram homes
%Homes	=	Percent of nonprogram homes in which they stated that measures were installed
%Savings	=	Percent savings for each measure
ProgEffect	=	1.0 if the Program significantly influence their decision and 0.5 otherwise

As part of the survey, builders provided two types of efficiency improvement information regarding nonprogram homes: (1) the percent of homes in which they installed specific measures, and (2) the average improvement above Title 24 that they built to.

Using this data, two separate approaches were used to quantify spillover effects. First, a bottom-up estimate was developed on a measure-specific basis, using builder-supplied data on percent of nonprogram homes in which measures were installed and a percent savings estimate for each measure. Savings percents used are as follows:

- Efficient air conditioning: 17% (increase from 10 SEER to 12 SEER);
- Duct improvement: 8% for air conditioning, 12% for heating (based on the realized gross participant savings estimates shown in Section 5);
- Increased ceiling insulation: 9% for air conditioning, 6% for heating (based on an increase from R-38 to R-49 levels and Micropas analysis); and
- Premium efficiency windows: 1% for air conditioning, 12% for heating (based on a decrease in U-values from 0.65 to 0.52 and Micropas analysis);

A second approach combined the *%Homes* and *%Savings* terms in Equation (11) into a single estimate: the average percent improvement in efficiency (above Title 24) that nonprogram homes were built to. This estimate was supplied by builders as part of the survey.

Results from Equation (11) were applied to the specific nonparticipant homes in the study to determine the average improvement in nonparticipant efficiency attributable to the Program. Results are presented in Table 6-15.

Table 6-15
Average Program-related Efficiency Improvement in Nonprogram Homes

Spillover quantification approach	Enduse	Program-related efficiency improvement
Measure specific	Cooling	0.0444
	Heating	0.0461
Improvement over Title 24	Cooling	0.0102
	Heating	0.0102

It is reasonable to expect that the measure specific efficiency improvements would exceed the general improvements. Builders may utilize selected energy efficiency practices to meet their Title 24 compliance budget while still providing less energy efficiency features for their homes, such as increased window area.

One key affect spillover has in the modeling framework discussed in this chapter is to increase the base from which net savings are measured, thus lowering net savings estimates. To integrate the spillover estimates into the net-to-gross analysis, the choice modeling comparison equation [Equation (10)] was modified as follows:

$$NTGR_{Cooling,Heating} = \frac{Participant\_Efficiency - (Participant\_Base\_Efficiency - NPSpillover)}{Participant\_Efficiency} \quad (12)$$

This calculation addresses spillover in a conservative manner, because only the effects on participants are taken into account. The Program is not taking credit for energy efficiency gain made in nonparticipating homes. Table 6-16 presents revised choice model *NTGR*s, using the more conservative estimate of nonparticipant efficiency improvement over Title 24 as shown in Table 6-15. The limited use of spillover estimates causes the *NTGR*s to increase. The heating NTGR increase by a larger amount because the participant and nonparticipant heating efficiencies were lower than the cooling efficiencies.

Table 6-16
Revised Simple-Comparison Net-to-Gross Ratios Incorporating Nonparticipant Spillover

	a	b	c	(a-b)/a	[a-(b-c)]/a
	Participant Efficiency	Adjusted Participant Efficiency	NP Spillover	Initial NTGR	Revised NTGR
Improvement over Title 24 Nonparticipant Spillover Calculation					
Cooling	0.23873	0.06122	0.01020	0.744	0.786
Heating	0.03674	-0.01500	0.01020	1.408	1.686

6.7 NET PROGRAM IMPACTS

Net impacts are calculated by applying *NTGR*s (see Table 6-14 for the cooking and clothes drying *NTGRs* and Table 6-16 for the cooling and heating *NTGRs*) to the Program-level gross impacts identified in Section 5 of this report. Net impact results are discussed next.

6.7.1 Space Conditioning Impacts

Net impacts for the space conditioning end uses are presented in Table 6-17. The impacts are calculated by applying *NTGRs* from Table 6-16 to gross impacts shown in Table 5-3. Net cooling impacts are estimated to be 457 kWh per participating home and 1,562,407 kWh for the Program. Heating impacts are estimated to be 26.9 therms per home and 91,948 therms for the Program.

Table 6-17
Net Program HVAC Impacts

	Average	Total
Cooling Savings - kWh/year	457	1,562,407
Heating Savings - Therms/year	26.9	91,948

Table 6-18 compares evaluation net impacts with PG&E ex ante estimates. The evaluation results are lower that PG&E estimates by about 20%.

Table 6-18
Comparison of Net HVAC Impacts to PG&E ex ante Estimates

	Evaluation	PG&E *ex ante*	Realization Rate
Cooling Savings - kWh/year	1,562,407	2,030,104	0.77
Heating Savings - Therms/year	91,948	115,039	0.80

6.7.2 Clothes Drying and Cooking

Cooking and clothes drying impacts are presented in Table 6-19. These impacts are derived by applying the appropriate *NTGR*s from Table 6-14 to gross impacts (see Table 5-5).

Table 6-19
Net Program Impacts for Gas Clothes Drying and Cooking Measures

	Per Home		Total	
	Therms	kWh	Therms	kWh
Clothes Drying	9.7	254.0	-33,296	868,246
Cooking	6.4	95.0	-21,691	324,128

Evaluation clothes drying and cooking impacts are compared to PG&E estimates in Table 6-20. Net realization rates for these end uses are lower than comparable gross realization rates because the evaluation *NTGR*s (0.287 for clothes drying and 0.205 for cooking) are lower than the PG&E

estimates (0.74 for clothes drying and 0.62 for cooking). Overall, net evaluation savings exceed PG&E estimates for clothes drying but are lower for cooking.

Table 6-20
Comparison of Net Clothes Drying and Cooking Impacts to PG&E ex ante Estimates

	Evaluation		PG&E ex ante		Realization Rate	
	Therms	kWh	Therms	kWh	Therms	kWh
Clothes Drying	-33,296	868,246	-14,856	445,687	2.24	1.95
Cooking	-21,691	324,128	-46,486	841,067	0.47	0.39

6.7.3 Other End Uses

For end uses not evaluated - water heating and lighting, default *NTGR*s of 0.75 were used, based on the default *NTGR* assumption in the M&E Protocols for miscellaneous program activity. Program impacts are summarized in Table 6-21.

Table 6-21
Net Savings for Measures Not Evaluated

	Total kWh	Total kW	Therms
Lighting	1,489	0.07	-
Water heating	-	-	137

6.7.4 Net Impacts by Costing Period

Using the allocation factors developed from load shape data and discussed in Section 4, net impacts were calculated for the PG&E costing periods. Results are presented in Table 6-22.

Table 6-22
Net Impacts by PG&E Costing Period

	PG&E Costing Period				
	Summer Peak	Summer Partial Peak	Summer Off Peak	Winter Partial Peak	Winter Off Peak
kWh Impacts					
Cooling	483,662	368,357	694,405	8,898	7,085
Clothes Drying	80,894	115,585	187,137	254,946	229,685
Cooking	38,226	45,826	62,413	101,564	76,099
Lighting	283	270	449	259	228
Total***	603,065	530,038	944,404	365,667	313,097
kW Impacts					
Cooling	1,983.4	2,860.4	1,381.7	0.0	0.0
Clothes Drying	93.0	114.2	114.8	176.7	17.4
Cooking	34.1	126.7	21.2	144.8	14.2
Lighting	0.07	0.11	0.04	0.03	0.01
Total	2,110.6	3,101.4	1,517.7	321.5	31.6
Therm Impacts					
Heating	1,423			90,525	
Clothes Drying	-14,711			-18,585	
Cooking	-9,802			-11,889	
Water Heating	69			69	
Total	-23,022			60,120	

6.7.5 Net Impact Confidence Intervals

Net impact confidence intervals are provided in Table 6-23. Space cooling and heating confidence intervals are derived from the statistical output of the efficiency choice model. Confidence intervals for clothes drying and cooking are based on the estimated variance for gross impacts combined with the estimated variance for the estimated *NTGR*s. Program-level confidence intervals are calculated as the sum of the end use intervals.

Table 6-23
Net Impact Confidence Intervals

	Point Estimate	90% Confidence Interval			80% Confidence Interval		
		Percent	Lower bound	Upper bound	Percent	Lower bound	Upper bound
kWh Impacts							
Cooling	1,562,407	±24%	1,192,726	1,932,088	±18%	1,274,303	1,850,511
Clothes Drying	868,247	±39%	528,614	1,075,026	±30%	603,560	1,132,934
Cooking	324,128	±41%	190,588	402,650	±32%	220,056	428,200
Lighting	1,489	±0%	1,489	1,489	±0%	1,489	1,489
Total**	2,756,271	±31%	1,913,417	3,411,252	±38%	2,099,408	3,413,134
Peak kW Impacts							
Cooling	1,983.4	±24%	1,514.1	2,452.7	±18%	1,617.7	2,349.1
Clothes Drying	93.0	±39%	56.6	115.1	±30%	64.6	121.4
Cooking	34.1	±41%	20.1	42.4	±32%	23.2	45.0
Lighting	0.07	±0%	0.07	0.07	±0%	0.07	0.07
Total	2,111	±25%	1,591	2,610	±35%	1,706	2,516
Therm Impacts							
Heating	91,948	±116%	-15,055	198,951	±91%	8,557	175,339
Clothes Drying	-33,296	±39%	-20,272	-41,226	±30%	-23,146	-43,446
Cooking	-21,691	±41%	-12,754	-26,946	±32%	-14,726	-28,656
Water Heating	137	±0%	137	137	±0%	137	137
Total	37,098	±229%	-47,944	130,917	±122%	-29,178	103,374

A SURVEY INSTRUMENTS

This appendix contains the survey instruments used for project data collection:

1. the onsite home survey; and
2. the telephone builder survey.

Onsite Home Survey

PG&E RESIDENTIAL NEW CONSTRUCTION EVALUATION - ON-SITE SURVEY

Confidential: All data collected on this form is confidential and may only be used for PG&E studies.

Home ID# CNTL

Surveyor	AUDNAME	Date	APPTDATE
Customer Name	CUSNAME		
Address	SERADDR		
City	SERCITY	Zip Code	SERZIP
Phone Number 1	PHONE1 (W) (H)		
Phone Number 2	PHONE2 (W) (H)		

Notes:

NOTES

Dwelling Characteristics

Dwelling Type

DWLTYPE

Age of Home, years

HSAGE

Number of Levels

NUMLVL

Estimated Conditioned Area, SF

SFCON

Estimated Unconditioned Area, SF

SFUNCON

Weather-stripping around doors? (Y/N)

WTRSTDR

Number of Bedrooms

BEDROOM

Total Number of Rooms (excluding hallways, bathrooms, basements, closets, and any rooms not used as living space)

NUMROOM

Dwelling Type Codes
1. Single-Family Stand Alone
2. Single-Family Attached
3. Multi-Family
4. Mobile Home
5. Other_________________________
DWL5DESC

Walls

Wall Reference Number	WL1	B1	WL2	B2	WL3	B3	WL4	B4
WLREF								
Wall Construction Code		☐		☐		☐		☐
WLCNSTR1								
Wall Siding Type Code		☐		☐		☐		☐
WLSDTYP1								
Percent Wall Below Grade		☐☐☐		☐☐☐		☐☐☐		☐☐☐
WLPCBGD1								
Wall Thickness, inches		☐☐		☐☐		☐☐		☐☐
WLTHCK1								
Wall Insulation R-value		☐☐		☐☐		☐☐		☐☐
WLINSR1								
Wall Percent Insulated		☐☐☐		☐☐☐		☐☐☐		☐☐☐
WLPCINS1								
Wall Color Code		☐		☐		☐		☐

(1-dark, 2-medium, 3-light)
WLCOLOR1

Wall Construction Type Codes	*Wall Siding Type Codes*
1. No Exterior	1. Wood Siding
2. 2”X4” Wood Frame	2. Masonary Siding
3. 2”X4” Wood Frame w/ insul. sheet	3. Stucco\ Plaster
4. 2”X6” Wood Frame	4. Combination Wood / Masonary
5. 2”X4” Metal Frame	5. Metal Siding
6. 2”X6” Metal Frame	6. Vinyl
7. Concrete block	7. Other
8. Brick wall	
9. Other ___________________________	WLCNTS9D

Windows

Window Reference	G1	G2	G3	G4
WDREF1				
Window Type Code	☐	☐	☐	☐
WDTYP1				
Number of Panes	☐	☐	☐	☐
WDPAN1				
Frame Type Code	☐	☐	☐	☐
WDFRM1				
Glazing Type Code	☐ , ☐	☐ , ☐	☐ , ☐	☐ , ☐
WDGLZ11 WDGLZ12				
Interior Shading Code	☐	☐	☐	☐
WDINSHD1				
Exterior Shading Code	☐☐	☐☐	☐☐	☐☐
WDEXSHD1				

Window Reference	G5	G6	G7	G8
WDREF5				
Window Type Code	☐	☐	☐	☐
WDTYP5				
Number of Panes	☐	☐	☐	☐
WDPAN5				
Frame Type Code	☐	☐	☐	☐
WDFRM5				
Glazing Type Code	☐ , ☐	☐ , ☐	☐ , ☐	☐ , ☐
WDGLZ51 WDGLZ52				
Interior Shading Code	☐	☐	☐	☐
WDINSHD5				
Exterior Shading Code	☐☐	☐☐	☐☐	☐☐
WDEXSHD5				

Window Type Codes	*Frame Type Codes*	*Glazing Type Codes*	*Interior Shading Codes*	*Exterior Shading Codes*
1. Window (opens)	1. Wood	1. Clear Glass	0. None	0. None
2. Window (fixed)	2. Metal	2. Tinted Glass	1. Drapes	1. Building
3. Skylight	3. Vinyl	3. Reflective Film	2. Blinds	2. Trees/Foliage
4. Door		4. Clear w/ Low-E		3. Fence
		5. Tinted w/ Low-E		4. Sunscreen or Awning
		6. Opaque		

Ceilings [1]

	C1	C2	C3
Ceiling Reference Code CEREF1			
Estimated Ceiling Area, SF CESQFT1			
Description CEDESC1			
Insulation			
Insulation Type Code CEINSTY1			
Insulation R-value CEINSRV1			
Insulation Thickness, inches CEINSTK1			
Percent Insulated, % CEINSPC1			
Describe Insulation Condition (1-good, 2-fair, 3-poor) CEINSCN1			
Skylights (Y/N) CESKYLG1			
Estimated Skylight Area, SF CESKYSF1			
Window Reference (G1, G2, etc.) CEWWDSYS1			

***Note:** Identify the ceiling types on the floor plan (page 7) with a proper code (e.g. C1, C2).

Roof

Roof Exterior Color (**D**ark/**M**ed/**L**ight) ☐

CERFCLR1

Roof Slope (1-almost flat, 2-average incline, 3-very steep) ☐

RFSLOPE

Roof Insulation Type Codes
0. None
1. Fiberglass (batt)
2. Blown-in Cellulose
3. Rigid Board (isocyanurate/polystyrene)
4. Other ______________________________
CEINOTR1

Floors

	F1	F2	F3
Floor Reference Code FLREF1			
Estimated Floor Area, SF FLSOFT1			
Floor Type Code FLTYP1			
Insulation R-Value FLINSRV1			
Percent of the Floor Tiled or Vinyl FLTILPC1			
Percent of the Floor Carpeted FLCPTPC1			

Raised Floor Only

	F1	F2	F3
Crawl Space Height (ft.) FLRSHT1			
Crawl Space Wall Construction Type FLRSTYP1			
Is Crawl Space Vented (Y/N) FLRSVNT1			
Crawl Space Wall Insulation R-Value FLRSWIN1			

*Note: Draw the floor outlines on the floor plan (next page) and identify with a proper code (e.g. F1, F2..).

Crawl Space Wall Construction Type Codes	*Floor Type Code*
1. Framed	1. Raised floor
2. Concrete	2. Slab-on-grade
3. Other______________	3. Floor over Basement
FLRST51	4. Floor over Other Uncond. Spaces

Floor Plan Sketches

① Include a Wall Reference Number for each wall (e.g., B1). The Reference Number will be the same for walls with the same construction characteristics. ② Record the outer length of each wall. ③ Indicate North with an arrow. ④ Identify all ceilings with the proper code (e.g., C1) and mark cathedral ceilings with cross-hatching. ⑤ Identify floors over unconditioned spaces (i.e., ground floor, and rooms over the garage). ⑥ Mark the location of the garage.

First Floor

Second Floor

Elevation Sketch #1

① Sketch each elevation separately. ② Record the height of exterior walls. ③ For each elevation show the window locations, mark the Window Reference (e.g., G1) and record the window height and width. ④ For each significant overhang, mark the location with a dark horizontal line passing over each shaded window.

FRONT

Elevation Sketch #2

① Sketch each elevation separately. ② Record the height of exterior walls. ③ For each elevation show the window locations, mark the Window Reference (e.g., G1) and record the window height and width. ④ For each significant overhang, mark the location with a dark horizontal line passing over each shaded window.

BACK

Elevation Sketch #3

① Sketch each elevation separately. ② Record the height of exterior walls. ③ For each elevation show the window locations, mark the Window Reference (e.g., G1) and record the window height and width. ④ For each significant overhang, mark the location with a dark horizontal line passing over each shaded window.

LEFT

Elevation Sketch #4

① Sketch each elevation separately. ② Record the height of exterior walls. ③ For each elevation show the window locations, mark the Window Reference (e.g., G1) and record the window height and width. ④ For each significant overhang, mark the location with a dark horizontal line passing over each shaded window.

RIGHT

Heating Systems

	System #1	System #2
System Type Code [1] HTSYS1		
Fuel Code HTFUEL1		
Quantity HTQTY1		
Age, years HTAGE1		
Programmable Thermostat (Y / N) HTPGTHM1		
Equipment Location Code HTLOCN1		
Manufacturer HTMANU1		
Model # HTMODL1		
Serial # HTSERL1		
Output (Btu) HTOBTU1		
Input (Btu) HTIBTU1		
Input (kW) HTIKW1		
Volts/ Phase/ Rated Amps (RLA) HTRLA1		
Auxiliary Heat, kW HTAUX1		
AFUE or HSPF or COP (circle one) HTTYP1		
Area serving (1st floor, 2nd floor, etc.) HTAREA		

Note: If System Type Code is 8, explain the usage pattern. Example: Gas furnace rarely used, fireplace - 4hr/day, portable electric heaters - 2 hr/day. HTNOTES

System Type Codes	***Fuel Codes***	***Location Codes***
1. DX Heat Pump	E = Electric	1. Conditioned Space
2. Central Forced Air Furnace	G = Natural Gas	2. Garage
3. Electric Resistance Baseboard	W = Wood	3. Outside
4. Radiant Heater	C = Coal	4. Other Unconditioned Space
5. Central Forced Air Packaged Unit --Gas Pack	P = LPG	
6. Portable Heaters	O = Oil	
7. Fireplace/Wood Burning Stove	S = Steam	
8. Combination/Addition of a secondary system	M = Other	

Cooling Systems

	System #1	System #2
System Type Code CLSYS1		
Quantity CLQTY1		
Age CLAGE1		
Programmable Thermostat (Y / N) CLPGTHM1		
Outdoor Unit:		
Manufacturer CLOMANU		
Model # CLOMODL1		
Serial # CLOSERL1		
Indoor Fan Coil (if accessible):		
Manufacturer CLIMANU1		
Model # CLIMODL1		
Output (Btuh) CLOBTU1		
Input (kW) CLIKW1		
Volts/ Phase/ Rated Amps (RLA) CLRLA1		
SEER or CLSEER1		
EER or CLEER1		
COP CLCOP1		

CLNOTES

System Type Codes	*Fuel Codes*
1. Central Forced Air System --AC only	E = Electric
2. Central Forced Air Packaged Unit --Gas Pack	G = Natural Gas
3. Heat Pump	W = Wood
4. Window or Wall AC unit	C = Coal
5. Central Evaporative Cooler	P = LPG
6. Other	O = Oil
	S = Steam
	M = Other

Outdoor Lighting

		Number		Operation, hr/day-bulb
Incandescent Bulbs	EINCNUM		EINCUSE	
Compact Fluorescent Bulbs (CFL)	ECFLNUM		ECFLUSE	
Security Lamps (Metal Halide/Mercury Vapor)	ESMHNUM		ESMHUSE	

Ducts

Duct Type
(0-none, 1-flexed, 2-sheet metal, 3-other)
DCTTYP

Duct Insulation R-value
DCTINSRV

Describe Duct Insulation Condition
(1- good, 2-fair, 3-poor)
DCTINSCN

Return air
(1- bend only, 2-ducted return, 3-none)
DCTRTAIR

Percent of Supply Duct Located in…

Conditioned Space		DCTCNSP
Vented Attic Space		DCTVATP
Vented Crawl Space		DCTCRLP
Open Space (or Garage)		DCTOPNP
Slab on Grade		DCTSLBP

Percent of Return Duct Located in…

Conditioned Space		DCTRCSP
Unconditioned Space		DCTRUSP

Is Duct Header (connection to AC unit) Taped? (Y/N) DCTHDTAP

Describe duct taping (0=none, 1=duct tape, 2=mastic, 3=butyl, 4=screws/mechanical only) DCTTAPD

Thermostat Settings

Primary **cooling** system thermostat settings (F°) during July and August.

Time periods (Off=99)		Weekdays #1 Unit		Weekend #1 Unit		Weekday #2 Unit		Weekend #2 Unit
6 am to 10 am (morning)	CLTMWKM1		CLTMWEM1		CLTMWKM2		CLTMWEM2	
10 am to 6 pm (day time)	CLTMWKD1		CLTMWED1		CLTMWKD2		CLTMWKE1	
6 pm to 10 pm (evening)	CLTMWKE1		CLTMWEE1		CLTMWKE2		CLTMWEE2	
10 pm to 6 am (night time)	CLTMWKN1		CLTMWEN1		CLTMWKN2		CLTMWEN2	

Off = 99°

Primary **heating** system thermostat settings (F°) during December and January.

Time periods (Off=99)		Weekdays #1 Unit		Weekend #1 Unit		Weekday #2 Unit		Weekend #2 Unit
6 am to 10 am (morning)	HTTMWKM1		HTTMWEM1		HTTMWKM2		HTTMWEM2	
10 am to 6 pm (day time)	HTTMWKD1		HTTMWED1		HTTMWKD2		HTTMWKE1	
6 pm to 10 pm (evening)	HTTMWKE1		HTTMWEE1		HTTMWKE2		HTTMWEE2	
10 pm to 6 am (night time)	HTTMWKN1		HTTMWEN1		HTTMWKN2		HTTMWEN2	

Off = 50°

Refrigerators

	Type	Cond. Space (Y/N)	Size Cu. Ft.	Watts	Amps	Age	Months/Year Used
	RFTYP1	RFCNSP1	RFSIZE1	RFWATT1	RFWATT1	RFAGE1	RFUSE1
Unit 1							
Unit 2							
Unit 3							

Type codes:
1. Auto Defrost Side by Side
2. Auto Defrost Top / Bottom
3. Auto Defrost Single Door
4. Manual Defrost Single Door

Freezers

	Type	Cond. Space (Y/N)	Size Cu. Ft.	Watts	Amps	Age	Months/Year Used
	FZTYP1	FZCNSP1	FZSIZE1	FZWATT1	FZWATT1	FZAGE1	FZUSE1
Unit 1							
Unit 2							
Unit 3							

Type codes:
1. Auto Defrost Side by Side
2. Auto Defrost Top / Bottom
3. Auto Defrost Single Door
4. Manual Defrost Single Door

Cooking

	Fuel (Elec/Gas/Prop)	Meals[1] /Week	Size (kW or kBtuh)
Oven Fuel (E/G/P)	KOVFUEL	KOVMEAL	KOVSIZE
Range Fuel (E/G/P)	KRGFUEL	KRGMEAL	KRGSIZE
Microwave Oven		KM MEAL	KM SIZE

Note: Enter the total number of meals. The maximum is 3 meals/day or 21 meals/week.

Television

Number of televisions	TVNUM	
Number of TV set hours per day (# TV * # Hours)	TVHRS	

Dishwasher

Use Electric Dishwasher (Y/N)	DSHELEC	
Uses energy saving cycle (Y/N)	DSHENRG	
Total loads per week	DSHTTLLD	
Number of loads weekdays between 10am - 6pm	DSHLDWKD	

Indoor Lighting

		Ind
Total Number of Bulbs (including Fluorescent bulbs)	IBLBNUM	
Number of Compact Fluorescent Bulbs (CFL)		
CFL hardwired	ICFLHARD	
CFL screw-in	ICFLSCRW	
Number of Fluorescent Tubes	IFLRNUM	

Number CFLs that were installed when you move in ?

CFL hardwired	PCFLHARD	
CFL screw-in	PCFLSCRW	

Hot Water Heating

Make	WHMAKE				
Model	WHMODL				
Fuel Code	WHFUEL		Located in conditioned space	WHCONSP	
Tank Capacity (gallons)	WHCAP		Input Rating (kW or kBtuh)	WHINP	
Temperature Setting (^{0}F)	WHTEMP		Insulation Blanket (Y/N)	WHBLKT	
Is there a Timeclock (Y/N)	WHTIME		Are visible pipes insulated (Y/N)	WHPIPE	

Laundry

Use Clothes Washer (Y/N)	CW	
Number of hot / warm water loads per week	CWHTWM	
Use Clothes Dryer (Y/N)	CD	
Clothes Dryer Fuel Code	CDFUEL	
Is Dryer/Washer located in Cond. Space (Y/N)	CDCONSP	
Number of dryer loads per week	CDLOAD	
Gas Stub in Laundry Area (Y/N)	CDGAS	

Fuel Codes		
E	=	Electric
G	=	Natural Gas
P	=	LPG
S	=	Solar
M	=	Other

Pool

Swimming Pool (Y/N)	PL		
Filter Pump			
Filter on timer (Y/N)	PLFPTIME		
Filter hours per day (summer)	PLFPSHR		
Filter hours per day (winter)	PLFPWHR		
Filter pump size (kW) or (HP)	PLFPSZKW	kW	HP PLFPSZHP
Pool Heater			
Heater Fuel Type Code[1]	PLHTFL1	,	PLHTFL2
Heater Capacity (kW) or (HP)	PLHTCPKW	kW	HP PLHTCPHP
Heater Use (1-never, 2-seldom, 3-a lot, 4-always)	PLHTUSE		

Note: [1]Indicate combination of fuel types. Sample: (G,S) means Gas and Solar. Describe the percent use allocated to each fuel type.

Spa

Spa or hot tub? (Y/N)	SP		
Spa location (1-outdoor, 2-indoor)	SPLOCN		
Spa uses per week	SPUSE		
Filter			
Filter on timer? (Y/N)	SPFPTIME		
Filter hours per day (summer)	SPFPSHR		
Filter hours per day (winter)	SPFPWHR		
Filter pump size (kW) or (HP)	SPSZKW	kW	HP SPSZHP
Heater			
Spa Heater Fuel Type Code	SPHTFL1		:
If electric, ON continuously? (Y/N)	SPELON		
If gas, hours ON before each use	SPGSON		
Heater ON, hours per week (summer)	SPHTSUSE		
Heater ON, hours per week (winter)	SPHTWUSE		

Fuel Codes			
E =	Electric	P =	LPG
G =	Natural Gas	O =	Oil
W =	Wood	S =	Steam
C =	Coal	M =	Other

RESIDENT QUESTIONNAIRE

1. Which of the following equipment or services are used in this home?

		Yes	No	(If Yes) How Many		Equipment Use, hr/week	
Home Office Equipment							
Personal computer	PC	☐	☐	PCNUM	____	PCUSE	____
Computer printer	PRN	☐	☐	PRNNUM	____	PRNUSE	____
Fax machine	FAX	☐	☐	FAXNUM	____	FAXUSE	____
Copier (other than fax)	CPR	☐	☐	CPRNUM	____	CPRUSE	____
Miscellaneous							
Heated H_2O Bed	H2O	☐	☐	H2ONUM	____	H2OUSE	____
Small Kitchen Appliances	SKT	☐	☐	SKTNUM	____	SKTUSE	____
Gas Fireplace	GFP	☐	☐	GFPNUM	____	GFPUSE	____
Kiln	KLN	☐	☐	KLNNUM	____	KLNUSE	____
Welding Equipment	WLD	☐	☐	WLDNUM	____	WLDUSE	____
Medical Equipment	MED	☐	☐	MEDNUM	____	MEDUSE	____
Well Pump	WLP	☐	☐	WLPNUM	____	WLPUSE	____
Other (list) _____________...	OTR1	☐	☐	OTR1NUM	____	OTR1USE	____
Other (list)_____________	OTR2	☐	☐	OTR2NUM	____	OTR2USE	____

2. Fan Uses in Summer?

		Don't Have	Rarely	Sometimes	Often
Portable Fans	PORTFAN	☐	☐	☐	☐
Ceiling Fans	CEILFAN	☐	☐	☐	☐
Attic Fan	ATTCFAN	☐	☐	☐	☐
Whole House Fan	WHHSFAN	☐	☐	☐	☐

3. <u>How many</u> people, including yourself, live in this home? OCCUP [|]

4. How many people living in your home are:

			Number	
Preschool	(under 6)	PRESCHL		
School Age	(6-17)	SCHOOL		
Adult -	18-34	ADLT18		
	35-59	ADLT35		
	60-74	ADLT60		
	Over 74	ADLT74		

5. How many people occupy the home from 10 a.m. to 6 p.m. on typical weekdays?

		Number
Winter (Dec - Feb)	OCCWN	
Spring (Mar-May)	OCCSP	
Summer (Jun-Aug)	OCCSM	
Fall (Sep-Nov)	OCCFL	

6. Is your home used as a primary work location?
HOMEOFFC
1. Yes ☐
2. No ☐

7. Does someone occupy the home at least 10 months per year?
YRRESID
1. Yes ☐
2. No ☐

8. Did you vacation away from home at least one week this summer?
VACATION
1. Yes ☐
2. No ☐

9. Is the home part of a subdivision?
SUBDVSN
1. Yes ☐
2. No ☐

10. Name of the builder/developer who constructed the home:
BUILDER
____

11. Do you own or rent?
OWNRENT
1. Own ☐
2. Rent ☐

If you RENT then skip to Question 27

12. Approximate purchase price of home:

PRCPRICE

Under $100,000	1	☐
$100,000-$149,999	2	☐
$150,000-$199,999	3	☐
$200,000-$249,999	4	☐
$250,000-$299,999	5	☐
$300,000-$349,999	6	☐
$350,000-$399,999	7	☐
$400,000 or more	8	☐

13. Please rank the following factors important in the decision to buy your home, with 1 for the most important to 7 for the least important:

Price	PRCFCTR1	☐
Location	PRCFCTR2	☐
House Size	PRCFCTR3	☐
Appearance	PRCFCTR4	☐
Home Layout	PRCFCTR5	☐
Energy Efficiency	PRCFCTR6	☐
Schools	PRCFCTR7	☐

14. Was energy efficiency an important consideration in your home purchase decision?
NRGEFF
1. Yes ☐
2. No ☐

15. Have you heard of the *PG&E Comfort Home Program*?
CHAWARE
1. Yes ☐
2. No ☐
3. Don't Know ☐

If you are aware of the Comfort Home Program,

16. How did you first learn about the PG&E Comfort Home?

PG&E	CHLEARN1	☐
Builder	CHLEARN2	☐
Realtor	CHLEARN3	☐
Advertisements	CHLEARN4	☐
Word-of-mouth5	CHLEARN5	☐
Other (list) ____________________	CHLEARN6	☐
CHLEARND		☐

17. Is your home a PG&E Comfort Home?
CMFTHOME
1. Yes ☐
2. No ☐
3. Don't Know ☐

If you home in a PG&E Comfort Home,

18. Were you specifically looking to purchase a PG&E Comfort Home?
CHWANT
1. Yes ☐
2. No ☐

19. What features of your home are energy efficient? EEFTR

____

____

20. Would you be willing to pay more for a new home with cost effective energy efficient features? (Cost effective energy efficient features usually produce savings on your energy bill that over time will pay for the higher costs of the home.)

PAYMORE

1. Yes ☐
2. No ☐

21. IF YES: How much more would you be willing to pay for a new home with cost effective energy efficient features?

PAYMORE1

- $0 ....1 ☐
- $0-500 ....2 ☐
- $501-1000 ....3 ☐
- $1001-2000 ....4 ☐
- $2001-3000 ....5 ☐
- $3001-5000 ....6 ☐
- $5001-10,000 ....7 ☐
- Other (list) ______________ .8 ☐

PAYMORED

22. Did you use any special energy efficient related loan packages to help with the financing of your new home?

EELOAN

1. Yes ☐
2. No ☐

23. IF YES: What type of package did you use? ______________________________

EELNDESC

24. IF NO: Were you aware that energy efficient loan packages were available?

EELNAVLB

1. Yes ☐
2. No ☐

25. During your efforts to purchase a new home, were you aware that some homes are built more energy efficient than others?

EEMORE

1. Yes ☐
2. No ☐

26. IF YES: From what source did you learn about the different levels of energy efficiency in new homes?

- Realtor — EEMRLRN1 ☐
- PG&E — EEMRLRN2 ☐
- New Home Advertising (Newspaper, Site Brochure) — EEMRLRN3 ☐
- Financial Institution — EEMRLRN4 ☐
- Other (list) ____________ — EEMRLRN5 ☐

EEMRLRND

27. Have you used PG&E rebate coupons in the purchase of any of the following:

27A. Natural gas clothes dryer .... 1. Yes ☐
REBCD 2. No ☐

27B. Energy efficient clothes washer .... 1. Yes ☐
REBCW 2. No ☐

27C. Energy efficient refrigerator .... 1. Yes ☐
REBRF 2. No ☐

28. What is the highest education level for the head of the household:
EDUC

Some high school .... 1 ☐
High school graduate .... 2 ☐
Some college/Junior college graduate .... 3 ☐
College graduate .... 4 ☐
Graduate degree .... 5 ☐

29. Approximate household income category:
INCOME

Under $25,000 .... 1 ☐
$25,000-$49,999 .... 2 ☐
$50,000-$74,999 .... 3 ☐
$75,000-$99,999 .... 4 ☐
$100,000-$149,999 .... 5 ☐
$150,000 or more .... 6 ☐

30. Have you heard of the Energy Star New Homes Program that is being provided through the U. S. Environmental Protection Agency? 1. Yes ☐ 2. No ☐
ESTAR

31. IF YES: From what source did you learn about the different levels of energy efficiency in new homes?

Realtor ESLRN1 ☐
New Home Advertising (Newspaper, Site Brochure) ESLRN2 ☐
Financial Institution ESLRN3 ☐
Other (list) ________________________________ ESLRN4 ☐

32. IF YES: Please describe what you know about this program:
ESDESC

____

____

DUCT PRESSURE TESTING

Date	
Work Crew Names	
Address	

Fan Connection Location	ΔP_{duct}	Ring Number	Duct Leakage Flow, cfm
DPFANLCN	DPDELTAP	DPRING	DPLEAK

Air Handler Location (closet, attic, crawlspace, garage, etc.)	DPAHLOCN
Number of Supply Registers	DPSOPREG
Number of Return Registers	DPRETREG

Notes:

Telephone Builder Survey

PG&E 1998 RESIDENTIAL NEW CONSTRUCTION PROGRAM EVALUATION BUILDER QUESTIONNAIRE

INTRODUCTION

Hello, my name is ____. I am calling on behalf of Pacific Gas & Electric as part of a research project. I have nothing to sell and will not ask for money. May speak with (INSERT NAME IF AVAILABLE)?

Hello, my name is ____. I am calling on behalf of Pacific Gas & Electric as part of a research project involving energy efficiency in newly constructed homes, including homes that were built under the PG&E Comfort Home Program. I have nothing to sell and will not ask for money. We would like to ask you a few questions about your company's knowledge and participation in the program and your company's use of building practices promoted by the program.

			Y	N
0.	Am I speaking to the person who would make major construction decisions, including the decision to participate in PG&E's program?	0		

(If "NO") May I speak to that person? *If contact is not available, get name and phone number for callback.*

(If "YES) Record name and number and continue with survey.

0a. Name:____

0b. Position:____

0c. Phone Number:____

This survey will take approximately 10-15 minutes.

HOME CONFIRMATION:

Our records indicate that you built homes at the following addresses under the Comfort Home Program during the past few years. Can you confirm this?

ID #	Project Name - **PARTICIPANT HOMES**	Yes	No	DK

Our records (also) indicate that you built homes at the following addresses during the past few years, and that these homes were not part of the Comfort Home Program. Can you confirm this?

ID #	Project Name - **NON-PARTICIPANT HOMES**	Yes	No	DK

BUILDER FIRMOGRAPHICS

1. How many residential development projects did you build between 1996and 1998 1. [ ]

2. In those developments, how many homes did you build (total, over 3 years)? 2. [ ]

3. Of those homes, how may were single family and how many were multi family? (**NUMBER OR PERCENT**) **- *(Indicate percent with a "%".)***

   Single Family .... 3a. [ ]

   Multi Family... 3b. [ ]

4. Of those homes, how many were custom homes and how many were production homes? (**NUMBER OR PERCENT**) **- *(Indicate percent with a "%".)***

   Custom (one-of-a- kind) 4a. [ ]

   Production (multiple, with std., designs) 4b. [ ]

5. What is the average price of the homes that you sell? 5. [ ]

6. What type of home buyers are your homes generally targeted towards?

   First time buyers/entry level homes .... 6a. [ ]

   "Move-up" buyers/mid level homes... 6b. [ ]

   Luxury home buyers/high end homes .... 6c. [ ]

   Other; specify ______________________________________ 6d. [ ]

COMFORT HOME PROGRAM

FOR BUILDERS WITH PARTICIPANT HOMES: ask 7a-7c and then skip to 8:

7a. Of the dwelling units that you built between 1996 and 1998 what percentage made use of the Comfort Home Program? 7a. [ ]

7b. Did you make use of the Comfort Home program prior to 1996? 7b. Y [ ] N [ ]

7c. Did you make use of the Comfort Home program this year, 1999? 7c. Y [ ] N [ ]

SKIP TO Question 8

FOR BUILDERS WITH ONLY NON-PARTICIPANT HOMES LISTED: ask 7d-7g:

7d. Prior to this phone call, did you know about the Comfort Home Program? 7d. Y N DK

If 7d = yes, CONTINUE, OTHERWISE SKIP TO Q9

7e. Have you ever participated in the Comfort Home Program 7e. Y N DK

If 7e = yes, CONTINUE, OTHERWISE SKIP TO Q8

7f. Did you participate in the Program between 1996 and 1998 7f. Y N DK

If 7f = yes, CONTINUE, OTHERWISE SKIP TO Q8

7g. What percentage of the dwelling units that you built between 1996 and 1998, made use of the Comfort Home Program? 7g.

FOR ALL BUILDERS WITH PARTICIPANT HOMES AND FOR ALL BUILDERS AWARE OF THE COMFORT HOME PROGRAM (question 7d = yes):

8. How did you first hear about the Comfort Home Program?

Approached by PG&E directly	8a.	
Saw PG&E literature	8b.	
Heard about program from other builder or sub contractor	8c.	
Heard about program from architect or designer	8d.	
Other ____________________	8e.	

NON COMFORT HOME ENERGY EFFICIENCY

FOR PARTICIPANTS AND NON-PARTICIPANTS:

9. Excluding homes built through the Comfort Home Program, what best describes the homes you build relative to Title 24 Standards? **READ LIST**

Homes met standards	9a.	
Homes exceeded Standards by about 5 to 10%	9b.	
Homes exceeded Standards by 10 to 20%	9c.	
Homes exceeded Standards by greater than 20%	9d.	
Don't know, Refused, or Not Applicable **(DON'T READ)**	9e.	

FOR BUILDERS WHO HAVE <u>EVER</u> PARTICIPATED IN THE COMFORT HOME PROGRAM (all participants, and any nonparticipants who answered yes to question 7e):

10. Which of the following statements best describes the homes you build outside of the Comfort Home Program? **READ FIRST TWO LINES OF LIST**

They contain HVAC equipment and construction characteristics similar to those in homes built under the Comfort Home Program.	10a.	
They contain HVAC equipment and construction characteristics chosen to comply with the Title 24 standards and nothing more.	10b.	
Don't know / Not applicable **(DON'T READ)**.	10c.	

I am going to ask you some questions about your use of specific energy efficiency measures over time.

For the following time periods, what percentage of the homes you built - ***outside of the PG&E Comfort Home Program*** - included the following high efficiency measures? (**QUERY AND FILL IN CHART**)

Q#		a	b	c	d	e	f
	Year	Included ACs with SEER above that used to comply with Title 24 Standards	Utilized enhanced HVAC duct installation procedures	Installed gas dryer stub	Installed gas cook top and/or range	Included insulation above that used to comply with Title 24 Standards	Installed premium efficiency windows
11.	1998						
12.	1994-97						
13.	1991-93						

FOR BUILDERS WHO HAVE <u>EVER</u> PARTICIPATED IN THE COMFORT HOME PROGRAM (all participants, and any nonparticipants who answered yes to question 7e):

14a. Did your participation in the Comfort Home Program influence your decision to install the energy efficiency measures in homes built ***outside*** of the Program?

Influenced decision significantly	14a1	
Influenced decision somewhat	14a2	
No significant influence	14a3	

If answer to question 14a is "no significant influence" then ask:

14b. What caused you to install the additional energy efficiency measures?

____

FOR BUILDERS WHO HAVE EVER PARTICIPATED IN THE COMFORT HOME PROGRAM (all participants, and any nonparticipants who answered yes to question 7e):

15a. For homes built under the Comfort Home Program, did you install additional energy efficiency measures ***not covered under the Program*** above those required to comply with Title 24 standards? If so, what measures were installed?

Premium efficiency windows (above standard double paned windows)	15a1	
Insulation levels above Title 24 compliance levels..	15a2	
High efficiency furnaces	15a3	
High efficiency water heaters...	15a4	
Efficient lighting technologies (T-8's, Hardwired CFLs, etc.)	15a5	
Other, specify: ____	15a6	

15b. Did your participation in the Comfort Home Program influence your decision to install the additional energy efficiency measures in the Program homes?

Influenced decision significantly...	15b1	
Influenced decision somewhat...	15b2	
No significant influence	15b3	

If question 15b answer is "no significant influence" then ask:

15c. What caused you to install the additional energy efficiency measures?

____

FOR PARTICIPANT AND NON-PARTICIPANTS:

		Y	N
16a. Do you think home buyers are generally willing to pay more for homes that are more energy efficient than Title 24 Standards?	16a		
16b. Do you think home energy efficiency is an important feature that makes it easier to sell homes?	16b		

17. I am going to read of list of factors that can affect new home construction and design. Please tell me which of these is most important from your experience (#1)? Least important (#6)? Next most important (#2)?

Construction costs	17a1	
Energy efficiency..	17a2	
Visual appearance of home	17a3	
Occupant comfort	17a4	
Quality of construction...	17a5	
Appropriateness of design for a given location..	17a6	

PARTICIPANT BUILDER INFORMATION

***ONLY* FOR BUILDERS WITH PARTICIPATING HOMES *IN THE SAMPLE*, ask Questions 18, 19, and 20for applicable efficiency measures:**

How did you learn about HE Equipment?

18a. How did you first learn about AC units with SEER levels above Title 24 Standards?

From PG&E representative	18a1	
From PG&E literature	18a2	
From other builders or sub contractors	18a3	
From architect or designer	18a4	
From manufacturers' literature or reps	18a5	
From trade literature	18a6	
Other ______________________	18a7	

18b. How did you first learn about duct testing and enhanced installation procedures?

From PG&E representative	18b1	
From PG&E literature	18b2	
From other builders or sub contractors	18b3	
From architect or designer	18b4	
From manufacturers' literature or reps	18b5	
From trade literature	18b6	
Other ______________________	18b7	

Decision Influences

19a. From the following list, please rank the three most important reasons you installed the higher efficiency AC Systems, with 1 being the most important and 3 the third most important. (**READ LIST**)

PG&E Rebates	19a1	
PG&E advice or recommendations	19a2	
Equipment literature	19a3	
Past experience with energy efficiency equipment	19a4	
Information from vendors or designers	19a5	
Home buyers request high efficiency equipment	19a6	
Meeting the Title 24 energy budget	19a7	
Other ______________________	19a8	

19b. From the following list, please rank the three most important reasons you used enhanced duct installation procedures, with 1 being the most important and 3 the third most important. (**READ LIST**)

PG&E Rebates	19b1	
PG&E advice or recommendations	19b2	
Equipment literature	19b3	
Past experience with energy efficiency equipment	19b4	
Information from vendors or designers	19b5	
Home buyers request high efficiency equipment	19b6	
Other ____	19b7	

19c. From the following list, please rank the three most important reasons you installed gas cooking equipment in your Comfort Homes, with 1 being the most important and 3 the third most important. (**READ LIST**)

PG&E Rebates	19c1	
PG&E advice or recommendations	19c2	
Equipment literature	19c3	
Past experience installing gas cooking equipment	19c4	
Information from vendors or designers	19c5	
Home buyers' request for gas cooking equipment	19c6	
Other ____	19c7	

19d. From the following list, please rank the three most important reasons you installed gas dryer stubs in your Comfort Homes, with 1 being the most important and 3 the third most important. (**READ LIST**)

PG&E Rebates	19d1	
PG&E advice or recommendations	19d2	
Equipment literature	19d3	
Past experience with gas installations	19d4	
Information from vendors or designers	19d5	
Home buyers' request for gas drying capabilities	19d6	
Other ____	19d7	

Importance of Rebates

20a. If the rebate had not been available, how likely is it that you would have installed the higher efficiency AC systems?

Definitely would have done it anyway	20a1	☐
Probably would have done it	20a2	☐
Probably would not have done it	20a3	☐
Definitely would not have done it	20a4	☐
Don't know	20a5	☐

20b. If the rebate had not been available, how likely is it that you would have conducted duct **testing**?

Definitely would have done it anyway	20b1	☐
Probably would have done it	20b2	☐
Probably would not have done it	20b3	☐
Definitely would not have done it	20b4	☐
Don't know	20b5	☐

20c. If the rebate had not been available, how likely is it that you would have conducted **enhanced duct installation procedures**?

Definitely would have done it anyway	20c1	☐
Probably would have done it	20c2	☐
Probably would not have done it	20c3	☐
Definitely would not have done it	20c4	☐
Don't know	20c5	☐

20d. If the rebate had not been available, how likely is it that you would have installed gas cooking in the same number of Comfort Homes?

Definitely would have done it anyway	20d1	☐
Probably would have done it	20d2	☐
Probably would not have done it	20d3	☐
Definitely would not have done it	20d4	☐
Don't know	20d5	☐

20e. If the rebate had not been available, how likely is it that you would have installed the dryer stubs?

Definitely would have done it anyway	20e1	☐
Probably would have done it	20e2	☐
Probably would not have done it	20e3	☐
Definitely would not have done it	20e4	☐
Don't know	20e5	☐

HVAC SUB CONTRACTORS

21a. Do you work with a HVAC sub-contractor? 21a Y ☐ N ☐

If yes. Would you tell us who it is?

21b. Company Name:______________________________

21c. Contact:______________________________

21d. Phone Number:______________________________

22. Who does your HVAC **duct** work?

We do our own work	22a	☐
We use the sub contractor mentioned above	22b	☐
We use a different sub contractor - *get name and phone number*	22c	☐
Don't know/ Won't say	22e	☐

If Question 22 indicates "different sub contractor" for duct work:

23a. Company Name:______________________________

23b. Contact:______________________________

23c. Phone Number:______________________________

ENERGY STAR PROGRAM

24a. Have you heard of the Energy Star New Homes Program that is being provided through the U. S. Environmental Protection Agency? 24a [Y | N]

24b. ***If 24a = Yes***: Do you know the requirements for participating in the Energy Star Program? 24b [Y | N]

24c. ***If 24a = Yes***: Do you plan to participate in the Program? 24c [Y | N | DK]

24d. ***If 24c = No***: Why not?

____

____

THIS CONCLUDES THE SURVEY. THANK YOU FOR YOUR TIME.

B

SURVEY DISPOSITION REPORTS

On-Site Survey
Final Sample Disposition Report

	Total Sample	
	Frequency	Percent of Sample Contacted
NonParticipants		
Not Contacted	1561	
Call Back	66	3.78%
Cancelled	30	1.72%
Not Qualified	50	2.87%
Refused	145	8.31%
Surveyed	153	8.77%
Unscheduled In Progress	1087	62.29%
Wrong Number	214	12.26%
Total Contacted	1745	100.00%
Participants		
Not Contacted	1123	
Call Back	37	3.36%
Cancelled	32	2.90%
Not Qualified	17	1.54%
Refused	113	10.25%
Surveyed	159	14.43%
Unscheduled In Progress	569	51.63%
Wrong Number	175	15.88%
Total Contacted	1102	
Average Number of Calls Per Site	1.3	
NonParticipant	1.4	
Participant	1.2	

Builder Telephone Survey Disposition Report

Total completes:	38
No telephone numbers available:	16
No response to calls:	31
Rejections	7
No answer	2
Subtotal:	40
Total:	94

C

DUCT MODEL PARAMETERS

The following assumptions were used in the ASHRAE Standard 152P: Method duct efficiency calculations. This ASHRAE method was coded into a form on the internet by Iain Walker of Lawrence Berkeley National Laboratory. The form was used for this analysis. The URL at the time was <*http://epb1.lbl.gov/ducts/152_ip_form.html*>.

Duct Model Input Parameters and Assumptions

Conditioned Floor Area, (ft²)
The surveyor's estimate of the total conditioned floor area.

Supply Duct Surface Area, (ft²)
The total surface area of the supply ductwork is determined based on the conditioned floor area of the building, using the following equation (ASHRAE 152P, eqn. 6.4):

$$A_{s,\,total} = 0.27\,A_{floor}$$

Return Duct Surface Area, (ft²)
The total surface area of the return ductwork is determined based on the actual return duct surface area indicated on the survey form. In the cases when this survey datum is not available, the area is determined based on the conditioned floor area of the building using the following equation (ASHRAE 152P, eqn. 6.5):

$$A_{r,\,total} = 0.05\,N_{returns}A_{floor}$$

where

$N_{returns}$ is the number of return registers,
A_{floor} is the conditioned floor area.

Fractional supply/return duct location
This is the amount of the duct system in a given location expressed as a fraction of the total. The total includes interior ducts. For each of the supply and return, the sum of the fractions entered plus the fractions of the duct inside the conditioned space (which is not entered) must add to 1. The supply duct location options are: in attic, in garage, in unvented & uninsulated crawlspace, in unvented crawlspace with insulated building floor and crawlspace walls, in unvented crawlspace with insulated building floor, in vented & uninsulated crawlspace, in vented crawlspace with insulated building floor and crawlspace walls, in vented crawlspace with insulated building floor, duct under slab and in exterior walls.

The fractional supply/return duct locations used in the models reflect the actual observations collected during the on-site survey. In the case of two-story houses, the duct location was assumed to be 70% in the attic and 30% in the conditioned space (ASHRAE 152P, table 6.1). In cases where there are no return ducts, the duct location for the return is entered the same as for the supply. This is necessary in order to calculate the appropriate thermal regain factor, because the thermal regain factor for the system is computed as an average of supply and return thermal regain factors.

Supply & Return Duct R values (hft^{2}F/Btu)
The models use the measured supply and return duct insulation R-values from the survey form.

Indoor Temperature, heating (F)
The surveyed heating system thermostat setting for December and January from the survey form.

Indoor Temperature, cooling (F)
The surveyed cooling system thermostat setting for July and August from the survey form.

Heating Design temperature at 97.5% and Cooling Design Temperature at 2.5%, ASHRAE, (F)
These site-specific values are taken from ASHRAE publication SPCDX, Climatic Data for Region X, Arizona, California, Hawaii and Nevada, 1982.

T wetbulb design, (F)
This value for the specific site location is taken from ASHRAE publication SPCDX, Climatic Data for Region X, Arizona, California, Hawaii and Nevada, 1982.

T wetbulb indoor, (F)
Determined from the psychometric chart, based on the cooling system thermostat setpoint.

Is there solar gain reduction in the attic? [Y/N]
Solar gain reduction is described in detail in (ASHRAE 152P, eqn. 6.4): If there is an appropriately installed radiant barrier, or a high reflectivity roof coating, or a barrel tiled roof, then these attics qualify for the solar gain reduction credit. The models use on-site data from the survey forms.

House Volume, (ft^3)
The total building volume is determined based on the conditioned floor area of the building and the measured average ceiling height:

$$V_{total} = height * A_{floor}$$

Equipment Heating/Cooling Capacity, [Btu/hour]
The single speed equipment capacity or the higher capacity for two-speed equipment; these are separate numbers for heating and cooling. The value is provided from the equipment name plate or from the manufacturers specification based on the model data. For cooling equipment, the convention is to enter values as negative.

Equipment Heating/Cooling Capacity, [Btu/hour], LOW
The lower capacity for two speed equipment. The value is provided from the equipment name plate or from the manufacturers specification based on the model data. Again, cooling is entered as a negative number.

Heating Fan Flow, (cfm)
The single speed heating fan flow or the higher heating fan flow for two speed equipment. The value is provided from the manufacturers specification of design fan system flow or is assumed equal to the calculated cooling fan flow. When using manufacturers rating, the 15% reduction indicated in the standard is applied.

Cooling Fan Flow, (cfm)
The single speed cooling fan flow or the higher cooling fan flow for two speed equipment. The value is calculated as a function of the cooling capacity of the system, (340 cfm per ton of cooling capacity).

$$Q_{ecool} = CoolCap / 12000 * 340$$

where

Q_{ecool} is the cooling fan flow, (cfm):

$CoolCap$ is the cooling capacity, Btu/h.

Heating Supply and Return Duct Leakages (cfm)
Assumed to be equal to the cooling supply and return duct leakages (cfm).

Cooling Supply duct leakage (cfm)
Duct leakage flow measured at the higher fan flow for two speed equipment is entered. Since this value represents the duct leakage flow to outside at operating conditions, it is assumed that 75% (a recommended value) of the measured leakage flow is lost to outside.

Cooling Return duct leakage (cfm)
Duct leakage flow calculated at the higher fan flow for two speed equipment is entered. If a return duct exists, it is assumed that 10% (a recommended value) of the measured total flow is lost to outside from the return ductwork.

Heating/Cooling Fan Flow, (cfm), LOW SPEED
The lower heating and cooling fan flows for two speed equipment. These values are calculated by prorating the design fan system flows using the ratio of capacities between lower and higher speeds.

Heating Supply/Return Duct Leakages (cfm), LOW SPEED
Assumed to be equal to the cooling supply and return duct leakages (cfm), LOW SPEED.

Cooling Supply duct leakage (cfm), LOW SPEED
Duct leakage flow measured at the higher fan flow for two speed equipment multiplied by the capacity ratio is entered. Since this value represents the duct leakage flow to outside at operating conditions, it is assumed that 75% (a recommended value) of the actually measured flow is lost to outside.

Cooling Return duct leakage (cfm), LOW SPEED

Duct leakage flow calculated at the higher fan flow for two speed equipment multiplied by the capacity ratio is entered. It a return duct exists, it is assumed that 10% (a recommended value) of the actually measured total flow is lost to outside from the return ductwork.

For Duct Thermal Mass Correction, enter F for flex duct or duct board, M for sheet metal. The actual duct construction is taken from the survey form.

For equipment efficiency correction, Enter 1 for ACCA manual D design, 2 without Manual D design. A value of 2 is always entered for no Manual D based design.

Enter 1 for single speed cooling/heating equipment, 2 for multispeed cooling/heating equipment. The actual cooling and heating equipment speed indices is entered.

For attics, enter V for vented, U for unvented. Actual observation is entered.

For cooling systems, Enter T for TXV control, O for other control. For cooling system control, a TXV is a thermostatic expansion valve. The other method of control is usually a simple orifice. These control systems differ in their ability to control the operation of the refrigerant cooling systems at different flows across the coil. The manufacturer's literature usually specifies which control method is used.

For heating systems, enter H for heat pump, O for other system. The observed system type is indicated.

Supply plenum dry bulb temperature for cooling systems, [F]. Since no flow temperature measurements were performed, the recommended value of 55F was assumed.

D

PROTOCOLS TABLES 6 AND 7

This appendix presents the CPUC Protocols: Table 6 and Table 7.

Table 6

M&E PROTOCOLS TABLE **Residential New Construction Program**

Designated Unit of Measurement: Home

ENDUSE: Whole Building

1. Average Participant Group and Average Comaprison Group		**Participant**	**Comparison**								
A. Pre-install usage:	Pre-install kW	na	na								
	Pre-install kW	na	na								
	Pre-install Therms	na	na								
	Base kW	na	na								
	Base kWh	na	na								
	Base Therms	na	na								
	Base kW/ designated unit of measurement	na	na								
	Base kWh/ designated unit of measurement	na	na								
	Base Therms/ designated unit of measurement	na	na								
B. Impact year usage:	Impact Yr kW	na	na								
	Impact Yr kWh	1,263,255	1,242,207								
	Impact Yr Therms	90,789	91,035								
	Impact Yr kW/designated unit	na	na								
	Impact Yr kWh/designated unit	7,945	8,119	**5. A. 90% CONFIDENCE LEVEL**				**5. B. 80% CONFIDENCE LEVEL**			
	Impact Yr Therms/designated unit	571	595	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	2,925.6	2,110.6	2,147.1	3,704.1	1,590.9	2,630.3	2,318.9	3,532.3	1,705.5	2,515.6
	A. ii. Load Impacts - kWh	5,768,315	2,756,271	3,666,474	7,870,156	1,913,417	3,599,125	4,130,285	7,406,345	2,099,408	3,413,134
	A. iii. Load Impacts - Therms	-129,424	37,098	-79,147	-179,702	-47,944	122,140	-90,241	-168,607	-29,178	103,374
	B. i. Load Impacts/designated unit - kW	0.86	0.62	0.63	1.08	0.47	0.77	0.68	1.03	0.50	0.74
	B. ii. Load Impacts/designated unit - kWh	1,688	806	1,073	2,303	560	1,053	1,208	2,167	614	999
	B. iii. Load Impacts/designated unit - Therms	-37.9	10.9	-23.2	-52.6	-14.0	35.7	-26.4	-49.3	-8.5	30.2
	C. i. a. % change in usage - Part Grp - k	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	1.27	0.99	0.73	1.25	0.54	0.89	0.79	1.20	0.58	0.85
	D.A. ii. Load Impacts - kWh, realization rate	1.43	0.83	0.77	1.66	0.40	0.76	0.87	1.56	0.44	0.72
	D.A. iii. Load Impacts - Therms, realization rate	-6.40	0.69	-1.03	-2.34	-0.62	1.59	-1.18	-2.20	-0.38	1.35
	D.B. i. Load Impacts/designated unit - kW, real rate	1.39	1.09	0.80	1.37	0.59	0.98	0.86	1.31	0.63	0.93
	D.B. ii. Load Impacts/designated unit - kWh, real rate	1.57	0.91	0.85	1.82	0.44	0.83	0.95	1.71	0.49	0.79
	D.B. iii. Load Impacts/designated unit - Therms, real rate	-7.00	0.75	-1.13	-2.56	-0.68	1.74	-1.29	-2.40	-0.42	1.47
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - k	0.72		na	na			na	na		
	A. ii. Average Load Impacts - kWh	0.48		na	na			na	na		
	A. iii. Average Load Impacts - Therms	-0.29		na	na			na	na		
	B. i. Avg Load Impacts/designated unit of measurement - kW	0.72		na	na			na	na		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	0.48		na	na			na	na		
	B. iii. Avg Load Impacts/designated unit of measurement - Therms	-0.29		na	na			na	na		
	C. i. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - k	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	See next page									
	B. Number of measures installed by all progra participants in the 12 months of the program year	See next page									
	C. Number of measures installed by Comp Group	na									
7. Market Segment Data											
	A. Distribution by CEC climate zone	See next page									

6A/6B Measure Count Data				
	Participant Group		All Program Participants	
Measure	# Homes	Percent	# Homes	Percent
Improved ducts	159	100%	3,418	100%
Efficient AC	159	100%	3,407	100%
Code enforceme	159	100%	3,407	100%
Gas drying	159	100%	3,400	100%
Gas cooking	158	99%	3,329	97%
Efficient furnace	0	0%	11	0%
Efficient water h	0	0%	10	0%
CFLs	0	0%	4	0%
Efficient window	0	0%	3	0%
All Measures	159		3,418	

7A. Market Segment Data - Distribution by CEC Climate Zone				
	Participant Group		All Program Participants	
Measure	# Homes	Percent	# Homes	Percent
Climate Zone 11	26	16%	560	16%
Climate Zone 12	81	51%	1,992	58%
Climate Zone 13	52	33%	866	25%
All Climate Zone	159		3,418	

Table 7

D.1 OVERVIEW INFORMATION

D.1.1 Study Title and Study ID Number

Study Title: *Impact Evaluation of Pacific Gas and Electric Company's Pre-1998 Residential New Construction Program Carry-Over*

Study ID No: 402

D.1.2 Program Year and Program Description

Program: Pre-1998 Residential New Construction Program Carry-Over
Program year: Program activity for which rebates were paid in the 1998 Calendar Year

Program description: The PG&E Residential New Construction Program, referred to as the PG&E Comfort Home Program, provides financial incentives to builders who construct energy-efficient homes that exceed Title 24 standards. Energy efficiency measures addressed in this evaluation were installed in years 1993 through 1998 and were rebated in Calendar Year 1998 under Program activity authorized in years 1993 through 1997. The Program focuses on homes built in California Energy Commission (CEC) climate zones 11, 12, and 13 and on four key energy efficiency measures (in addition to Title 24 compliance): high efficiency air conditioning; enhance duct installations; natural gas cooking; and natural gas dryer stubs. A total of 3,418 homes qualified for rebates in 1998 under the shared savings portion of the Program.

D.1.3 End Uses Covered

Whole building

D.1.4 Methods and Models Used

To develop gross impacts, engineering estimates of impacts were first developed. The Micropas building simulation model was used to develop impacts for space conditioning and other engineering algorithms were used to estimate impacts for cooking and clothes drying. For space conditioning, impacts were defined as the difference between Title 24 compliance loads and as-build loads. For cooking and clothes drying, impacts were defined as total end use energy consumption for rebated homes.

Engineering results were calibrated to customer bills using an SAE (Statistically Adjusted Engineering) approach. For this approach, billed consumption was regressed against energy consumption for all end uses. The model's regression coefficients are interpreted as calibration factors because they are used to calibrate the engineering results to the customer bills.

For space conditioning, the calibrated engineering estimates of impacts for participants and nonparticipants were then compared using an efficiency choice model. In this model, efficiency (defined as the percent improvement above Title 24 compliance energy consumption) is modeled (using an econometric approach) as a function of program participation and other variables such as house size and builder characteristics. The model provides estimates of efficiency improvement attributable to the Program while factoring out confounding effects of other factors. Spillover effects on the participant base efficiency assumptions were examined, and the NTGRs were adjusted to account for this affect, yielding an estimate of net savings.

For the cooking and clothes drying end uses, a self report approach was used to develop net savings using the results of a builder survey in which respondents were asked if they would have installed measures in the absence of the Program. Net-to-gross ratios developed from the self-report analysis were applied to gross savings in order to determine net savings.

D.1.5 Participant and Comparison Group Definition

- Participant group: homes built by participant builders that were rebated in 1998.
- Nonparticipant comparison group: single family homes that were built in the 1996-1998 period and were located in the same geographical area as the participant homes.

D.1.6 Analysis Sample Size

The analysis sample size was 153 participants and 159 nonparticipants.

The following tables summarizes the number of homes used in various stages of the analysis. Also note, monthly data was used in the SAE models - 3,644 observations were included in the electric model and 3,040 observations were included in the gas model.

	Participants	Nonparticipants	Total
Participant Population	3,418		
Screened Sites Available for Surveys	2,225	3,306	5,531
On-site Surveys	159	153	312
Duct Tests	71	78	149
Builder Surveys[1]	109(23)	65(22)	174(38)
Electric SAE Model	159	153	312
Gas SAE Model	133	130	263
Electric Efficiency Choice Model[2]	101	60	161
Gas Efficiency Choice Model[2]	84	49	133
Self Report NTG Analysis[2]	103		103

[1]Number of builders are included in parentheses. Builder counts do not sum to total because of overlap of builders in the two categories.

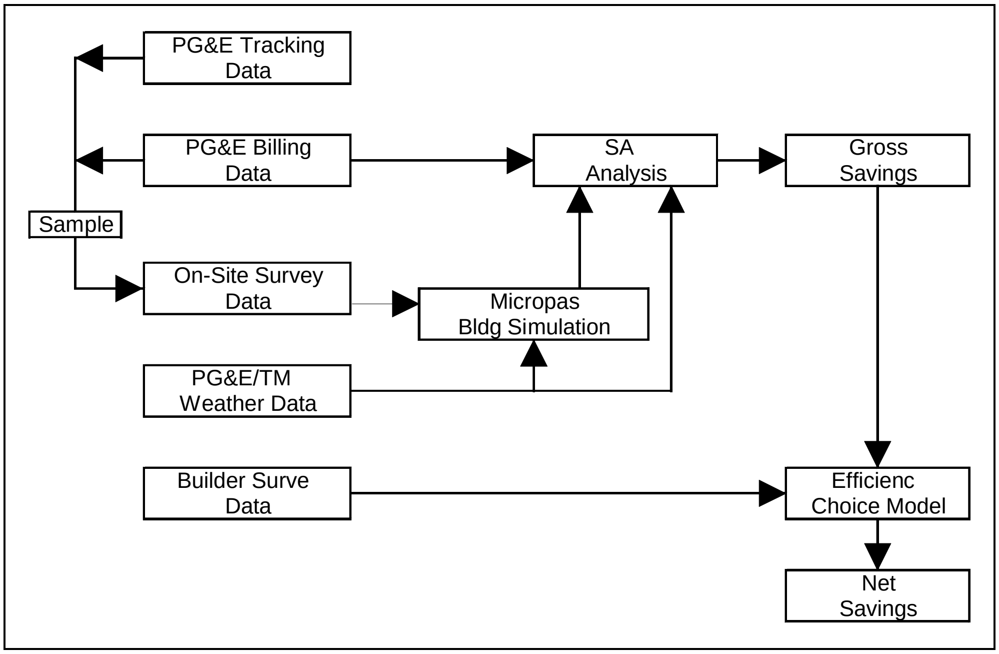
[2]Two builders did not respond to survey questions that were used in the efficiency choice model and the self report analysis.

D.2 DATABASE MANAGEMENT

D.2.1 Flow Chart

The flow chart is presented in the following figure.

Data Flow Chart



D.2.2 Specific Data Sources

PG&E rebate tracking data:

PDETAIL.SD2	Measure level savings for each home
TRACK.SD2	Savings summarized to the home level and list of addresses for 1998 participating homes
ELEYPGE1.SD2	Additional participant data from hardcopy files

PG&E billing/weather data:

EBILL65.SD2	Electric billing data and matched weather data
GBILL65.SD2	Gas billing data and matched weather data

On-site survey data:

CLNSURV.SD2	Onsite survey dataset (see Appendix A survey instrument for variable descriptions) and non-space-conditioning engineering estimates of energy usage
BLDGEOM.XLS	Onsite survey data regarding building geometry, input by modelers; variable descriptions in GEOM-DB.DOC

Builder survey data:

BLDSURV.SD2	Survey data for each respondent
BLDID.SD2	File linking builder ID to home ID (the PG&E Control number)

Other data:

LSPGE.SD2:	PG&E cooking and clothes drying load shapes
WEATHMAP.SD2	CEC climate zone indicator for each home
LOADSHAP.XLS	AC load shapes from the 1993 new construction evaluation

Micropas input files (each file begins with the 7 digit ID number):

_______A.M45	Type A simulations, as built, customer reported schedules
_______B.M45	Type B simulations, as built, compliance schedules
_______C.M45	Type C simulations, compliance, customer reported schedules
_______D.M45	Type D simulations, compliance, compliance schedules

ASHRAE Standard 152 Duct Efficiency Calculations:

Duct_152.XLS

Other created datasets:

DUCTEFF.SD2	Estimated duct efficiencies for homes with duct tests
DCLEFF.SD2	Cooling duct efficiencies for all homes
DHTEFF.SD2	Heating duct efficiencies for all homes
BLDSIM.SD2	Micropas simulation results
ENGIMPCS.SD2	Engineering energy usage using compliance schedules
ENGIMPRS.SD2	Engineering energy usage using reported schedules
ADJSAV.SD2	Adjusted engineering results using reported schedules
NETSAMP.SD2	List of final sites in the efficiency choice model
WEIGHTS.SD2	Site expansion weights

Analysis programs:

ENGMODV2.SAS	Non-space-conditioning engineering module
ENGMODV1.SAS	Runs ENGMOD.SAS for different daytypes and retains results
BLDSIM.SAS	Combines Micropas results with duct and system efficiencies
ELESAE.SAS	Electric SAE model
GASSAE.SAS	Gas SAE model
WEIGHTS.SAS	Calculates site expansion weights
NTGSR.SAS	Self-report net-to-gross analysis
NTGMOD.SAS	Efficiency choice model and calculation of net impacts
LDSHAPE.SAS	Develops and applies allocation factors to provide impacts by cost period
SPILLOVR.SAS	Calculation of nonparticipant spillover from builder survey data

D.2.3 Data Attrition

The initial participant and nonparticipant screening described is in the following table.

	Remaining Homes	Screened Homes
Participants		
Total homes with 1998 Rebate	3,418	
Unique control code in tracking system	3,358	60
Single family homes matched to billing system	3,320	38
Tracking system address, service address match	3,235	85
Homes with an electric account with PG&E	3,225	10
Homes with adequate billing data	2,444	781
Nonparticipants		
Homes with adequate bills, matched to participants by meter route	4,147	
Homes after additional geographical/proportional matching to participants	3,306	841

A sample disposition report for the on-site survey is presented in the following table.

	Frequency	% of Sample Contacted
Participants		
Not Contacted	1,123	
Call Back	37	3.36%
Cancelled	32	2.90%
Not Qualified	17	1.54%
Refused	113	10.25%
Surveyed	***159***	***14.43%***
Unscheduled In Progress	569	51.63%
Wrong Number	175	15.88%
Total Contacted	1,102	100.00%
NonParticipants		
Not Contacted	1,561	
Call Back	66	3.78%
Cancelled	30	1.72%
Not Qualified	50	2.87%
Refused	145	8.31%
Surveyed	***153***	***8.77%***
Unscheduled In Progress	1,087	62.29%
Wrong Number	214	12.26%
Total Contacted	1,745	100.00%

The sample disposition report for the builder survey is presented in the following table.

Total completes:	38
No telephone numbers available:	16
No response to calls:	31
Rejections	7
No answer	2
Subtotal - unsurveyed, with phone number:	40
Total:	94

D.2.4 Data Quality

PG&E tracking and billing audit data were matched using the PG&E Control number, a fixed number uniquely corresponding to a PG&E account. After matching, addresses from the tracking system were match against addresses from the billing system. A total of 85 sites were dropped from the study because the address did not match.

Each on-site survey was tracked using the PG&E Control number. Builders were associated with each survey by Control number. Weather data was assigned, based on CEC climate zone.

D.2.5 Data Collected Specifically for the Analysis but not Used

NA

D.3 SAMPLING

D.3.1 Sampling Procedures and Protocols

To comply with the M&E Protocols, studies utilizing on-site data collection require minimum participant and nonparticipant sample sizes of 150 each. For this study, sample size goals of 158 participants and 158 nonparticipant were established to allow for some attrition due to factors such as problematic billing data and contradictory or incomplete survey results.

It was decided that a cluster sampling technique would be most efficient for the on-site surveys. This technique ensures that sampled sites are “clustered” in areas that are scheduled for surveys by the same surveyor on a given day. The geographically diverse sample segmentation used in the cluster approach also will ensure that final sample of surveyed homes will contain variation by builder, home type, and home size.

To implement the sample design, using the cluster sampling technique, the available homes were divided into geographical nodes - areas that could be reached by a single surveyor in a given day. In several cities, initial nodes were further disaggregated by PG&E meter route in order to better match participant and nonparticipant homes. Next, a random sample of 53 participants was drawn. This sample of participants determined how many surveys would be conducted in a given node. For each participant selected in a node, a total of six surveys would be conducted (3 participant and 3 nonparticipant). Overall, 27 nodes were target for surveys, providing a random and diverse sample.

D.3.2 Survey Information

Survey instruments are presented in Appendix A of the report. See section B3 for response rates. Non-response bias was not addressed.

D.3.3 Statistical Descriptions

Descriptive statistics for key model variables are provided in the following tables.

Electric SAE Model

Group	Variable	N	Mean	Std Dev	Minimum	Maximum
Nonparticipants	kWh	1830	22.1737	12.9318	0.1290	101.4828
	Base case cooling use	1830	5.1019	7.6225	0.0000	48.1464
	Efficent AC savings	1830	0.4679	1.0695	0.0000	8.3578
	Duct savings	1830	-0.0237	0.7638	-8.0893	8.0839
	Other savings	1830	-0.4168	2.0691	-15.7718	9.8947
	Pool/Spa use	1815	1.2115	3.8314	0.0000	33.3203
	Other end use consumption	1815	15.7362	4.8634	7.2271	33.6597
Participants	kWh	1906	21.6605	12.2952	0.0667	105.6000
	Base case cooling use	1906	5.1637	7.5546	0.0000	40.8016
	Efficent AC savings	1906	0.9485	1.3921	0.0000	8.0643
	Duct savings	1906	0.4297	0.9483	-3.5019	6.5038
	Other savings	1906	-0.4755	2.1656	-28.4342	8.3018
	Pool/Spa use	1884	0.8207	2.7437	0.0000	30.2130
	Other end use consumption	1884	15.6439	5.4323	3.9565	38.8697

Gas SAE Model

Group	Variable	N	Mean	Std Dev	Minimum	Maximum
Nonparticipants	Therms	1543	1.6256	1.4158	0.0313	7.9697
	Base case heating use	1543	0.8479	1.0922	0.0000	5.9027
	Efficient furnace savings	1543	0.0371	0.0595	0.0000	0.8593
	Duct savings	1543	-0.0192	0.1698	-2.0604	0.9805
	Other savings	1543	-0.1844	0.3708	-2.2575	0.8115
	Clothes drying use	1543	0.0617	0.0704	0.0000	0.3446
	Cooking use	1543	0.0791	0.0480	0.0000	0.2357
	Pool/Spa use	1543	0.0292	0.1650	0.0000	1.1768
	Water heater use	1543	0.5396	0.2550	0.0000	1.5738
	Fireplace use	1543	0.0193	0.0380	0.0000	0.1000
Participants	Therms	1581	1.5657	1.6295	0.0000	21.2500
	Base case heating use	1581	0.8774	1.1312	0.0000	7.6807
	Efficient furnace savings	1581	0.0354	0.0522	0.0000	0.6583
	Duct savings	1581	0.1290	0.2303	-0.7937	1.8455
	Other savings	1581	-0.2092	0.4501	-4.6159	0.7954
	Clothes drying use	1569	0.0740	0.0924	0.0000	0.4738
	Cooking use	1545	0.0775	0.0441	0.0000	0.2346
	Pool/Spa use	1581	0.0461	0.2628	0.0000	2.3315
	Water heater use	1545	0.5149	0.2942	0.1230	1.7469
	Fireplace use	1581	0.0249	0.0411	0.0000	0.1000

Participation Decision Model

Group	Variable	N	Mean	Std Dev	Minimum	Maximum
Nonparticipants	Number of homes	60	752.73	424.71	1.00	1800.00
	Climate Zone 12 indicator	153	0.56	0.50	0.00	1.00
	Energy efficiency was an important home purchase factor	153	0.58	0.49	0.00	1.00
	Average price of builders' homes	65	219188.46	140306.77	650.00	550000.00
	Builder constructs luxury homes	153	0.18	0.39	0.00	1.00
	Construction costs not important to builder	153	0.80	0.40	0.00	1.00
	Number of rooms in home	153	6.59	1.93	1.00	11.00
Participants	Number of homes	101	587.77	485.37	25.00	2000.00
	Climate Zone 12 indicator	159	0.55	0.50	0.00	1.00
	Energy efficiency was an important home purchase factor	159	0.70	0.46	0.00	1.00
	Average price of builders' homes	109	166644.04	84372.45	650.00	350000.00
	Builder constructs luxury homes	159	0.01	0.11	0.00	1.00
	Construction costs not important to builder	159	0.81	0.40	0.00	1.00
	Number of rooms in home	159	6.50	2.14	1.00	13.00

Electric Efficiency Model

Group	Variable	N	Mean	Std Dev	Minimum	Maximum
Nonparticipants	Cooling efficiency	153	0.0551	0.1350	-0.3263	0.3487
	Participation indicator	153	0.0000	0.0000	0.0000	0.0000
	Mills Ratio 1	60	-1.0544	1.0490	-4.3209	-0.0080
	Mills Ratio 2	60	0.0000	0.0000	0.0000	0.0000
	Customer is college-educated	153	0.4902	0.5015	0.0000	1.0000
	Number of levels in home	153	1.3791	0.4868	1.0000	2.0000
	Percentage of single family homes of builder	65	98.2308	3.4721	90.0000	100.0000
	Builder targets the entry level market	153	0.2484	0.4335	0.0000	1.0000
	Energy efficiency makes home a better sell according to builder	153	0.3268	0.4706	0.0000	1.0000
	Climate zone 11 indicator	153	0.1438	0.3520	0.0000	1.0000
	Climate zone 12 indicator	153	0.5621	0.4978	0.0000	1.0000
Participants	Cooling efficiency	159	0.2396	0.0909	0.0218	0.6850
	Participation indicator	159	1.0000	0.0000	1.0000	1.0000
	Mills Ratio 1	101	0.6255	0.5621	0.0227	3.2832
	Mills Ratio 2	101	0.6255	0.5621	0.0227	3.2832
	Customer is college-educated	159	0.3836	0.4878	0.0000	1.0000
	Number of levels in home	159	1.3396	0.4751	1.0000	2.0000
	Percentage of single family homes of builder	109	98.7798	2.6852	90.0000	100.0000
	Builder targets the entry level market	159	0.3836	0.4878	0.0000	1.0000
	Energy efficiency makes home a better sell according to builder	159	0.5912	0.4932	0.0000	1.0000
	Climate zone 11 indicator	159	0.1321	0.3396	0.0000	1.0000
	Climate zone 12 indicator	159	0.5472	0.4993	0.0000	1.0000

Gas Efficiency Model

Group	Variable	N	Mean	Std Dev	Minimum	Maximum
Nonparticipants	Heating efficiency	153	-0.0646	0.1708	-0.8230	0.3080
	Participation indicator	153	0.0000	0.0000	0.0000	0.0000
	Mills Ratio 1	60	-1.0544	1.0490	-4.3209	-0.0080
	Mills Ratio 2	60	0.0000	0.0000	0.0000	0.0000
	Number of levels in home	153	1.3791	0.4868	1.0000	2.0000
	Housing purchase price	153	181.7974	68.8238	90.0000	500.0000
	Energy efficiency was an important home purchase factor	153	0.5817	0.4949	0.0000	1.0000
	Percentage of single family homes of builder	65	98.2308	3.4721	90.0000	100.0000
	Average price of builders' homes	65	219188.4600	140306.7700	650.0000	550000.0000
	Builder targets the entry level market	153	0.2484	0.4335	0.0000	1.0000
	Window floor ratio	153	0.1395	0.0331	0.0000	0.2320
	Climate zone 11 indicator	153	0.1438	0.3520	0.0000	1.0000
	Climate zone 12 indicator	153	0.5621	0.4978	0.0000	1.0000
Participants	Heating efficiency	159	0.0615	0.1489	-0.5828	0.2763
	Participation indicator	159	1.0000	0.0000	1.0000	1.0000
	Mills Ratio 1	101	0.6255	0.5621	0.0227	3.2832
	Mills Ratio 2	101	0.6255	0.5621	0.0227	3.2832
	Number of levels in home	159	1.3396	0.4751	1.0000	2.0000
	Housing purchase price	159	187.2642	77.7018	90.0000	500.0000
	Energy efficiency was an important home purchase factor	159	0.7044	0.4578	0.0000	1.0000
	Percentage of single family homes of builder	109	98.7798	2.6852	90.0000	100.0000
	Average price of builders' homes	109	166644.0400	84372.4500	650.0000	350000.0000
	Builder targets the entry level market	159	0.3836	0.4878	0.0000	1.0000
	Window floor ratio	159	0.1442	0.0355	0.0610	0.3060
	Climate zone 11 indicator	159	0.1321	0.3396	0.0000	1.0000
	Climate zone 12 indicator	159	0.5472	0.4993	0.0000	1.0000

D.4 DATA SCREENING AND ANALYSIS

D.4.1 Outliers, Missing Data Points and Weather Adjustment

Outliers: 60 outlier observations (or 5 customers), with studentized residuals greater that 4 in absolute value were removed from the electric SAE model. For the gas model, the same outlier screening was conducted, and 48 outlier observations (or 4 customers) were removed.

Missing data points: Sites with missing builder survey data were excluded from the efficiency choice model. Also, two builders did not respond to survey questions that were used in the efficiency models and the self-report analysis. Sites with missing homeowner survey data were excluded from the SAE models.

Weather adjustment: All space cooling variables in the electric SAE model were interacted with the ratio of actual-to-normal cooling degree days (65 degree base) to account for differences between billed consumption that reflect actual weather and the engineering cooling estimates that reflect normal weather. The same approach was used for space heating variables in the gas SAE model, but a heating degree day ratio was applied.

D.4.2 Control for the Effects of Background Variables

For the SAE models, engineering equations that incorporated customer behavior as well as site characteristics were used to control for differences between participants and nonparticipants. For the efficiency choice models, site-specific and builder-specific variables were included to account for factors that could lead to differences in energy efficiency in addition to Program participation.

D.4.3 Screening Data

See the database management and attrition discussion above.

D.4.4 Regression Statistics

Regression statistics are provided in the following tables.

Electric SAE Model, Dependent Variable: Billed Consumption

Variable	Parameter Estimate	t-statistic
Base case cooling use	1.197	73.2
Efficient AC savings	-1.197	-73.2
Duct savings	-1.197	-73.2
Other cooling savings	-0.291	-6.0
Pool/Spa use	0.678	8.1
Other end use consumption	1.052	97.1
Number of observations	3,644	
Adjusted R^2	0.8004	

Gas SAE Model, Dependent Variable: Billed Consumption

Variable	Parameter Estimate	t-statistic
Base case heating use	0.742	66.7
Efficient furnace savings	-0.742	-66.7
Duct savings	-0.617	-11.3
Other savings	-0.384	-11.9
Cooking use	1.026	7.3
Clothes drying use	1.026	7.3
Pool and spa use	0.665	8.2
Water heater use	0.777	18.2
Number of observations	3,040	
Adjusted R^2	0.6710	

Participation Decision Model
Dependent Variable: Program Participation

Variable	Parameter Estimate	t-statistic
Intercept	2.869	2.7
Number of homes	-0.001	-1.8
Climate Zone 12 indicator	2.028	2.9
Energy efficiency was an important home purchase factor	0.891	1.8
Average price of builders' homes	-0.000009	-2.0
Builder constructs luxury homes	-3.890	-4.4
Construction costs not important to builder	2.254	4.1
Number of rooms in home	-0.350	-2.4
Number of observations	161	
Log likelihood ratio	0.4052	

Cooling Efficiency Models
Dependent Variable: Efficiency Relative to Base Case Usage

Variable	Parameter Estimate	t-statistic
Intercept	-1.348164	-4.85
Participation indicator	0.187474	6.95
Mills Ratio 1	-0.028705	-2.12
Mills Ratio 2	0.013719	0.60
Customer is college-educated	0.025052	1.44
Number of levels in home	0.034353	1.75
Percentage of single family homes of builder	0.013498	4.73
Builder targets the entry level market	-0.023062	-1.27
Energy efficiency makes home a better sell according to builder	0.069601	2.54
Climate zone 11 indicator	-0.006057	-0.19
Climate zone 12 indicator	-0.056445	-2.50
Number of observations	161	
Adjusted R^2	0.4377	

Heating Efficiency Models
Dependent Variable: Efficiency Relative to Base Case Usage

Variable	Parameter Estimate	t-statistic
Intercept	-0.649703	-1.47
Participation indicator	0.072418	1.41
Mills Ratio 1	0.000266	0.01
Mills Ratio 2	-0.027632	-0.82
Number of levels in home	-0.05521	-2.06
Housing purchase price	0.000397	2.11
Energy efficiency was an important home purchase factor	0.073239	2.91
Percentage of single family homes of builder	0.008763	1.86
Average price of builders' homes	-0.0000006	-2.89
Builder targets the entry level market	-0.051111	-1.36
Window floor ratio	-0.556019	-1.58
Climate zone 11 indicator	-0.090133	-1.88
Climate zone 12 indicator	-0.072945	-1.91
Number of observations	133	
Adjusted R^2	0.3636	

D.4.5 Specification

See Section 5.2 of the report for a discussion of the SAE model. See 6.4 of the report for a discussion of the efficiency choice model.

Heterogeneity

Variations in energy use across customers was addressed through the use of engineering algorithms that took into account customer behavior as well as site characteristics.

Changes

Weather variables were included in the model as well as engineering usage estimates that contained seasonal variation.

Self-Selection

The efficiency choice model utilized participation decision equation to estimate the probability of participation as a function of site and builder variables. Mills ratio variables were developed from the predicted probability of participation and included in the cooling and heating efficiency models to account for self selection. bias.

Omitted Factors

NA

Interpretation as Net Impacts

In the efficiency choice model, participant and nonparticipant efficiency improvements over Title 24 compliance energy consumption are modeled as a function of program participation and other variables such as the number of levels in the home and builder characteristics. Differences between participant and nonparticipant efficiencies are captured in the program participation variable that is included in the model. The coefficient on this variable is the amount of efficiency improvement attributable to the Program. Spillover effects on participant base efficiency was examined, and nonparticipant spillover was subtracted from participant base efficiency. The results are then an estimate of net savings.

Other factors that can also cause differences in site-level efficiency are also included as model variables in order to factor out their confounding effects on the estimate of efficiency improvement due to the Program.

Since the estimation of efficiency choice model utilizes differences between participants and nonparticipants to quantify the impacts of Program participation on efficiency improvements, the efficiency choice approach is entirely consistent with Table 5 net impact guidelines in the M&E Protocols.

D.4.6 Error in Measuring Variables

Surveyor training and quality control procedures were utilized to minimize measurement error in on-site data collection.

D.4.7 Autocorrelation

For the electric SAE model, a generalized least squares procedure was used mitigate the effects of autocorrelation. Autocorrelation was detected in the gas SAE model as well, but the generalized least squares specification produced unreasonable parameter estimates.

D.4.8 Heteroskedasticity

The SAE models were estimated on a use-per-day basis to mitigate the effects of varying billing cycles. No other attempt was made to address heteroskedasticity which usually not considered a problem in these types of residential analysis.

D.4.9 Collinearity

Multicollinearity between regression variables was reviewed using standard statistical output. The SAE modeling framework limits the multicollinearity effect that occurs because many home have the same end use by developing home-specific energy usage estimates based on customer-reported usage factors.

D.4.10Influential Data Points

Studentized residuals were reviewed. Models were run without the largest outliers. Outliers were removed from the electric SAE model but not from the gas SAE model. See Sections D.1. and D.9. above.

D.4.11Missing Data

See Section D.1.

D.4.12Precision

Gross savings precision was based on standard errors of the regression parameters of the energy savings variables in the SAE models. For heating and cooling, net savings precision was based on the standard error of the regression parameters for the program savings variables in the electric and gas components of the efficiency choice model. For cooking and clothes drying, standard errors for the gas cooking and clothes drying variables in the SAE model were combined with standard errors of the self-report net-to-gross ratios to develop net saving precision.

D.4.13 Engineering Analyses

The Micropas simulation model was used for the study. It is a Title-24 compliance model as required by the M&E Protocols. Customer-reported thermostat setpoints were used to develop gross impacts. Home construction and household behavior data used in the engineering models were developed on a home-specific basis using on-site survey data.

D.4.14 Net-to-Gross Ratios

A comparison group was not used to develop NTGRs for the cooking and clothes drying measures. A self-report method was used. This method was applied on a measure-specific basis and consistency checks were used.

D.5 DATA INTERPRETATION AND APPLICATION

D.5.1 Net Impacts

For space cooling and space heating the methods used in this study provide net impacts according to method 1a of Section E of Table 7. For cooking and clothes drying end uses net impacts were derived using method 1b of Section E of Table 7.

D.5.2 Rationale

See Sections 5 and 6 of the report for the rationale for the approach taken. Section 5.2 outlines the reason for using an SAE model to develop gross impacts. Section 6.4 presents the rationale for using an efficiency choice model to develop net impacts for cooling and heating. Section 6.5 presents rationale for the choice of a self-report net-to-gross method do determine net impacts of cooking and clothes drying. Section 6.6 explains the rationale for adjusting participant base efficiency to account for nonparticipant spillover, and the resulting adjustment to *NTGRs*.

E DATABASE DOCUMENTATION

This report documents the database developed for the Impact Evaluation of PG&E's 1998 Residential New Construction Program.

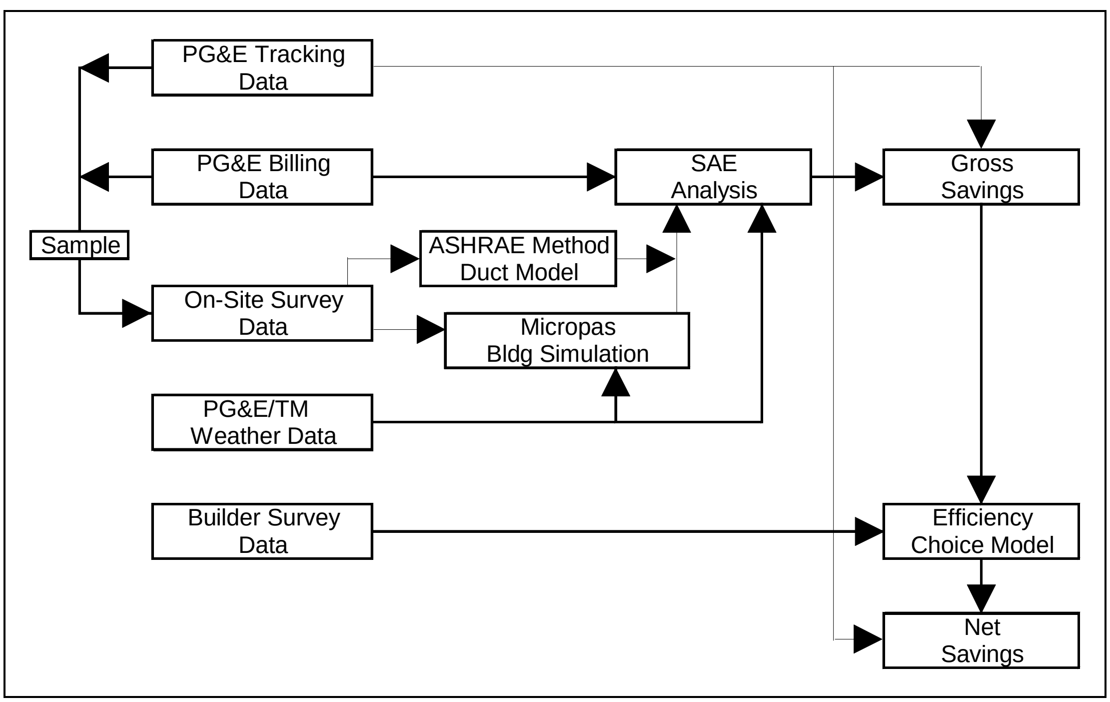
The following topics are presented:

- Data flowchart
- Description of analysis process
- List of data and program files
- Contents of datasets
- Survey instruments that provide definitions for all survey variables

E.1 FLOWCHART

A data flow chart is presented in Figure 1-1. This figure shows the general data flows for the project.

Figure E-1
Data Flow Chart



E.2 ANALYSIS PROCESS

The data and programs used in the analysis are discussed next. Datasets and programs are also listed in Section 1.3.

First, data from the tracking system (TRACK.SD2) and billing system data were used to develop a sample of homes for on-site surveys. Data from the surveys (CLNSURV.SD2, BLDGEOM.XLS) were used to develop engineering estimates of energy use using the ASHRAE Method 152P for ducts (Duct_152.xls), the Micropas building simulations (____.M45 files), and the non-space-conditioning algorithms (ENGMODV1.SAS and ENGMODV2.SAS). Outputs from the engineering analysis include:

- BLDSIM.SD2 (Micropas)
- DUCTEFF.SD2, DCLEFF.SD2, and DHTEFF.SD2 (ASHRAE calculations)
- CLNSURV.SD2 (contains non space conditioning model)
- ENGIMPCS.SD2 / ENGIMPRS.SD2 (usage estimates combining Micropas loads with system and duct efficiencies)

Next the engineering results were combined with billing and weather data (EBILL65.SD2 and GBILL65.SD2) to develop the SAE models (ELESAE.SAS and GASSAE.SAS). Outputs of the SAE models included coefficients, adjusted savings estimates for use as gross program impacts (ADJSAV.SD2), and inputs to the net-to-gross models.

Net savings were developed using adjusted savings from the SAE models, input from the builder survey (BLDSURV.SD2 and BLDID.SD2) and inputs from the on-site survey. Both self-report (NTGSR.SAS) and choice modeling (NTGMOD.SAS) net-to-gross approaches were used. Spillover was also analyzed (SPILLOVR.SAS).

Using secondary source load shape data (LSPGE.SD2 and LOADSHAP.XLS), energy consumption was allocated to the appropriate cost periods (LDSHAPE.SAS).

Weights used to expand study results to the participant population were developed (WEIGHTS.SAS) using tracking system data (PDETAIL.SD2). Weights are contained in the WEIGHTS.SD2 dataset.

E.3 SPECIFIC DATA SOURCES

Specific data sources and programs are listed next, by category. A brief description of each data source is provided.

PG&E rebate tracking data:

PDETAIL.SD2	Measure level savings for each home
TRACK.SD2	Savings summarized to the home level and list of addresses for 1998 participating homes
ELEYPGE1.SD2	Additional participant data from hardcopy files

PG&E billing/weather data:

EBILL65.SD2	Electric billing data and matched weather data
GBILL65.SD2	Gas billing data and matched weather data

On-site survey data:

CLNSURV.SD2	Onsite survey dataset (see Appendix A survey instrument for variable descriptions) and non-space-conditioning engineering estimates of energy usage
BLDGEOM.XLS	Onsite survey data regarding building geometry, input by modelers; variable descriptions in GEOM-DB.DOC

Builder survey data:

BLDSURV.SD2	Survey data for each respondent
BLDID.SD2	File linking builder ID to home ID (the PG&E Control number)

Other data:

LSPGE.SD2:	PG&E cooking and clothes drying load shapes
WEATHMAP.SD2	CEC climate zone indicator for each home
LOADSHAP.XLS	AC load shapes from the 1993 new construction evaluation

Micropas input files (each file begins with the 7 digit ID number):

_______A.M45	Type A simulations, as built, customer reported schedules
_______B.M45	Type B simulations, as built, compliance schedules
_______C.M45	Type C simulations, compliance, customer reported schedules
_______D.M45	Type D simulations, compliance, compliance schedules

ASHRAE Standard 152 Duct Efficiency Calculations:

Duct_152.XLS

Other created datasets:

DUCTEFF.SD2	Estimated duct efficiencies for homes with duct tests
DCLEFF.SD2	Cooling duct efficiencies for all homes
DHTEFF.SD2	Heating duct efficiencies for all homes
BLDSIM.SD2	Micropas simulation results
ENGIMPCS.SD2	Engineering energy usage using compliance schedules
ENGIMPRS.SD2	Engineering energy usage using reported schedules
ADJSAV.SD2	Adjusted engineering results using reported schedules
NETSAMP.SD2	List of final sites in the efficiency choice model
WEIGHTS.SD2	Site expansion weights

Analysis SAS programs:

ENGMODV2.SAS	Non-space-conditioning engineering module
ENGMODV1.SAS	Runs ENGMOD.SAS for different daytypes and retains results
BLDSIM.SAS	Combines Micropas results with duct and system efficiencies
ELESAE.SAS	Electric SAE model
GASSAE.SAS	Gas SAE model
WEIGHTS.SAS	Calculates site expansion weights
NTGSR.SAS	Self-report net-to-gross analysis
NTGMOD.SAS	Efficiency choice model and calculation of net impacts
LDSHAPE.SAS	Develops and applies allocation factors to provide impacts by cost period
SPILLOVR.SAS	Calculation of nonparticipant spillover from builder survey data

E.4 MODEL VARIABLES

A listing of model variables is presented next. First, the BLDGEOM.XLS variables that were created from the sketches developed during the on-site survey are shown. Then a listing of all the variables in the SAS datasets is provided.

E.4.1 BLDGEOM.XLS Dataset Variables

Attributes of the building geometry were transferred from the paper surveys to the “BldgGeom” database. Areas of walls, floors, windows, skylights, and roofs are included in this database, along with the u-values, shading coefficients, mass characteristics and other properties associated with these construction components. The areas of walls and windows are assigned to one of the four cardinal compass points based on measurements taken during the survey. This binning of the areas is needed in preparation for creating the Micropas input files. Functionally, the “BldgGeom” database is linked to the other databases through the unique seven-digit site code. By indexing the databases with the site code, it becomes possible to keep data from different sources in separate tables while still retaining the ability to reference all tables during the automated creation of the Micropas input files.

The BldgGeom database contains the following variables:

General	
CNTL	Seven-digit site code
FrontOrientation	Azimuth of from door
ClimateZone	California climate zone number
CalcFloorArea	Floor area based on drawings and measurements
CalcVolume	Volume based on drawings and measurements
Walls (4)	
WallBxForm3Name	Micropas wall construction name
WallBxFrontArea	Area of wall type x on the "front" facade
WallBxFrontSolar	(y/n) Does the front wall receive solar gain?
WallBxRightArea	Area of wall type x on the "right" facade
WallBxRightSolar	(y/n) Does the right wall receive solar gain?
WallBxBackArea	Area of wall type x on the "back" facade
WallBxBackSolar	(y/n) Does the back wall receive solar gain?
WallBxLeftArea	Area of wall type x on the "left" facade
WallBxLeftSolar	(y/n) Does the left wall receive solar gain?
Glazing (10)	
GlzGxType	Pick: Window, Skylight
GlzGxFrame	Pick: Wood, Metal, Vinyl, None
GlzGxVent	Pick: Fixed, Slider, Casement
GlzGxPanes	Pick: 1, 2, 3
GlzGxShade	Pick: None, Blinds, Roller Blinds, Drapes, Shutters
GlzGxCode	Pick Micropas window code name
Windows (15)	
WinxGlzCode	Glazing type reference code (Gx)
WinxOrient	Pick: Front, Right, Back, Left, Horz
WinxHeight	Window height in feet
WinxWidth	Window width in feet
WinxOverHeight	Dist. from top of wind. to bottom of overhang in feet
WinxOverDepth	Depth of overhang in feet
WinxMult	Number of windows with this description
Roofs (3)	
RoofCxType	Pick Micropas roof type code
RoofCxSolar	(y/n) Does the roof receive solar gain?
RoofCxArea	Area in square feet of roof

Floors (3)

FlrFxType	Pick Micropas floor type code
FlrFxArea	Area of floor in square feet
FlrFxLength	Length of the gross perimeter of a slab floor in feet
FlrFxGarage	Length of a slab floor adjacent to the garage in feet
FlrFxCovered	Percent of floor area covered with carpet

E.4.2 SAS Dataset Variables

SAS dataset variables are presented in the following order:

Billing / Weather data: EBILL65, GBILL65

Tracking data: ELEYPGE1, PDETAIL, TRACK

Survey data: BLDID, BLDSURV, CLNSURV (contains non-space conditioning engineering estimates)

Other data: WEATHMAP, LSPGE

Created datasets: ADJSAV, BLDSIM, DCLEFF DHTEFF, DUCTEFF, ENGIMPCS, ENGIMPRS, NETSAMP, WEIGHTS

CONTENTS PROCEDURE

```
Data Set Name: A.EBILL65                                Observations:         3736
Member Type:   DATA                                     Variables:            15
Engine:        V612                                     Indexes:              0
Created:       12:38 Wednesday, February 23, 2000       Observation Length:   54
Last Modified: 12:38 Wednesday, February 23, 2000       Deleted Observations: 0
Protection:                                             Compressed:           NO
Data Set Type:                                          Sorted:               NO
Label:
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Number of Data Set Pages: 26
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First Data Page:          1
Max Obs per Page:         151
Obs in First Data Page:   110
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-----Alphabetic List of Variables and Attributes-----

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#	Variable	Type	Len	Pos	Format	Informat	Label
9	CDD	Num	3	33			Cooling degree days
13	CDDTMY	Num	3	45			Typical cooling degree days
15	CDDTMYZN	Num	3	51			Typical cooling degree days/weather zone
11	CDDZN	Num	3	39			Cooling degree days/weather zone
3	CECWZN	Num	5	10			CEC weather zone
1	CNTL	Num	8	0	8.	10.	Control number
7	DAY	Num	3	27			Day
8	HDD	Num	3	30			Heating degree days
12	HDDTMY	Num	3	42			Typical heating degree days
14	HDDTMYZN	Num	3	48			Typical heating degree days/weather zone
10	HDDZN	Num	3	36			Heating degree days/weather zone
5	KWH	Num	5	18			kWh
4	PART	Num	3	15			Participant
6	RD	Num	4	23	DATE7.		Read
2	WTHRID	Char	2	8			Weather ID

CONTENTS PROCEDURE

```
Data Set Name: A.GBILL65                                Observations:         3124
Member Type:   DATA                                     Variables:            15
Engine:        V612                                     Indexes:              0
Created:       12:37 Wednesday, February 23, 2000       Observation Length:   54
Last Modified: 12:37 Wednesday, February 23, 2000       Deleted Observations: 0
Protection:                                             Compressed:           NO
Data Set Type:                                          Sorted:               NO
Label:
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-----Engine/Host Dependent Information-----

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Number of Data Set Pages: 21
File Format:              607
First Data Page:          1
Max Obs per Page:         151
Obs in First Data Page:   110
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-----Alphabetic List of Variables and Attributes-----

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#	Variable	Type	Len	Pos	Format	Informat	Label
9	CDD	Num	3	33			Cooling degree days
13	CDDTMY	Num	3	45			Typical cooling degree days
15	CDDTMYZN	Num	3	51			Typical cooling degree days/weather zone
11	CDDZN	Num	3	39			Cooling degree days/weather zone
3	CECWZN	Num	5	10			CEC weather zone
1	CNTL	Num	8	0	8.	10.	Control number
7	DAY	Num	3	27			Day
8	HDD	Num	3	30			Heating degree days
12	HDDTMY	Num	3	42			Typical heating degree days
14	HDDTMYZN	Num	3	48			Typical heating degree days/weather zone

#	Variable	Type	Len	Pos	Format	Label
10	HDDZN	Num	3	36		Heating degree days/weather zone
4	PART	Num	3	15		Participant
6	RD	Num	4	23	DATE7.	Read
5	THM	Num	5	18		Therm
2	WTHRID	Char	2	8		Weather ID

CONTENTS PROCEDURE

```
Data Set Name: B.ELEYPGE1                                Observations:         312
Member Type:   DATA                                      Variables:            18
Engine:        V612                                      Indexes:              0
Created:       12:56 Wednesday, February 23, 2000        Observation Length:   58
Last Modified: 12:56 Wednesday, February 23, 2000        Deleted Observations: 0
Protection:                                              Compressed:           NO
Data Set Type:                                           Sorted:               NO
Label:
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-----Engine/Host Dependent Information-----

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Number of Data Set Pages: 3
File Format:              607
First Data Page:          1
Max Obs per Page:         140
Obs in First Data Page:   96
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-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Label
10	APPBUD	Num	3	29		Application budget
11	APPPRO	Num	3	32		Application proposed
13	AZIMUTH	Num	3	38	5.	Azimuth
12	CLIZONE	Num	3	35	4.	Climate zone
6	CLPRO	Num	3	17	9.2	Cooling proposed
3	CLSTD	Num	3	8	9.2	Cooling standard
1	CNTL	Num	5	0	12.	Control number
14	CONFID	Num	3	41	2.	Confidence ID
15	CSFCON	Num	4	44	6.	Conditioned square feet
16	CVOLUME	Num	4	48	9.	Volume
5	HTPRO	Num	3	14	9.2	Heating proposed
2	HTSTD	Num	3	5	9.2	Heating standard
9	SEER	Num	3	26	9.2	SEER
18	WFR	Num	3	55	7.3	Window to floor ratio
8	WHEF	Num	3	23	7.2	Water heating efficiency

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Label
7	WHPRO	Num	3	20	9.2	Water heating proposed
4	WHSTD	Num	3	11	9.2	Water heating standard
17	WINAREA	Num	3	52	10.3	Window area

CONTENTS PROCEDURE

```
Data Set Name: B.PDETAIL                                 Observations:         17081
Member Type:   DATA                                      Variables:            45
Engine:        V612                                      Indexes:              0
Created:       12:57 Wednesday, February 23, 2000        Observation Length:   456
Last Modified: 12:57 Wednesday, February 23, 2000        Deleted Observations: 0
Protection:                                              Compressed:           NO
Data Set Type:                                           Sorted:               NO
Label:
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-----Engine/Host Dependent Information-----

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File Format:              607
First Data Page:          1
Max Obs per Page:         30
Obs in First Data Page:   17
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#	Variable	Type	Len	Pos	Format	Informat	Label
44	ACCT_CAT	Char	11	439	$11.	$11.	ACCT_CAT
14	ACCT_ID	Num	8	110	2.	2.	ACCT_ID
42	ACTCODE	Num	8	423	6.	6.	ACTCODE
6	ACTV_CD	Num	8	40	6.	6.	ACTV_CD
22	AC_UNITS	Num	8	265	2.	2.	AC_UNITS
5	AMOUNT	Num	8	32	5.	5.	AMOUNT
26	CAPACITY	Num	8	297	7.	7.	CAPACITY
25	CAP_FAC	Num	8	289	10.	10.	CAP_FAC
2	CNTL	Num	8	8	10.	10.	CNTL
35	ELE_COST	Num	8	369	9.1	9.1	ELE_COST
17	ENDUSE	Char	51	134	$51.	$51.	ENDUSE
40	ENDUSECD	Num	8	409	4.	4.	ENDUSECD
19	ENUSEDS	Char	59	187	$59.	$59.	ENUSEDS
36	GAS_COST	Num	8	377	7.1	7.1	GAS_COST
37	INCENTIV	Num	8	385	5.	5.	INCENTIV

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
34	INC_COST	Num	8	361	9.1	9.1	INC_COST
8	KW	Num	8	56	10.5	10.5	KW
9	KWH	Num	8	64	11.4	11.4	KWH
39	LIFE	Num	8	401	4.	4.	LIFE
41	MEASCODE	Char	6	417	$6.	$6.	MEASCODE
45	MEASCODX	Char	6	450	$6.	$6.	MEASCODX
3	MEASID	Num	8	16	5.	5.	MEASID
16	MEASNUM	Num	8	126	4.	4.	MEASNUM
20	METHOD	Char	11	246	$11.	$11.	METHOD
28	M_KW	Num	8	313	10.5	10.5	KW
29	M_KWH	Num	8	321	7.1	7.1	KWH
31	M_SAV	Num	8	337	2.	2.	SAVINGS
30	M_THERMS	Num	8	329	7.1	7.1	THERMS
43	M_UNITS	Num	8	431	2.	2.	UNITS
38	NTG	Num	8	393	6.2	6.2	NTG
1	PAYID	Num	8	0	10.	10.	PAYID
15	PROGYR	Num	8	118	4.	4.	PROGYR
7	SACTV_CD	Num	8	48	6.	6.	SACTV_CD
11	SAVINGS	Num	8	80	11.4	11.4	SAVINGS
23	SEER_AVG	Num	8	273	6.	6.	SEER_AVG
24	SEER_INC	Num	8	281	5.	5.	SEER_INC
27	SOP_HRS	Num	8	305	5.	5.	SOP_HRS
21	STORIES	Num	8	257	2.	2.	STORIES
33	SUM_USE	Num	8	353	4.	4.	SUM_USE
10	THERMS	Num	8	72	11.4	11.4	THERMS
18	TYPE	Char	2	185	$2.	$2.	TYPE
12	UNITS	Num	8	88	2.	2.	UNITS
4	UPD_DT	Num	8	24	MMDDYY8.	MMDDYY8.	UPD_DT
13	UPD_NAME	Char	14	96	$14.	$14.	UPD_NAME
32	WIN_USE	Num	8	345	5.	5.	WIN_USE

CONTENTS PROCEDURE

```
Data Set Name: B.TRACK                                          Observations:         3418
Member Type:   DATA                                             Variables:            151
Engine:        V612                                             Indexes:              0
Created:       12:58 Wednesday, February 23, 2000               Observation Length:   1722
Last Modified: 12:59 Wednesday, February 23, 2000               Deleted Observations: 0
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Max Obs per Page:           9
Obs in First Data Page:     7
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-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
120	ACCT	Char	14	1501	$14.	$14.	ACCT_CODE
54	ACT_INC	Num	8	705	13.2	13.2	ACTIVE_INCENTIVE
53	ACT_MOD	Num	8	697	4.	4.	ACTIVE_MODELS
108	AC_UNITS	Num	8	1429	2.	2.	AC_UNITS
83	ADJ_AMT	Num	8	1122	6.	6.	ADJUSTMENT_AMOUNT
68	AD_ADD	Char	20	835	$20.	$20.	AD_MAILING_ADDRESS
30	AD_AREA	Num	8	417	5.	5.	AD_PHONE_AREA_CODE
26	AD_CAMP	Char	2	348	$2.	$2.	AD_CAMPAIGN
29	AD_CN_MI	Char	26	391	$26.	$26.	AD_CONTACT_MIDDLE_INIT
65	AD_CODE	Char	5	811	$5.	$5.	AD_CODE
67	AD_COMCD	Num	8	827	2.	2.	AD_COMMENT_CODE
69	AD_COMM	Char	168	855	$168.	$168.	AD_COMMENT
70	AD_EXPDT	Num	8	1023	MMDDYY8.	MMDDYY8.	AD_EXPIRATION_DATE
28	AD_FSTCN	Char	18	373	$18.	$18.	AD_CONTACT_FIRST
66	AD_GROUP	Char	11	816	$11.	$11.	AD_GROUP

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
27	AD_LSTCN	Char	23	350	$23.	$23.	AD_CONTACT_LAST
63	AD_NO	Char	6	783	$6.	$6.	AD_NUMBER_OF_PROSPECTS
31	AD_PHONE	Char	11	425	$11.	$11.	AD_PHONE_NUMBER
64	AD_PRICE	Char	22	789	$22.	$22.	AD_PRICE_RANGE
84	AGENCY	Char	18	1130	$18.	$18.	PLAN_CHECK_AGENCY
131	AMOUNT	Num	8	1560	5.	5.	AMOUNT_PAID
123	AMT_REQ	Num	8	1532	5.	5.	AMOUNT_REQUESTED
104	APPLID	Num	8	1403	10.	10.	APPLICATION_ID
74	APPLNO	Char	14	1049	$14.	$14.	APPLICATION_NUMBER
90	APPNAME	Char	37	1188	$37.	$37.	APPLICANT_PRINTED_NAME
91	APPTITLE	Char	51	1225	$51.	$51.	APPLICANT_TITLE
100	APPTYPE	Char	2	1377	$2.	$2.	APPLICATION_TYPE
61	AREA_CD	Char	5	767	$5.	$5.	AREA_CODE
47	AVG_INC	Num	8	649	9.2	9.2	AVERAGE_INCENTIVE
114	BATH_NO	Num	8	1471	2.	2.	NUMBER_OF_FULL_BATHROOMS
132	CHK_NUM	Num	8	1568	7.	7.	CHECK_NUM
35	CITY	Char	27	530	$27.	$27.	CITY
121	CNTL	Num	8	1515	10.	10.	CNTL_CODE
20	CONT_MI	Char	4	299	$4.	$4.	CONTACT_MIDDLE
125	COOK	Char	2	1542	$2.	$2.	COOKTOP
141	COOKING	Num	8	1634			
137	COOLING	Num	8	1602			
111	CU_YR_DO	Num	8	1453	7.	7.	PAID_CURRENT_YEAR_DOLLARS
60	CU_YR_P	Num	8	759	7.	7.	PAID_CURRENT_YEAR_DOLLARS-PROJECT
76	C_AREA	Num	8	1071	6.	6.	CONDITIONED_FLOOR_AREA
112	C_LOTS	Num	8	1461	10.4	10.4	C_LOTS
78	C_UNITS	Num	8	1094	4.	4.	UNITS_COMMITTED
99	DATE_COM	Num	8	1369	MMDDYY8.	MMDDYY8.	DATE_COMMITTED
134	DCT_INSP	Char	2	1584	$2.	$2.	DUCT_INSPECTION
56	DIVID	Num	8	721	4.	4.	DIVISION_ID
96	DIVLANID	Char	6	1347	$6.	$6.	DIVISION_LAN_ID
93	DIVRC_DT	Num	8	1284	MMDDYY8.	MMDDYY8.	DIVISION_DATE_RECEIVED
97	DIV_DATE	Num	8	1353	MMDDYY8.	MMDDYY8.	DIVISION_DATE_SIGNED
94	DIV_NAME	Char	23	1292	$23.	$23.	DIVISION_PRINTED_NAME
95	DIV_TITL	Char	32	1315	$32.	$32.	DIVISION_TITLE

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
142	DRYER	Num	8	1642			
127	DRY_STUB	Char	2	1546	$2.	$2.	DRYER_STUB-PP
138	DUCTS	Num	8	1610			
51	DUCT_INP	Num	8	681	4.	4.	DUCT_INSPECTIONS-PROJECT
103	DUCT_INS	Num	8	1395	4.	4.	DUCT_INSPECTIONS
45	EFFDATE	Num	8	633	MMDDYY8.	MMDDYY8.	EFFECTIVE_DATE
139	ENFORCE	Num	8	1618			
24	ENT_DT	Num	8	327	MMDDYY8.	MMDDYY8.	ENTRY_DATE

128	EQ_INSP	Char	2	1548	$2.	$2.	EQUIPMENT_INSPECTION
102	EQ_INSPA	Num	8	1387	4.	4.	EQUIPMENT_INSPECTIONS_APP
50	EQ_INSPP	Num	8	673	4.	4.	EQUIPMENT_INSPECTIONS-PROJECT
46	EXPDATE	Num	8	641	MMDDYY8.	MMDDYY8.	EXPIRATION_DATE
21	FAXAREA	Num	8	303	5.	5.	FAX_AREA_CODE
22	FAXNO	Num	8	311	10.	10.	FAX_NUMBER
18	FIRSTCNT	Char	46	239	$46.	$46.	CONTACT_FIRST
143	FURNACE	Num	8	1650			
80	GS_BONUS	Char	2	1110	$2.	$2.	GAS_BONUS
75	G_AREA	Num	8	1063	6.	6.	GROSS_FLOOR_AREA
115	HBATH_NO	Num	8	1479	2.	2.	NUMBER_OF_HALF_BATHROOMS
81	HOMETYPE	Char	2	1112	$2.	$2.	HOME_TYPE
82	INC_AMT	Num	8	1114	5.	5.	INCENTIVE_AMOUNT
105	INC_CAT	Char	2	1411	$2.	$2.	INCENTIVE_CATEGORY
133	INV_NO	Num	8	1576	10.	10.	INVOICE_NUM
43	ISSUE_PM	Char	16	609	$16.	$16.	PERMIT_ISSUER
118	IS_PCH	Char	2	1491	$2.	$2.	IS_PCH_PLUS
71	IS_ROLL	Char	2	1031	$2.	$2.	IS_ROLLOVER
126	KITCHEN	Char	2	1544	$2.	$2.	KITCHEN_STUB
146	KW	Num	8	1674	10.5	10.5	KW
147	KWH	Num	8	1682	11.4	11.4	KWH
17	LASTCONT	Char	18	221	$18.	$18.	CONTACT_LAST
140	LIGHTING	Num	8	1626			
122	LOT_PD	Char	9	1523	$9.	$9.	LOT_PAID
77	MODNAME	Char	15	1079	$15.	$15.	MODEL_NAME
98	MPCRC_DT	Num	8	1361	MMDDYY8.	MMDDYY8.	MPC_DATE_RECEIVED
58	MST_APNO	Char	14	737	$14.	$14.	MASTER_APPLICATION_NUMBER

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
33	NAME	Char	41	444	$41.	$41.	NAME
41	NO_LOTS	Num	8	593	5.	5.	NUMBER_OF_LOTS
40	NO_MODEL	Num	8	585	4.	4.	NUMBER_OF_MODELS
113	N_GAS	Char	2	1469	$2.	$2.	N_GAS
149	N_KW	Num	8	1698			NET KW=NTG(PM)*KW(PPD)
150	N_KWH	Num	8	1706			NET KWH=NTG(PM)*KWH(PPD)
151	N_THERMS	Num	8	1714			NET THERMS=NTG(PM)*THERMS(PPD)
129	OWN_OCC	Char	2	1550	$2.	$2.	OWNER_OCCUPIED
130	PAID_DT	Num	8	1552	MMDDYY8.	MMDDYY8.	DATE_PAID
57	PAYEEID	Num	8	729	6.	6.	PAYEE_ID
119	PAYID	Num	8	1493	10.	10.	PAYMENT_ID
85	PCHK_DAT	Num	8	1148	MMDDYY8.	MMDDYY8.	PLAN_CHECK_DATE
101	PD_CURR	Num	8	1379	4.	4.	PAID_CURRENT_YEAR
49	PD_CURRP	Num	8	665	4.	4.	PAID_CURRENT_YEAR-PROJECT
48	PD_PR_YR	Num	8	657	5.	5.	PAID_PRIOR_YEARS
62	PHONE	Char	11	772	$11.	$11.	PHONE_NUMBER
79	PRJ_DATE	Num	8	1102	MMDDYY8.	MMDDYY8.	PROJECTED_COMPLETION_DATE
52	PROGYR	Num	8	689	4.	4.	PROGRAM_YEAR
55	PROJID	Num	8	713	10.	10.	PROJECT_ID
110	PR_YR_DO	Num	8	1445	7.	7.	PAID_PRIOR_YEARS_DOLLARS
59	PR_YR_P	Num	8	751	7.	7.	PAID_PRIOR_YEARS_DOLLARS-PROJECT
124	RANGE	Char	2	1540	$2.	$2.	RANGE
135	REQ_ID	Num	8	1586	10.	10.	REQUEST_ID
136	REQ_ID2	Num	8	1594	10.	10.	REQUEST_ID_FOR_INSP
72	ROLL_ID	Num	8	1033	6.	6.	ROLLOVERED_PROJECT_ID
86	SEER1_PR	Num	8	1156	7.	7.	SEER1_PROPOSED
87	SEER1_TL	Num	8	1164	7.	7.	SEER1_TITLE24
88	SEER2_PR	Num	8	1172	6.	6.	SEER2_PROPOSED
89	SEER2_TL	Num	8	1180	6.	6.	SEER2_TITLE24
106	SEER_AVA	Num	8	1413	6.1	6.1	SEER_AVERAGE-APP
107	SEER_INA	Num	8	1421	5.1	5.1	SEER_INCREASE-APP
92	SIGN_DT	Num	8	1276	MMDDYY8.	MMDDYY8.	APPLICANT_DATE_SIGNED
25	STAGE	Char	13	335	$13.	$13.	STAGE
73	STAGE_CD	Num	8	1041	2.	2.	STAGE_CODE
44	STAGE_DT	Num	8	625	MMDDYY8.	MMDDYY8.	STAGE_DATE

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
36	STATE	Char	4	557	$4.	$4.	STATE

15	STAT_CD	Char	2	213	$2.	$2.	STATUS_CODE
32	STG_CDP	Num	8	436	2.	2.	STAGE_CODE
34	STREET	Char	45	485	$45.	$45.	STREET
13	TAXID	Num	8	197	13.	13.	TAXID
14	TAX_STAT	Num	8	205	2.	2.	TAX_STATUS
148	THERMS	Num	8	1690	11.4	11.4	THERMS
16	TITLE	Char	6	215	$6.	$6.	TITLE_OF_COURTESY
42	TRACT	Num	8	601	7.	7.	TRACT
39	TYPEP	Num	8	577	2.	2.	TYPE-PROJECT
1	UPD_DT	Num	8	0	MMDDYY8.	MMDDYY8.	UPDATE_DATE
19	UPD_NAME	Char	14	285	$14.	$14.	UPDATE_USERNAME
109	USER_ID	Num	8	1437	4.	4.	AUTHORIZED_USER_ID
10	VENDAREA	Num	8	170	5.	5.	PHONE_AREA_CODE
6	VENDCITY	Char	19	131	$19.	$19.	CITY
4	VENDCONT	Char	32	53	$32.	$32.	CONTACT
12	VENDEXT	Num	8	189	6.	6.	PHONE_EXTENSION
23	VENDID	Num	8	319	6.	6.	VENDOR_ID
3	VENDNAME	Char	37	16	$37.	$37.	NAME
11	VENDPHON	Char	11	178	$11.	$11.	PHONE_NUMBER
7	VENDST	Char	4	150	$4.	$4.	STATE
5	VENDSTR	Char	46	85	$46.	$46.	STREET
8	VENDZIP	Num	8	154	7.	7.	ZIP
9	VENDZIP4	Num	8	162	6.	6.	ZIP4
2	VEND_NO	Num	8	8	10.	10.	VENDOR_NUMBER
144	WATHEAT	Num	8	1658			
145	WINDOWS	Num	8	1666			
116	WIND_50U	Char	2	1487	$2.	$2.	WINDOW_50_U_FACTOR
117	WIND_65U	Char	2	1489	$2.	$2.	WINDOW_65_U_FACTOR
37	ZIP	Num	8	561	7.	7.	ZIP
38	ZIP4	Num	8	569	6.	6.	ZIP4

CONTENTS PROCEDURE

Data Set Name:	C.BLDID	Observations:	174
Member Type:	DATA	Variables:	4
Engine:	V612	Indexes:	0
Created:	13:03 Wednesday, February 23, 2000	Observation Length:	22
Last Modified:	13:03 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size:	8192
Number of Data Set Pages:	1
File Format:	607
First Data Page:	1
Max Obs per Page:	369
Obs in First Data Page:	174

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Label
1	BLDID	Num	3	0	Builder ID
2	CNTL	Num	8	3	Control number
4	PART	Num	3	19	Participant
3	STAT	Num	8	11	Participant/NP Status

CONTENTS PROCEDURE

Data Set Name:	C.BLDSURV	Observations:	38
Member Type:	DATA	Variables:	226
Engine:	V612	Indexes:	0
Created:	17:54 Thursday, February 10, 2000	Observation Length:	2429
Last Modified:	17:54 Thursday, February 10, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	YES
Label:			

-----Engine/Host Dependent Information-----

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Data Set Page Size:       14848
Number of Data Set Pages: 9
File Format:              607
First Data Page:          3
Max Obs per Page:         6
Obs in First Data Page:   6
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-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat
199	BLDID	Num	3	2327		
3	BNAME	Char	40	11		
5	BPHONE	Num	6	91		
4	BPOSTION	Char	40	51		
221	BUETLER	Num	3	2411		
198	ENTRYDT	Num	8	2319	MMDDYY8.	MMDDYY8.
33	NPCNTL1	Num	5	619		
36	NPCNTL2	Num	5	677		
39	NPCNTL3	Num	5	735		
42	NPCNTL4	Num	5	793		
45	NPCNTL5	Num	5	851		
48	NPCNTL6	Num	5	909		
51	NPCNTL7	Num	5	967		
54	NPCNTL8	Num	5	1025		
57	NPCNTL9	Num	5	1083		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
34	NPNAME1	Char	50	624		
37	NPNAME2	Char	50	682		
40	NPNAME3	Char	50	740		
43	NPNAME4	Char	50	798		
46	NPNAME5	Char	50	856		
49	NPNAME6	Char	50	914		
52	NPNAME7	Char	50	972		
55	NPNAME8	Char	50	1030		
58	NPNAME9	Char	50	1088		
35	NPSTAT1	Num	3	674		
38	NPSTAT2	Num	3	732		
41	NPSTAT3	Num	3	790		
44	NPSTAT4	Num	3	848		
47	NPSTAT5	Num	3	906		
50	NPSTAT6	Num	3	964		
53	NPSTAT7	Num	3	1022		
56	NPSTAT8	Num	3	1080		
59	NPSTAT9	Num	3	1138		
219	NPW	Num	3	2405		
1	PARTTYPE	Char	5	0		
6	PCNTL1	Num	5	97		
9	PCNTL2	Num	5	155		
12	PCNTL3	Num	5	213		
15	PCNTL4	Num	5	271		
18	PCNTL5	Num	5	329		
21	PCNTL6	Num	5	387		
24	PCNTL7	Num	5	445		
27	PCNTL8	Num	5	503		
30	PCNTL9	Num	5	561		
200	PCNTL10	Num	5	2330		
201	PCNTL11	Num	5	2335		
202	PCNTL12	Num	5	2340		
203	PCNTL13	Num	5	2345		
204	PCNTL14	Num	5	2350		
205	PCNTL15	Num	5	2355		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
206	PCNTL16	Num	5	2360		
207	PCNTL17	Num	5	2365		

208	PCNTL18	Num	5	2370		
2	PDATE	Num	6	5	MMDDYY8.	MMDDYY8.
7	PNAME1	Char	50	102		
10	PNAME2	Char	50	160		
13	PNAME3	Char	50	218		
16	PNAME4	Char	50	276		
19	PNAME5	Char	50	334		
22	PNAME6	Char	50	392		
25	PNAME7	Char	50	450		
28	PNAME8	Char	50	508		
31	PNAME9	Char	50	566		
8	PSTAT1	Num	3	152		
11	PSTAT2	Num	3	210		
14	PSTAT3	Num	3	268		
17	PSTAT4	Num	3	326		
20	PSTAT5	Num	3	384		
23	PSTAT6	Num	3	442		
26	PSTAT7	Num	3	500		
29	PSTAT8	Num	3	558		
32	PSTAT9	Num	3	616		
209	PSTAT10	Num	3	2375		
210	PSTAT11	Num	3	2378		
211	PSTAT12	Num	3	2381		
212	PSTAT13	Num	3	2384		
213	PSTAT14	Num	3	2387		
214	PSTAT15	Num	3	2390		
215	PSTAT16	Num	3	2393		
216	PSTAT17	Num	3	2396		
217	PSTAT18	Num	3	2399		
218	PW	Num	3	2402		
60	Q1	Num	3	1141		
61	Q2	Num	4	1144		
66	Q5	Num	4	1160		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
90	Q10A	Num	3	1277		
91	Q10B	Num	3	1280		
92	Q10C	Num	3	1283		
93	Q11A	Num	3	1286		
94	Q11B	Num	3	1289		
95	Q11C	Num	3	1292		
96	Q11D	Num	3	1295		
97	Q11E	Num	3	1298		
98	Q11F	Num	3	1301		
99	Q12A	Num	3	1304		
100	Q12B	Num	3	1307		
101	Q12C	Num	3	1310		
102	Q12D	Num	3	1313		
103	Q12E	Num	3	1316		
104	Q12F	Num	3	1319		
105	Q13A	Num	3	1322		
106	Q13B	Num	3	1325		
107	Q13C	Num	3	1328		
108	Q13D	Num	3	1331		
109	Q13E	Num	3	1334		
110	Q13F	Num	3	1337		
111	Q14A1	Num	3	1340		
112	Q14A2	Num	3	1343		
113	Q14A3	Num	3	1346		
114	Q14B	Char	70	1349		
115	Q15A1	Num	3	1419		
116	Q15A2	Num	3	1422		
117	Q15A3	Num	3	1425		
118	Q15A4	Num	3	1428		
119	Q15A5	Num	3	1431		
120	Q15A6	Num	3	1434		
121	Q15A6OTH	Char	30	1437		
122	Q15B1	Num	3	1467		
123	Q15B2	Num	3	1470		
124	Q15B3	Num	3	1473		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
125	Q15C	Char	70	1476		
126	Q16A	Num	3	1546		
127	Q16B	Num	3	1549		
128	Q17A1	Num	3	1552		
129	Q17A2	Num	3	1555		
130	Q17A3	Num	3	1558		
131	Q17A4	Num	3	1561		
132	Q17A5	Num	3	1564		
133	Q17A6	Num	3	1567		
134	Q18A1	Num	3	1570		
135	Q18A2	Num	3	1573		
136	Q18A3	Num	3	1576		
137	Q18A4	Num	3	1579		
138	Q18A5	Num	3	1582		
139	Q18A6	Num	3	1585		
140	Q18A7	Num	3	1588		
141	Q18A7OTH	Char	40	1591		
142	Q18B1	Num	3	1631		
143	Q18B2	Num	3	1634		
144	Q18B3	Num	3	1637		
145	Q18B4	Num	3	1640		
146	Q18B5	Num	3	1643		
147	Q18B6	Num	3	1646		
148	Q18B7	Num	3	1649		
149	Q18B7OTH	Char	40	1652		
150	Q19A1	Num	3	1692		
151	Q19A2	Num	3	1695		
152	Q19A3	Num	3	1698		
153	Q19A4	Num	3	1701		
154	Q19A5	Num	3	1704		
155	Q19A6	Num	3	1707		
156	Q19A7	Num	3	1710		
157	Q19A8	Num	3	1713		
158	Q19A8OTH	Char	40	1716		
159	Q19B1	Num	3	1756		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
160	Q19B2	Num	3	1759		
161	Q19B3	Num	3	1762		
162	Q19B4	Num	3	1765		
163	Q19B5	Num	3	1768		
164	Q19B6	Num	3	1771		
165	Q19B7	Num	3	1774		
166	Q19B7OTH	Char	40	1777		
167	Q19C1	Num	3	1817		
168	Q19C2	Num	3	1820		
169	Q19C3	Num	3	1823		
170	Q19C4	Num	3	1826		
171	Q19C5	Num	3	1829		
172	Q19C6	Num	3	1832		
173	Q19C7	Num	3	1835		
174	Q19C7OTH	Char	40	1838		
175	Q19D1	Num	3	1878		
176	Q19D2	Num	3	1881		
177	Q19D3	Num	3	1884		
178	Q19D4	Num	3	1887		
179	Q19D5	Num	3	1890		
180	Q19D6	Num	3	1893		
181	Q19D7	Num	3	1896		
182	Q19D7OTH	Char	40	1899		
222	Q20A	Num	3	2414		
223	Q20B	Num	3	2417		
224	Q20C	Num	3	2420		
225	Q20D	Num	3	2423		
226	Q20E	Num	3	2426		
183	Q21A	Num	3	1939		
184	Q21B	Char	40	1942		

185	Q21C	Char	40	1982
186	Q21D	Char	40	2022
187	Q22A	Num	3	2062
188	Q22B	Num	3	2065
189	Q22C	Num	3	2068

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
190	Q22D	Num	3	2071		
191	Q23A	Char	40	2074		
192	Q23B	Char	40	2114		
193	Q23C	Num	6	2154		
194	Q24A	Num	3	2160		
195	Q24B	Num	3	2163		
196	Q24C	Num	3	2166		
197	Q24D	Char	150	2169		
62	Q3A	Num	3	1148		
63	Q3B	Num	3	1151		
64	Q4A	Num	3	1154		
65	Q4B	Num	3	1157		
67	Q6A	Num	3	1164		
68	Q6B	Num	3	1167		
69	Q6C	Num	3	1170		
70	Q6D	Num	3	1173		
71	Q6DOTH	Char	30	1176		
72	Q7A	Num	3	1206		
73	Q7B	Num	3	1209		
74	Q7C	Num	3	1212		
75	Q7D	Num	3	1215		
76	Q7E	Num	3	1218		
77	Q7F	Num	3	1221		
78	Q7G	Num	3	1224		
79	Q8A	Num	3	1227		
80	Q8B	Num	3	1230		
81	Q8C	Num	3	1233		
82	Q8D	Num	3	1236		
83	Q8E	Num	3	1239		
84	Q8EOTH	Char	20	1242		
85	Q9A	Num	3	1262		
86	Q9B	Num	3	1265		
87	Q9C	Num	3	1268		
88	Q9D	Num	3	1271		
89	Q9E	Num	3	1274		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
220	W	Num	3	2408		

-----Sort Information-----

```
Sortedby:      BLDID
Validated:     YES
Character Set: ANSI
```

CONTENTS PROCEDURE

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Data Set Name: C.CLNSURV                                 Observations:         312
Member Type:   DATA                                      Variables:            821
Engine:        V612                                      Indexes:              0
Created:       16:54 Thursday, February 17, 2000         Observation Length:   4230
Last Modified: 16:54 Thursday, February 17, 2000         Deleted Observations: 0
Protection:                                              Compressed:           NO
Data Set Type:                                           Sorted:               NO
Label:
```

-----Engine/Host Dependent Information-----

```
Data Set Page Size:       12800
Number of Data Set Pages: 112
File Format:              607
First Data Page:          9
Max Obs per Page:         3
Obs in First Data Page:   3
```

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat
491	ADLT18	Num	3	2672		
492	ADLT35	Num	3	2675		
493	ADLT60	Num	3	2678		
494	ADLT74	Num	3	2681		
632	ANN_KWH	Num	4	3473		
6	APPTDATE	Num	4	165	MMDDYY8.	MMDDYY8.
486	ATTCFAN	Num	3	2657		
5	AUDNAME	Char	20	145	$40.	
559	BEDROOM	Num	8	3173		
503	BUILDER	Char	30	2708		
416	CD	Num	3	2423		
418	CDCONSP	Num	3	2429		
417	CDFUEL	Num	3	2426		
420	CDGAS	Num	3	2435		
419	CDLOAD	Num	3	2432		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
657	CDLOADX	Num	4	3573		
574	CD_EX	Num	4	3241		
582	CD_GX	Num	4	3273		
658	CD_KWH	Num	4	3577		
698	CD_KWH1	Num	4	3734		
720	CD_KWH2	Num	4	3822		
742	CD_KWH3	Num	4	3910		
764	CD_KWH4	Num	4	3998		
786	CD_KWH5	Num	4	4086		
808	CD_KWH6	Num	4	4174		
660	CD_KWHI	Num	4	3585		
659	CD_THM	Num	4	3581		
707	CD_THM1	Num	4	3770		
729	CD_THM2	Num	4	3858		
751	CD_THM3	Num	4	3946		
773	CD_THM4	Num	4	4034		
795	CD_THM5	Num	4	4122		
817	CD_THM6	Num	4	4210		
661	CD_THMI	Num	4	3589		
144	CEDESC1	Num	3	845		
145	CEDESC2	Num	3	848		
146	CEDESC3	Num	3	851		
485	CEILFAN	Num	3	2654		
176	CEINOTR1	Char	15	941		
177	CEINOTR2	Char	15	956		
178	CEINOTR3	Char	15	971		
159	CEINSCN1	Num	3	890		
160	CEINSCN2	Num	3	893		
161	CEINSCN3	Num	3	896		
156	CEINSPC1	Num	3	881		
157	CEINSPC2	Num	3	884		
158	CEINSPC3	Num	3	887		
150	CEINSRV1	Num	3	863		
151	CEINSRV2	Num	3	866		
152	CEINSRV3	Num	3	869		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
153	CEINSTK1	Num	3	872		
154	CEINSTK2	Num	3	875		

155	CEINSTK3	Num	3	878
147	CEINSTY1	Num	3	854
148	CEINSTY2	Num	3	857
149	CEINSTY3	Num	3	860
138	CEREF1	Num	3	827
139	CEREF2	Num	3	830
140	CEREF3	Num	3	833
162	CESKY1	Num	3	899
163	CESKY2	Num	3	902
164	CESKY3	Num	3	905
168	CESKYRF1	Num	3	917
169	CESKYRF2	Num	3	920
170	CESKYRF3	Num	3	923
165	CESKYSF1	Num	3	908
166	CESKYSF2	Num	3	911
167	CESKYSF3	Num	3	914
141	CESQFT1	Num	3	836
142	CESQFT2	Num	3	839
143	CESQFT3	Num	3	842
171	CEWDSYS1	Num	3	926
172	CEWDSYS2	Num	3	929
173	CEWDSYS3	Num	3	932
514	CHAWARE	Num	3	2768
515	CHLEARN1	Num	3	2771
516	CHLEARN2	Num	3	2774
517	CHLEARN3	Num	3	2777
518	CHLEARN4	Num	3	2780
519	CHLEARN5	Num	3	2783
520	CHLEARN6	Num	3	2786
521	CHLEARND	Char	15	2789
523	CHWANT	Num	3	2807
391	CKMCMEAL	Num	3	2348
393	CKMCNUMB	Num	3	2354

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
392	CKMCSIZE	Num	3	2351	3.2	
383	CKOVFUEL	Num	3	2324		
384	CKOVMEAL	Num	3	2327		
386	CKOVNUMB	Num	3	2333		
385	CKOVSIZE	Num	3	2330	3.1	
387	CKRGFUEL	Num	3	2336		
388	CKRGMEAL	Num	3	2339		
389	CKRGNUMB	Num	3	2342		
390	CKRGSIZE	Num	3	2345	3.1	
557	CKSTATE	Char	5	3134	$5.	
264	CLAGE1	Num	3	1646		
265	CLAGE2	Num	3	1649		
288	CLCOP1	Num	5	1938		
289	CLCOP2	Num	5	1943		
286	CLEER1	Num	5	1928		
287	CLEER2	Num	5	1933		
280	CLIKW1	Num	5	1868		
281	CLIKW2	Num	5	1873		
274	CLIMANU1	Char	20	1778		
275	CLIMANU2	Char	20	1798		
276	CLIMODL1	Char	20	1818		
277	CLIMODL2	Char	20	1838		
290	CLNOTES	Char	100	1948		
278	CLOBTU1	Num	5	1858		
279	CLOBTU2	Num	5	1863		
268	CLOMANU1	Char	20	1658		
269	CLOMANU2	Char	20	1678		
270	CLOMODL1	Char	20	1698		
271	CLOMODL2	Char	20	1718		
272	CLOSERL1	Char	20	1738		
273	CLOSERL2	Char	20	1758		
266	CLPGTHM1	Num	3	1652		
267	CLPGTHM2	Num	3	1655		
262	CLQTY1	Num	3	1640		
263	CLQTY2	Num	3	1643		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
258	CLREF1	Num	3	1628		
259	CLREF2	Num	3	1631		
282	CLRLA1	Char	20	1878		
283	CLRLA2	Char	20	1898		
284	CLSEER1	Num	5	1918		
285	CLSEER2	Num	5	1923		
260	CLSYS1	Num	3	1634		
261	CLSYS2	Num	3	1637		
314	CLTMWED1	Num	3	2117		
316	CLTMWED2	Num	3	2123		
318	CLTMWEE1	Num	3	2129		
320	CLTMWEE2	Num	3	2135		
310	CLTMWEM1	Num	3	2105		
312	CLTMWEM2	Num	3	2111		
322	CLTMWEN1	Num	3	2141		
324	CLTMWEN2	Num	3	2147		
313	CLTMWKD1	Num	3	2114		
315	CLTMWKD2	Num	3	2120		
317	CLTMWKE1	Num	3	2126		
319	CLTMWKE2	Num	3	2132		
309	CLTMWKM1	Num	3	2102		
311	CLTMWKM2	Num	3	2108		
321	CLTMWKN1	Num	3	2138		
323	CLTMWKN2	Num	3	2144		
618	CMCMEAL	Num	4	3417		
522	CMFTHOME	Num	3	2804		
4	CNTL	Num	5	140	Z7.	
617	COVMEAL	Num	4	3413		
455	CPR	Num	3	2540		
456	CPRNUM	Num	3	2543		
457	CPRUSE	Num	3	2546		
616	CRGMEAL	Num	4	3409		
7	CUSNAME	Char	40	169	$30.	
414	CW	Num	3	2417		
415	CWHTWM	Num	3	2420		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
644	CWHTWMX	Num	4	3521		
652	CWHTWMZ	Num	4	3553		
573	CW_EX	Num	4	3237		
654	CW_KWH	Num	4	3561		
699	CW_KWH1	Num	4	3738		
721	CW_KWH2	Num	4	3826		
743	CW_KWH3	Num	4	3914		
765	CW_KWH4	Num	4	4002		
787	CW_KWH5	Num	4	4090		
809	CW_KWH6	Num	4	4178		
655	CW_KWHI	Num	4	3565		
653	CW_USE	Num	4	3557		
561	DAYTYPE	Char	4	3189		
300	DCTCNSP	Num	3	2075		
302	DCTCRLP	Num	3	2081		
307	DCTHDTAP	Num	3	2096		
298	DCTINSCN	Num	3	2069		
297	DCTINSRV	Num	3	2066	3.1	
303	DCTOPNP	Num	3	2084		
305	DCTRCSP	Num	3	2090		
299	DCTRTAIR	Num	3	2072		
306	DCTRUSP	Num	3	2093		
304	DCTSLBP	Num	3	2087		
308	DCTTAPD	Num	3	2099		
296	DCTTYP	Num	3	2063		
301	DCTVATP	Num	3	2078		
552	DPAHLOCN	Num	3	3017		
549	DPDELTAP	Num	3	3008		
548	DPFANLCN	Char	1	3007		
551	DPLEAK	Num	3	3014		

555	DPNOTES	Char	100	3026		
554	DPRETREG	Num	3	3023		
550	DPRING	Num	3	3011		
553	DPSUPREG	Num	3	3020		
396	DSHELEC	Num	3	2363		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
397	DSHENRG	Num	3	2366		
399	DSHLDWKD	Num	3	2372		
630	DSHLOAD	Num	4	3465		
398	DSHTTLLD	Num	3	2369		
20	DWL5DESC	Char	20	443		
14	DWLTYPE	Num	3	423		
571	DW_EX	Num	4	3229		
631	DW_KWH	Num	4	3469		
700	DW_KWH1	Num	4	3742		
722	DW_KWH2	Num	4	3830		
744	DW_KWH3	Num	4	3918		
766	DW_KWH4	Num	4	4006		
788	DW_KWH5	Num	4	4094		
810	DW_KWH6	Num	4	4182		
293	ECFLNUM	Num	3	2054		
539	EDUC	Num	3	2926		
3	EEFTR	Char	100	40		
528	EELNAVLB	Num	3	2876		
527	EELNDESC	Char	20	2856		
526	EELOAN	Num	3	2853		
529	EEMORE	Num	3	2879		
530	EEMRLRN1	Num	3	2882		
531	EEMRLRN2	Num	3	2885		
532	EEMRLRN3	Num	3	2888		
533	EEMRLRN4	Num	3	2891		
534	EEMRLRN5	Num	3	2894		
535	EEMRLRND	Char	20	2897		
667	EHEAT	Num	4	3613		
291	EINCNUM	Num	3	2048		
638	EINCUS	Num	4	3497		
292	EINCUSE	Num	3	2051		
682	ELECGAIN	Num	4	3673		
556	ENTRYDT	Num	8	3126	MMDDYY8.	MMDDYY8.
547	ESDESC	Char	40	2967		
542	ESLRN1	Num	3	2935		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
543	ESLRN2	Num	3	2938		
544	ESLRN3	Num	3	2941		
545	ESLRN4	Num	3	2944		
546	ESLRND	Char	20	2947		
294	ESMHNUM	Num	3	2057		
639	ESMHUS	Num	4	3501		
295	ESMHUSE	Num	3	2060		
541	ESTAR	Num	3	2932		
640	EXLTG	Num	4	3505		
625	F1	Num	4	3445		
633	F2	Num	4	3477		
634	F3	Num	4	3481		
452	FAX	Num	3	2531		
453	FAXNUM	Num	3	2534		
454	FAXUSE	Num	3	2537		
688	FLAGDW	Num	4	3694		
685	FLAGFZ	Num	3	3685		
686	FLAGLND	Num	3	3688		
687	FLAGOVG	Num	3	3691		
689	FLAGPLL	Num	4	3698		
199	FLCPTPC1	Num	4	1066		
200	FLCPTPC2	Num	4	1070		
201	FLCPTPC3	Num	4	1074		

202	FLCPTPC4	Num	4	1078
191	FLINSRV1	Num	4	1034
192	FLINSRV2	Num	4	1038
193	FLINSRV3	Num	4	1042
194	FLINSRV4	Num	4	1046
179	FLREF1	Num	4	986
180	FLREF2	Num	4	990
181	FLREF3	Num	4	994
182	FLREF4	Num	4	998
203	FLRSHT1	Num	4	1082
204	FLRSHT2	Num	4	1086
205	FLRSHT3	Num	4	1090

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
206	FLRSHT4	Num	4	1094		
219	FLRST51	Char	15	1146		
220	FLRST52	Char	15	1161		
221	FLRST53	Char	15	1176		
222	FLRST54	Char	15	1191		
207	FLRSTYP1	Num	4	1098		
208	FLRSTYP2	Num	4	1102		
209	FLRSTYP3	Num	4	1106		
210	FLRSTYP4	Num	4	1110		
211	FLRSVNT1	Num	4	1114		
212	FLRSVNT2	Num	4	1118		
213	FLRSVNT3	Num	4	1122		
214	FLRSVNT4	Num	4	1126		
215	FLRSWIN1	Num	4	1130		
216	FLRSWIN2	Num	4	1134		
217	FLRSWIN3	Num	4	1138		
218	FLRSWIN4	Num	4	1142		
183	FLSQFT1	Num	4	1002		
184	FLSQFT2	Num	4	1006		
185	FLSQFT3	Num	4	1010		
186	FLSQFT4	Num	4	1014		
195	FLTILPC1	Num	4	1050		
196	FLTILPC2	Num	4	1054		
197	FLTILPC3	Num	4	1058		
198	FLTILPC4	Num	4	1062		
187	FLTYP1	Num	4	1018		
188	FLTYP2	Num	4	1022		
189	FLTYP3	Num	4	1026		
190	FLTYP4	Num	4	1030		
585	FP_GX	Num	4	3285		
680	FP_THM	Num	4	3665		
710	FP_THM1	Num	4	3782		
732	FP_THM2	Num	4	3870		
754	FP_THM3	Num	4	3958		
776	FP_THM4	Num	4	4046		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
798	FP_THM5	Num	4	4134		
820	FP_THM6	Num	4	4222		
367	FZAGE1	Num	3	2276		
373	FZAGE2	Num	3	2294		
381	FZAGE3	Num	3	2318		
366	FZAMP1	Num	3	2273		
374	FZAMP2	Num	3	2297		
380	FZAMP3	Num	3	2315		
363	FZCNSP1	Num	3	2264		
370	FZCNSP2	Num	3	2285		
377	FZCNSP3	Num	3	2306		
601	FZKWH1	Num	4	3349		
602	FZKWH2	Num	4	3353		
603	FZKWH3	Num	4	3357		
604	FZKWHI1	Num	4	3361		
605	FZKWHI2	Num	4	3365		

#	Variable	Type	Len	Pos	Format	Informat
606	FZKWHI3	Num	4	3369		
607	FZKWHP1	Num	4	3373		
608	FZKWHP2	Num	4	3377		
609	FZKWHP3	Num	4	3381		
364	FZSIZE1	Num	3	2267		
371	FZSIZE2	Num	3	2288		
378	FZSIZE3	Num	3	2309		
362	FZTYP1	Num	3	2261		
369	FZTYP2	Num	3	2282		
376	FZTYP3	Num	3	2303		
368	FZUSE1	Num	3	2279		
375	FZUSE2	Num	3	2300		
382	FZUSE3	Num	3	2321		
365	FZWATT1	Num	3	2270		
372	FZWATT2	Num	3	2291		
379	FZWATT3	Num	3	2312		
566	FZ_EX	Num	4	3209		
610	FZ_KWH	Num	4	3385		
692	FZ_KWH1	Num	4	3710		

CONTENTS PROCEDURE

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#	Variable	Type	Len	Pos	Format	Informat
714	FZ_KWH2	Num	4	3798		
736	FZ_KWH3	Num	4	3886		
758	FZ_KWH4	Num	4	3974		
780	FZ_KWH5	Num	4	4062		
802	FZ_KWH6	Num	4	4150		
611	FZ_KWHI	Num	4	3389		
683	GASGAIN	Num	4	3677		
464	GFP	Num	3	2567		
465	GFPNUM	Num	3	2570		
466	GFPUSE	Num	3	2573		
458	H2O	Num	3	2549		
459	H2ONUM	Num	3	2552		
460	H2OUSE	Num	3	2555		
563	HOMEDAY	Num	4	3197		
499	HOMEOFFC	Num	3	2696		
626	HOURS	Num	4	3449		
15	HSAGE	Num	3	426		
231	HTAGE1	Num	3	1230		
232	HTAGE2	Num	3	1233		
255	HTAREA1	Char	20	1488		
256	HTAREA2	Char	20	1508		
251	HTAUX1	Num	5	1438		
252	HTAUX2	Num	5	1443		
227	HTFUEL1	Num	3	1218		
228	HTFUEL2	Num	3	1221		
245	HTIBTU1	Num	5	1378		
246	HTIBTU2	Num	5	1383		
247	HTIKW1	Num	5	1388		
248	HTIKW2	Num	5	1393		
235	HTLOCN1	Num	3	1242		
236	HTLOCN2	Num	3	1245		
237	HTMANU1	Char	20	1248		
238	HTMANU2	Char	20	1268		
239	HTMODL1	Char	20	1288		
240	HTMODL2	Char	20	1308		

CONTENTS PROCEDURE

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#	Variable	Type	Len	Pos	Format	Informat
257	HTNOTES	Char	100	1528		
243	HTOBTU1	Num	5	1368		
244	HTOBTU2	Num	5	1373		
233	HTPGTHM1	Num	3	1236		
234	HTPGTHM2	Num	3	1239		
229	HTQTY1	Num	3	1224		
230	HTQTY2	Num	3	1227		
223	HTREF1	Num	3	1206		
224	HTREF2	Num	3	1209		

249	HTRLA1	Char	20	1398
250	HTRLA2	Char	20	1418
241	HTSERL1	Char	20	1328
242	HTSERL2	Char	20	1348
225	HTSYS1	Num	3	1212
226	HTSYS2	Num	3	1215
330	HTTMWED1	Num	3	2165
332	HTTMWED2	Num	3	2171
334	HTTMWEE1	Num	3	2177
336	HTTMWEE2	Num	3	2183
326	HTTMWEM1	Num	3	2153
328	HTTMWEM2	Num	3	2159
338	HTTMWEN1	Num	3	2189
340	HTTMWEN2	Num	3	2195
329	HTTMWKD1	Num	3	2162
331	HTTMWKD2	Num	3	2168
333	HTTMWKE1	Num	3	2174
335	HTTMWKE2	Num	3	2180
325	HTTMWKM1	Num	3	2150
327	HTTMWKM2	Num	3	2156
337	HTTMWKN1	Num	3	2186
339	HTTMWKN2	Num	3	2192
253	HTTYP1	Char	20	1448
254	HTTYP2	Char	20	1468
596	I	Num	4	3329
400	IBLBNUM	Num	3	2375

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#	Variable	Type	Len	Pos	Format	Informat
401	ICFLHARD	Num	3	2378		
402	ICFLSCRW	Num	3	2381		
403	IFLRNUM	Num	3	2384		
564	INC	Num	4	3201		
540	INCOME	Num	3	2929		
684	INTGAIN	Num	4	3681		
711	INTGAIN1	Num	4	3786		
733	INTGAIN2	Num	4	3874		
755	INTGAIN3	Num	4	3962		
777	INTGAIN4	Num	4	4050		
799	INTGAIN5	Num	4	4138		
821	INTGAIN6	Num	4	4226		
678	KWHUSE	Num	4	3657		
597	KWH_DAY	Num	4	3333		
598	KWH_DAYI	Num	4	3337		
628	KWH_LOAD	Num	4	3457		
677	KWH_USE	Num	4	3653		
624	KW_TV	Num	4	3441		
641	LT_KWH	Num	4	3509		
697	LT_KWH1	Num	4	3730		
719	LT_KWH2	Num	4	3818		
741	LT_KWH3	Num	4	3906		
763	LT_KWH4	Num	4	3994		
785	LT_KWH5	Num	4	4082		
807	LT_KWH6	Num	4	4170		
470	MED	Num	3	2585		
676	MEDKWH	Num	4	3649		
471	MEDNUM	Num	3	2588		
472	MEDUSE	Num	3	2591		
612	MICROSAV	Num	4	3393		
679	MS_KWH	Num	4	3661		
703	MS_KWH1	Num	4	3754		
725	MS_KWH2	Num	4	3842		
747	MS_KWH3	Num	4	3930		
769	MS_KWH4	Num	4	4018		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
791	MS_KWH5	Num	4	4106		
813	MS_KWH6	Num	4	4194		

681	MS_KWHI	Num	4	3669
569	MW_EX	Num	4	3221
619	MW_KWH	Num	4	3421
696	MW_KWH1	Num	4	3726
718	MW_KWH2	Num	4	3814
740	MW_KWH3	Num	4	3902
762	MW_KWH4	Num	4	3990
784	MW_KWH5	Num	4	4078
806	MW_KWH6	Num	4	4166
586	NCS_FAC	Num	4	3289
13	NOTES	Char	100	323
513	NRGEFF	Num	3	2765
16	NUMLVL	Num	3	429
562	NUMRES	Num	4	3193
560	NUMROOM	Num	8	3181
498	OCCFL	Num	3	2693
497	OCCSM	Num	3	2690
496	OCCSP	Num	3	2687
488	OCCUP	Num	3	2663
495	OCCWN	Num	3	2684
567	OC_EX	Num	4	3213
579	OC_GX	Num	4	3261
622	OC_KWH	Num	4	3433
695	OC_KWH1	Num	4	3722
717	OC_KWH2	Num	4	3810
739	OC_KWH3	Num	4	3898
761	OC_KWH4	Num	4	3986
783	OC_KWH5	Num	4	4074
805	OC_KWH6	Num	4	4162
623	OC_THM	Num	4	3437
706	OC_THM1	Num	4	3766
728	OC_THM2	Num	4	3854
750	OC_THM3	Num	4	3942

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
772	OC_THM4	Num	4	4030		
794	OC_THM5	Num	4	4118		
816	OC_THM6	Num	4	4206		
636	OL	Num	4	3489		
637	OLWATT	Num	4	3493		
477	OTR1	Num	3	2618		
481	OTR2	Num	3	2642		
476	OTR1DESC	Char	15	2603		
478	OTR1NUM	Num	3	2621		
479	OTR1USE	Num	3	2624		
480	OTR2DESC	Char	15	2627		
482	OTR2NUM	Num	3	2645		
483	OTR2USE	Num	3	2648		
504	OWNRENT	Num	3	2738		
524	PAYMORE	Num	3	2810		
525	PAYMORED	Char	40	2813		
446	PC	Num	3	2513		
404	PCFLHARD	Num	3	2387		
405	PCFLSCRW	Num	3	2390		
672	PCKWH	Num	4	3633		
447	PCNUM	Num	3	2516		
448	PCUSE	Num	3	2519		
674	PCUSE2	Num	4	3641		
673	PCUSEX	Num	4	3637		
577	PC_EX	Num	4	3253		
558	PHONE	Char	34	3139	$34.	
11	PHONE1	Char	15	293		
12	PHONE2	Char	15	308		
421	PL	Num	3	2438		
423	PLFPSHR	Num	3	2444		
426	PLFPSZHP	Num	3	2453	3.1	
425	PLFPSZKW	Num	3	2450	3.1	
422	PLFPTIME	Num	3	2441		
424	PLFPWHR	Num	3	2447		
430	PLHTCPHP	Num	3	2465	3.1	

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
429	PLHTCPKW	Num	3	2462	3.1	
427	PLHTFL1	Num	3	2456		
428	PLHTFL2	Num	3	2459		
431	PLHTUSE	Num	3	2468		
575	PL_EX	Num	4	3245		
583	PL_GX	Num	4	3277		
663	PL_KWH	Num	4	3597		
701	PL_KWH1	Num	4	3746		
723	PL_KWH2	Num	4	3834		
745	PL_KWH3	Num	4	3922		
767	PL_KWH4	Num	4	4010		
789	PL_KWH5	Num	4	4098		
811	PL_KWH6	Num	4	4186		
664	PL_THM	Num	4	3601		
708	PL_THM1	Num	4	3774		
730	PL_THM2	Num	4	3862		
752	PL_THM3	Num	4	3950		
774	PL_THM4	Num	4	4038		
796	PL_THM5	Num	4	4126		
818	PL_THM6	Num	4	4214		
662	POOLLOAD	Num	4	3593		
484	PORTFAN	Num	3	2651		
506	PRCFCTR1	Num	3	2744		
507	PRCFCTR2	Num	3	2747		
508	PRCFCTR3	Num	3	2750		
509	PRCFCTR4	Num	3	2753		
510	PRCFCTR5	Num	3	2756		
511	PRCFCTR6	Num	3	2759		
512	PRCFCTR7	Num	3	2762		
505	PRCPRICE	Num	3	2741		
489	PRESCHL	Num	3	2666		
449	PRN	Num	3	2522		
450	PRNNUM	Num	3	2525		
451	PRNUSE	Num	3	2528		
536	REBCD	Num	3	2917		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
537	REBCW	Num	3	2920		
538	REBRF	Num	3	2923		
345	RFAGE1	Num	3	2210		
353	RFAGE2	Num	3	2234		
360	RFAGE3	Num	3	2255		
346	RFAMP1	Num	3	2213		
352	RFAMP2	Num	3	2231		
359	RFAMP3	Num	3	2252		
342	RFCNSP1	Num	3	2201		
349	RFCNSP2	Num	3	2222		
356	RFCNSP3	Num	3	2243		
174	RFCOLOR	Num	3	935		
587	RFKWH1	Num	4	3293		
588	RFKWH2	Num	4	3297		
589	RFKWH3	Num	4	3301		
590	RFKWHI1	Num	4	3305		
591	RFKWHI2	Num	4	3309		
592	RFKWHI3	Num	4	3313		
593	RFKWHP1	Num	4	3317		
594	RFKWHP2	Num	4	3321		
595	RFKWHP3	Num	4	3325		
343	RFSIZE1	Num	3	2204		
350	RFSIZE2	Num	3	2225		
357	RFSIZE3	Num	3	2246		
175	RFSLOPE	Num	3	938		
341	RFTYP1	Num	3	2198		
348	RFTYP2	Num	3	2219		
355	RFTYP3	Num	3	2240		
347	RFUSE1	Num	3	2216		
354	RFUSE2	Num	3	2237		

361	RFUSE3	Num	3	2258
344	RFWATT1	Num	3	2207
351	RFWATT2	Num	3	2228
358	RFWATT3	Num	3	2249
565	RF_EX	Num	4	3205

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
599	RF_KWH	Num	4	3341		
691	RF_KWH1	Num	4	3706		
713	RF_KWH2	Num	4	3794		
735	RF_KWH3	Num	4	3882		
757	RF_KWH4	Num	4	3970		
779	RF_KWH5	Num	4	4058		
801	RF_KWH6	Num	4	4146		
600	RF_KWHI	Num	4	3345		
642	SBACK	Num	4	3513		
490	SCHOOL	Num	3	2669		
568	SC_EX	Num	4	3217		
580	SC_GX	Num	4	3265		
620	SC_KWH	Num	4	3425		
694	SC_KWH1	Num	4	3718		
716	SC_KWH2	Num	4	3806		
738	SC_KWH3	Num	4	3894		
760	SC_KWH4	Num	4	3982		
782	SC_KWH5	Num	4	4070		
804	SC_KWH6	Num	4	4158		
621	SC_THM	Num	4	3429		
705	SC_THM1	Num	4	3762		
727	SC_THM2	Num	4	3850		
749	SC_THM3	Num	4	3938		
771	SC_THM4	Num	4	4026		
793	SC_THM5	Num	4	4114		
815	SC_THM6	Num	4	4202		
8	SERADDR	Char	40	209	$45.	
9	SERCITY	Char	40	249	$26.	
10	SERZIP	Num	4	289	16.	
17	SFCON	Num	4	432		
18	SFUNCON	Num	4	436		
635	SHR	Num	4	3485		
461	SKT	Num	3	2558		
462	SKTNUM	Num	3	2561		
463	SKTUSE	Num	3	2564		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
432	SP	Num	3	2471		
665	SPALOAD	Num	4	3605		
436	SPFPSHR	Num	3	2483		
439	SPFPSZHP	Num	3	2492	3.1	
438	SPFPSZKW	Num	3	2489	3.1	
435	SPFPTIME	Num	3	2480		
437	SPFPWHR	Num	3	2486		
442	SPHTELON	Num	3	2501		
440	SPHTFL1	Num	3	2495		
441	SPHTFL2	Num	3	2498		
443	SPHTGSON	Num	3	2504		
444	SPHTSUSE	Num	3	2507		
445	SPHTWUSE	Num	3	2510		
433	SPLOCN	Num	3	2474		
434	SPUSE	Num	3	2477		
576	SP_EX	Num	4	3249		
584	SP_GX	Num	4	3281		
666	SP_KWH	Num	4	3609		
702	SP_KWH1	Num	4	3750		
724	SP_KWH2	Num	4	3838		
746	SP_KWH3	Num	4	3926		
768	SP_KWH4	Num	4	4014		
790	SP_KWH5	Num	4	4102		

812	SP_KWH6	Num	4	4190
669	SP_KWHI	Num	4	3621
668	SP_THM	Num	4	3617
709	SP_THM1	Num	4	3778
731	SP_THM2	Num	4	3866
753	SP_THM3	Num	4	3954
775	SP_THM4	Num	4	4042
797	SP_THM5	Num	4	4130
819	SP_THM6	Num	4	4218
670	SP_THMI	Num	4	3625
502	SUBDVSN	Num	3	2705
656	THM_LOAD	Num	4	3569

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
395	TVHRS	Num	3	2360		
394	TVNUM	Num	3	2357		
570	TV_EX	Num	4	3225		
627	TV_KWH	Num	4	3453		
693	TV_KWH1	Num	4	3714		
715	TV_KWH2	Num	4	3802		
737	TV_KWH3	Num	4	3890		
759	TV_KWH4	Num	4	3978		
781	TV_KWH5	Num	4	4066		
803	TV_KWH6	Num	4	4154		
629	TYPLOAD	Num	4	3461		
615	TYPMCM	Num	4	3405		
614	TYPOVM	Num	4	3401		
613	TYPRGM	Num	4	3397		
646	USEFAC	Num	4	3529		
501	VACATION	Num	3	2702		
647	WATUSE	Num	4	3533		
671	WBKWH	Num	4	3629		
578	WB_EX	Num	4	3257		
645	WCLOTHES	Num	4	3525		
134	WDEXSH9	Num	3	815		
135	WDEXSH10	Num	3	818		
136	WDEXSH11	Num	3	821		
137	WDEXSH12	Num	3	824		
78	WDEXSHD1	Num	3	647		
79	WDEXSHD2	Num	3	650		
80	WDEXSHD3	Num	3	653		
81	WDEXSHD4	Num	3	656		
106	WDEXSHD5	Num	3	731		
107	WDEXSHD6	Num	3	734		
108	WDEXSHD7	Num	3	737		
109	WDEXSHD8	Num	3	740		
66	WDFRM1	Num	3	611		
67	WDFRM2	Num	3	614		
68	WDFRM3	Num	3	617		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
69	WDFRM4	Num	3	620		
94	WDFRM5	Num	3	695		
95	WDFRM6	Num	3	698		
96	WDFRM7	Num	3	701		
97	WDFRM8	Num	3	704		
122	WDFRM9	Num	3	779		
123	WDFRM10	Num	3	782		
124	WDFRM11	Num	3	785		
125	WDFRM12	Num	3	788		
70	WDGLZ1	Num	3	623		
71	WDGLZ2	Num	3	626		
72	WDGLZ3	Num	3	629		
73	WDGLZ4	Num	3	632		
98	WDGLZ5	Num	3	707		
99	WDGLZ6	Num	3	710		
100	WDGLZ7	Num	3	713		

101	WDGLZ8	Num	3	716
126	WDGLZ9	Num	3	791
127	WDGLZ10	Num	3	794
128	WDGLZ11	Num	3	797
129	WDGLZ12	Num	3	800
130	WDINSH9	Num	3	803
131	WDINSH10	Num	3	806
132	WDINSH11	Num	3	809
133	WDINSH12	Num	3	812
74	WDINSHD1	Num	3	635
75	WDINSHD2	Num	3	638
76	WDINSHD3	Num	3	641
77	WDINSHD4	Num	3	644
102	WDINSHD5	Num	3	719
103	WDINSHD6	Num	3	722
104	WDINSHD7	Num	3	725
105	WDINSHD8	Num	3	728
62	WDPAN1	Num	3	599
63	WDPAN2	Num	3	602

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
64	WDPAN3	Num	3	605		
65	WDPAN4	Num	3	608		
90	WDPAN5	Num	3	683		
91	WDPAN6	Num	3	686		
92	WDPAN7	Num	3	689		
93	WDPAN8	Num	3	692		
118	WDPAN9	Num	3	767		
119	WDPAN10	Num	3	770		
120	WDPAN11	Num	3	773		
121	WDPAN12	Num	3	776		
54	WDREF1	Num	3	575		
55	WDREF2	Num	3	578		
56	WDREF3	Num	3	581		
57	WDREF4	Num	3	584		
82	WDREF5	Num	3	659		
83	WDREF6	Num	3	662		
84	WDREF7	Num	3	665		
85	WDREF8	Num	3	668		
110	WDREF9	Num	3	743		
111	WDREF10	Num	3	746		
112	WDREF11	Num	3	749		
113	WDREF12	Num	3	752		
58	WDTYP1	Num	3	587		
59	WDTYP2	Num	3	590		
60	WDTYP3	Num	3	593		
61	WDTYP4	Num	3	596		
86	WDTYP5	Num	3	671		
87	WDTYP6	Num	3	674		
88	WDTYP7	Num	3	677		
89	WDTYP8	Num	3	680		
114	WDTYP9	Num	3	755		
115	WDTYP10	Num	3	758		
116	WDTYP11	Num	3	761		
117	WDTYP12	Num	3	764		
675	WELLKWH	Num	4	3645		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
411	WHBLKT	Num	3	2408		
408	WHCAP	Num	3	2399		
407	WHCONSP	Num	3	2396		
406	WHFUEL	Num	3	2393		
487	WHHSFAN	Num	3	2660		
409	WHINP	Num	3	2402		
1	WHMANU	Char	20	0		
2	WHMODL	Char	20	20		
413	WHPIPE	Num	3	2414		

410	WHTEMP	Num	3	2405
412	WHTIME	Num	3	2411
572	WH_EX	Num	4	3233
581	WH_GX	Num	4	3269
648	WH_KWH	Num	4	3537
690	WH_KWH1	Num	4	3702
712	WH_KWH2	Num	4	3790
734	WH_KWH3	Num	4	3878
756	WH_KWH4	Num	4	3966
778	WH_KWH5	Num	4	4054
800	WH_KWH6	Num	4	4142
650	WH_KWHI	Num	4	3545
649	WH_THM	Num	4	3541
704	WH_THM1	Num	4	3758
726	WH_THM2	Num	4	3846
748	WH_THM3	Num	4	3934
770	WH_THM4	Num	4	4022
792	WH_THM5	Num	4	4110
814	WH_THM6	Num	4	4198
651	WH_THMI	Num	4	3549
53	WLCNST9D	Char	20	555
25	WLCNSTR1	Num	3	471
26	WLCNSTR2	Num	3	474
27	WLCNSTR3	Num	3	477
28	WLCNSTR4	Num	3	480
49	WLCOLOR1	Num	3	543

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
50	WLCOLOR2	Num	3	546		
51	WLCOLOR3	Num	3	549		
52	WLCOLOR4	Num	3	552		
467	WLD	Num	3	2576		
468	WLDNUM	Num	3	2579		
469	WLDUSE	Num	3	2582		
41	WLINSR1	Num	3	519		
42	WLINSR2	Num	3	522		
43	WLINSR3	Num	3	525		
44	WLINSR4	Num	3	528		
473	WLP	Num	3	2594		
33	WLPCBGD1	Num	3	495		
34	WLPCBGD2	Num	3	498		
35	WLPCBGD3	Num	3	501		
36	WLPCBGD4	Num	3	504		
45	WLPCINS1	Num	3	531		
46	WLPCINS2	Num	3	534		
47	WLPCINS3	Num	3	537		
48	WLPCINS4	Num	3	540		
474	WLPNUM	Num	3	2597		
475	WLPUSE	Num	3	2600		
21	WLREF1	Char	2	463		
22	WLREF2	Char	2	465		
23	WLREF3	Char	2	467		
24	WLREF4	Char	2	469		
29	WLSDTYP1	Num	3	483		
30	WLSDTYP2	Num	3	486		
31	WLSDTYP3	Num	3	489		
32	WLSDTYP4	Num	3	492		
37	WLTHCK1	Num	3	507		
38	WLTHCK2	Num	3	510		
39	WLTHCK3	Num	3	513		
40	WLTHCK4	Num	3	516		
643	WSHOWER	Num	4	3517		
19	WTRSTDR	Num	3	440		

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat
500	YRRESID	Num	3	2699		

CONTENTS PROCEDURE

Data Set Name:	D.WEATHMAP	Observations:	87
Member Type:	DATA	Variables:	6
Engine:	V612	Indexes:	0
Created:	12:40 Wednesday, February 23, 2000	Observation Length:	72
Last Modified:	12:40 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size:	8192
Number of Data Set Pages:	1
File Format:	607
First Data Page:	1
Max Obs per Page:	113
Obs in First Data Page:	87

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Label
6	CLI_ZONE	Num	5	67	Climate zone
2	LO_ID	Char	2	20	Local office
3	LO_NAME	Char	20	22	Local office name
1	REGION	Char	20	0	Region
4	SITENAME	Char	20	42	Site name
5	SITE_ID	Num	5	62	Site ID

CONTENTS PROCEDURE

Data Set Name:	D.LSPGE	Observations:	12
Member Type:	DATA	Variables:	26
Engine:	V612	Indexes:	0
Created:	12:46 Wednesday, February 23, 2000	Observation Length:	205
Last Modified:	12:46 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size:	8192
Number of Data Set Pages:	1
File Format:	607
First Data Page:	1
Max Obs per Page:	39
Obs in First Data Page:	12

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
1	APPL	Char	5	0	$5.	$5.	Application
2	DAYTYPE	Char	8	5	$8.	$8.	Day type
3	KWH1	Num	8	13	9.7	9.7	KWH1
4	KWH2	Num	8	21	9.7	9.7	KWH2
5	KWH3	Num	8	29	9.7	9.7	KWH3
6	KWH4	Num	8	37	9.7	9.7	KWH4
7	KWH5	Num	8	45	9.7	9.7	KWH5
8	KWH6	Num	8	53	9.7	9.7	KWH6
9	KWH7	Num	8	61	9.7	9.7	KWH7
10	KWH8	Num	8	69	9.7	9.7	KWH8
11	KWH9	Num	8	77	9.7	9.7	KWH9
12	KWH10	Num	8	85	9.7	9.7	KWH10
13	KWH11	Num	8	93	9.7	9.7	KWH11
14	KWH12	Num	8	101	9.7	9.7	KWH12
15	KWH13	Num	8	109	9.7	9.7	KWH13

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
16	KWH14	Num	8	117	9.7	9.7	KWH14
17	KWH15	Num	8	125	9.7	9.7	KWH15
18	KWH16	Num	8	133	9.7	9.7	KWH16
19	KWH17	Num	8	141	9.7	9.7	KWH17
20	KWH18	Num	8	149	9.7	9.7	KWH18
21	KWH19	Num	8	157	9.7	9.7	KWH19
22	KWH20	Num	8	165	9.7	9.7	KWH20
23	KWH21	Num	8	173	9.7	9.7	KWH21
24	KWH22	Num	8	181	9.7	9.7	KWH22
25	KWH23	Num	8	189	9.7	9.7	KWH23
26	KWH24	Num	8	197	9.7	9.7	KWH24

CONTENTS PROCEDURE

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Data Set Name: E.ADJSAV                                   Observations:         159
Member Type:   DATA                                       Variables:            29
Engine:        V612                                       Indexes:              0
Created:       11:26 Wednesday, February 23, 2000         Observation Length:   229
Last Modified: 11:26 Wednesday, February 23, 2000         Deleted Observations: 0
Protection:                                               Compressed:           NO
Data Set Type:                                            Sorted:               NO
Label:
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-----Engine/Host Dependent Information-----

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Data Set Page Size:       8192
Number of Data Set Pages: 6
File Format:              607
First Data Page:          1
Max Obs per Page:         35
Obs in First Data Page:   18
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-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
3	ACACSAV	Num	8	13			Gross SEER savings
4	ACDCTSAV	Num	8	21			Gross cooling duct savings
19	ACD_KWH	Num	8	141			Gross clothes dryer kWh savings
16	ACD_THM	Num	8	117			Gross clothes dryer therm savings
7	ACOOLAB	Num	8	45			Gross cooling as built
6	ACOOLSAV	Num	8	37			Gross cooling savings
2	ACOOLSTD	Num	8	5			Gross cooling standard savings
5	ACOTHSAV	Num	8	29			Gross cooling shell savings
10	AHDCTSAV	Num	8	69			Gross heating duct savings
13	AHEATAB	Num	8	93			Gross heating as built savings
12	AHEATSAV	Num	8	85			Gross heating savings
8	AHEATSTD	Num	8	53			Gross heating standard savings
9	AHFURSAV	Num	8	61			Gross heating furnace savings
11	AHOTHSAV	Num	8	77			Gross heating shell savings
18	AOC_KWH	Num	8	133			Gross oven cooking kWh savings

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
15	AOC_THM	Num	8	109			Gross oven cooking therm savings
17	ASC_KWH	Num	8	125			Gross stove cooking kWh
14	ASC_THM	Num	8	101			Gross stove cooking therm
1	CNTL	Num	5	0	10.	10.	Control number
25	NETCDKWH	Num	8	189			Net clothes drying kWh
24	NETCDTHM	Num	8	181			Net clothes drying kWh
20	NETCOOL1	Num	8	149			Net cooling w/o spillover savings
22	NETCOOL2	Num	8	165			Net cooling w/ spillover savings
21	NETHEAT1	Num	8	157			Net heating w/o spillover savings
23	NETHEAT2	Num	8	173			Net heating w/ spillover savings
29	NETOCKWH	Num	8	221			Net oven cooking kWh savings
28	NETOCTHM	Num	8	213			Net oven cooking therm savings
27	NETSCKWH	Num	8	205			Net stove cooking kWh savings

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26   NETSCTHM   Num      8   197                      Net stove cooking therm savings


                              CONTENTS PROCEDURE

  Data Set Name: E.BLDSIM                                  Observations:         1248
  Member Type:   DATA                                      Variables:            28
  Engine:        V612                                      Indexes:              0
  Created:       17:04 Wednesday, January 5, 2000         Observation Length:   118
  Last Modified: 17:04 Wednesday, January 5, 2000         Deleted Observations: 0
  Protection:                                              Compressed:           NO
  Data Set Type:                                           Sorted:               YES
  Label:

                    -----Engine/Host Dependent Information-----

                         Data Set Page Size:       8192
                         Number of Data Set Pages: 19
                         File Format:              607
                         First Data Page:          1
                         Max Obs per Page:         69
                         Obs in First Data Page:   37

                -----Alphabetic List of Variables and Attributes-----

                     #    Variable    Type    Len    Pos    Format
                    ffffffffffffffffffffffffffffffffffffffffffffff
                    16    C1          Num       4     66    9.
                    17    C2          Num       4     70    9.
                    18    C3          Num       4     74    9.
                    19    C4          Num       4     78    9.
                    20    C5          Num       4     82    9.
                    21    C6          Num       4     86    9.
                    22    C7          Num       4     90    9.
                    23    C8          Num       4     94    9.
                    24    C9          Num       4     98    9.
                    25    C10         Num       4    102    9.
                    26    C11         Num       4    106    9.
                    27    C12         Num       4    110    9.
                    28    CA          Num       4    114    9.
                     1    CNTL        Num       5      0    9.
                     3    H1          Num       4     14    9.


                              CONTENTS PROCEDURE

                     #    Variable    Type    Len    Pos    Format
                    ffffffffffffffffffffffffffffffffffffffffffffff
                     4    H2          Num       4     18    9.
                     5    H3          Num       4     22    9.
                     6    H4          Num       4     26    9.
                     7    H5          Num       4     30    9.
                     8    H6          Num       4     34    9.
                     9    H7          Num       4     38    9.
                    10    H8          Num       4     42    9.
                    11    H9          Num       4     46    9.
                    12    H10         Num       4     50    9.
                    13    H11         Num       4     54    9.
                    14    H12         Num       4     58    9.
                    15    HA          Num       4     62    9.
                     2    TYPE        Char      9      5    $9.

                           -----Sort Information-----

                              Sortedby:      CNTL
                              Validated:     YES
                              Character Set: ANSI


                              CONTENTS PROCEDURE

  Data Set Name: E.DCLEFF                                    Observations:         312
  Member Type:   DATA                                        Variables:            3
  Engine:        V612                                        Indexes:              0
```

```
Created:       12:22 Wednesday, February 23, 2000         Observation Length:   11
Last Modified: 12:22 Wednesday, February 23, 2000         Deleted Observations: 0
Protection:                                               Compressed:           NO
Data Set Type:                                            Sorted:               NO
Label:

                    -----Engine/Host Dependent Information-----

                         Data Set Page Size:       8192
                         Number of Data Set Pages: 1
                         File Format:              607
                         First Data Page:          1
                         Max Obs per Page:         734
                         Obs in First Data Page:   312

                -----Alphabetic List of Variables and Attributes-----

#    Variable    Type    Len    Pos    Format    Informat    Label
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
1    CNTL        Num       5      0    10.       10.         Control number
2    DCLEFF      Num       3      5    6.2                   Duct cooling efficiency
3    PART        Num       3      8                          Participant


                                CONTENTS PROCEDURE

Data Set Name: E.DHTEFF                                   Observations:         312
Member Type:   DATA                                       Variables:            3
Engine:        V612                                       Indexes:              0
Created:       12:23 Wednesday, February 23, 2000         Observation Length:   11
Last Modified: 12:23 Wednesday, February 23, 2000         Deleted Observations: 0
Protection:                                               Compressed:           NO
Data Set Type:                                            Sorted:               NO
Label:

                    -----Engine/Host Dependent Information-----

                         Data Set Page Size:       8192
                         Number of Data Set Pages: 1
                         File Format:              607
                         First Data Page:          1
                         Max Obs per Page:         734
                         Obs in First Data Page:   312

                -----Alphabetic List of Variables and Attributes-----

#    Variable    Type    Len    Pos    Format    Informat    Label
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
1    CNTL        Num       5      0    10.       10.         Control number
2    DHTEFF      Num       3      5    6.2                   Duct heating efficiency
3    PART        Num       3      8                          Participant


                                CONTENTS PROCEDURE

 Data Set Name: E.DUCTEFF                                Observations:         149
 Member Type:   DATA                                     Variables:            3
 Engine:        V612                                     Indexes:              0
 Created:       10:39 Tuesday, December 21, 1999         Observation Length:   11
 Last Modified: 10:39 Tuesday, December 21, 1999         Deleted Observations: 0
 Protection:                                             Compressed:           NO
 Data Set Type:                                          Sorted:               NO
 Label:

                    -----Engine/Host Dependent Information-----

                         Data Set Page Size:       8192
                         Number of Data Set Pages: 1
                         File Format:              607
                         First Data Page:          1
                         Max Obs per Page:         734
                         Obs in First Data Page:   149

               -----Alphabetic List of Variables and Attributes-----
```

#	Variable	Type	Len	Pos	Format
1	CNTL	Num	5	0	10.
3	DCLEFF	Num	3	8	6.2
2	DHTEFF	Num	3	5	6.2

CONTENTS PROCEDURE

```
Data Set Name: E.ENGIMPCS                                   Observations:         312
Member Type:   DATA                                         Variables:            96
Engine:        V612                                         Indexes:              0
Created:       13:43 Wednesday, February 23, 2000           Observation Length:   401
Last Modified: 13:43 Wednesday, February 23, 2000           Deleted Observations: 0
Protection:                                                 Compressed:           NO
Data Set Type:                                              Sorted:               NO
Label:
```

-----Engine/Host Dependent Information-----

```
Data Set Page Size:        12288
Number of Data Set Pages: 12
File Format:               607
First Data Page:           2
Max Obs per Page:          30
Obs in First Data Page:    30
```

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
34	APPBUD	Num	4	149			Application budget
95	APPDIFF	Num	4	393			Application difference
35	APPPRO	Num	4	153			Application proposed
71	ARL	Num	4	297			Water heating proposed budget parameter
6	AUDNAME	Char	20	21	$40.		Auditor name
37	AZIMUTH	Num	4	161	5.		Azimuth
45	A_CA	Num	4	193	9.		Proposed cooling annual usage
44	A_HA	Num	4	189	9.		Proposed heating annual usage
92	BUDGET	Num	4	381			Total budget
57	CACSAV	Num	4	241			Cooling duct savings minus as built
56	CDCTSAV	Num	4	237			Cooling shell savings minus duct savings
4	CD_THM	Num	4	13			Clothes dryer therms
11	CEINSRV1	Num	4	57			Ceiling insulation %
36	CLIZONE	Num	4	157	4.		Climate zone
30	CLPRO	Num	4	133	9.2		Application cooling proposed

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
5	CLSEERX1	Num	4	17	7.2		AC SEER
27	CLSTD	Num	4	121	9.2		Application cooling standard
21	CMFTHOME	Num	4	97			Part of comfort home program
1	CNTL	Num	5	0	10.	10.	Control number
38	CONFID	Num	4	165	2.		Confidence ID
53	COOLAB	Num	4	225			Cooling as built
52	COOLDCT	Num	4	221			Cooling savings from ducts
58	COOLEFF	Num	4	245			Cooling standard minus SEER savings
54	COOLSAV	Num	4	229			Cooling standard minus as built
51	COOLSHL	Num	4	217			Cooling savings from shell
50	COOLSTD	Num	4	213			Cooling standard
55	COTHSAV	Num	4	233			Cooling standard minus shell savings
39	CSFCON	Num	4	169	6.		Application cond square feet
40	CVOLUME	Num	4	173	9.		Application volume
47	C_CA	Num	4	201	9.		Standard cooling annual
46	C_HA	Num	4	197	9.		Standard heating annual
89	C_PRO	Num	4	369			Calculated cooling proposed
87	C_STD	Num	4	361			Calculated cooling standard
85	DCE	Num	4	353			Standard duct cooling efficiency
77	DCE1	Num	4	321			Standard duct cooling efficiency paramet
79	DCE2	Num	4	329			Standard duct cooling efficiency paramet
81	DCE3	Num	4	337			Standard duct cooling efficiency paramet
83	DCE4	Num	4	345			Standard duct cooling efficiency paramet

#	Variable	Type	Len	Pos	Format	Informat	Label
24	DCLEFF	Num	4	109	6.2		Duct cooling efficieincy
13	DCTCNSP	Num	4	65			Percent duct in cond space
15	DCTCRLP	Num	4	73			Percent duct in crawl space
12	DCTINSRV	Num	4	61	3.1		Percent duct insulated
48	DCTOPCP	Num	4	205			Percent duct in open cond space
16	DCTOPNP	Num	4	77			Percent duct in open non-cond space
17	DCTSLBP	Num	4	81			Percent duct in slab
14	DCTVATP	Num	4	69			Percent duct in vented space
86	DHE	Num	4	357			Standard duct heating efficiency
78	DHE1	Num	4	325			Standard duct heating efficiency paramet
80	DHE2	Num	4	333			Standard duct heating efficiency paramet
82	DHE3	Num	4	341			Standard duct heating efficiency paramet

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
84	DHE4	Num	4	349			Standard duct heating efficiency paramet
25	DHTEFF	Num	4	113	6.2		Duct heating efficiency
93	DIFF	Num	4	385			Budget minus proposed
43	EF	Num	4	185			Water heating energy factor
59	FANAB	Num	4	249			Fan as built
60	FANSTD	Num	4	253			Fan standard
49	GBILL	Num	4	209			Has gas bills
67	HDCTSAV	Num	4	281			Heating shell savings minus duct savings
64	HEATAB	Num	4	269			Heating as built
63	HEATDCT	Num	4	265			Heating duct savings
69	HEATEFF	Num	4	289			Heating standard minus furnace savings
65	HEATSAV	Num	4	273			Heating savings
62	HEATSHL	Num	4	261			Heating shell savings
61	HEATSTD	Num	4	257			Heating standard
68	HFURSAV	Num	4	285			Heating duct savings minus as built
66	HOTHSAV	Num	4	277			Heating standard minus shell savings
29	HTPRO	Num	4	129	9.2		Application heating proposed
26	HTSTD	Num	4	117	9.2		Application heating standard
23	HTTYPX	Num	4	105	11.1		AFUE
90	H_PRO	Num	4	373			Calculated heating proposed
88	H_STD	Num	4	365			Calculated heating standard
72	LDEF	Num	4	301			Water heating proposed budget parameter
7	NUMLVL	Num	4	41			Number of levels in home
3	OC_THM	Num	4	9			Oven cooking therms
22	PART	Num	4	101			Participant in comfort home program
96	PCTADIFF	Num	4	397			% difference in application difference
94	PCTDIFF	Num	4	389			Percent difference
91	PROPOSED	Num	4	377			Total proposed
2	SC_THM	Num	4	5			Stove cooking therms
33	SEER	Num	4	145	9.2		SEER
8	SFCON	Num	4	45			Conditioned square footage
74	STIC	Num	4	309			Water heating proposed budget parameter
76	SUMUCON	Num	4	317			Sum of unconditioned duct return percent
73	TSA	Num	4	305			Water heating proposed budget parameter
10	WDPAN1	Num	4	53			Number of window panes

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
42	WFR	Num	4	181	7.3		Window to floor ratio
19	WHBLKT	Num	4	89			Water heater blanket
18	WHCAP	Num	4	85			Water heater capacity
32	WHEF	Num	4	141	7.2		Water heater efficiency
20	WHPIPE	Num	4	93			Water heater pipes insulated
31	WHPRO	Num	4	137	9.2		Water heater proposed
28	WHSTD	Num	4	125	9.2		Water heater standard
41	WINAREA	Num	4	177	10.3		Window area
9	WLINSR1	Num	4	49			Percent wall insulated
75	W_PRO	Num	4	313			Water heater proposed
70	W_STD	Num	4	293			Water heater standard

CONTENTS PROCEDURE

Data Set Name:	E.ENGIMPRS	Observations:	312
Member Type:	DATA	Variables:	96
Engine:	V612	Indexes:	0
Created:	13:42 Wednesday, February 23, 2000	Observation Length:	401
Last Modified:	13:42 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size:	12288
Number of Data Set Pages:	12
File Format:	607
First Data Page:	2
Max Obs per Page:	30
Obs in First Data Page:	30

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
34	APPBUD	Num	4	149			Application budget
95	APPDIFF	Num	4	393			Application difference
35	APPPRO	Num	4	153			Application proposed
71	ARL	Num	4	297			Water heating proposed budget parameter
6	AUDNAME	Char	20	21	$40.		Auditor name
37	AZIMUTH	Num	4	161	5.		Azimuth
45	A_CA	Num	4	193	9.		Proposed cooling annual usage
44	A_HA	Num	4	189	9.		Proposed heating annual usage
92	BUDGET	Num	4	381			Total budget
57	CACSAV	Num	4	241			Cooling duct savings minus as built
56	CDCTSAV	Num	4	237			Cooling shell savings minus duct savings
4	CD_THM	Num	4	13			Clothes dryer therms
11	CEINSRV1	Num	4	57			Ceiling insulation %
36	CLIZONE	Num	4	157	4.		Climate zone
30	CLPRO	Num	4	133	9.2		Application cooling proposed

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
5	CLSEERX1	Num	4	17	7.2		AC SEER
27	CLSTD	Num	4	121	9.2		Application cooling standard
21	CMFTHOME	Num	4	97			Part of comfort home program
1	CNTL	Num	5	0	10.	10.	Control number
38	CONFID	Num	4	165	2.		Confidence ID
53	COOLAB	Num	4	225			Cooling as built
52	COOLDCT	Num	4	221			Cooling savings from ducts
58	COOLEFF	Num	4	245			Cooling standard minus SEER savings
54	COOLSAV	Num	4	229			Cooling standard minus as built
51	COOLSHL	Num	4	217			Cooling savings from shell
50	COOLSTD	Num	4	213			Cooling standard
55	COTHSAV	Num	4	233			Cooling standard minus shell savings
39	CSFCON	Num	4	169	6.		Application cond square feet
40	CVOLUME	Num	4	173	9.		Application volume
47	C_CA	Num	4	201	9.		Standard cooling annual
46	C_HA	Num	4	197	9.		Standard heating annual
89	C_PRO	Num	4	369			Calculated cooling proposed
87	C_STD	Num	4	361			Calculated cooling standard
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79	DCE2	Num	4	329			Standard duct cooling efficiency paramet
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83	DCE4	Num	4	345			Standard duct cooling efficiency paramet
24	DCLEFF	Num	4	109	6.2		Duct cooling efficieincy
13	DCTCNSP	Num	4	65			Percent duct in cond space
15	DCTCRLP	Num	4	73			Percent duct in crawl space
12	DCTINSRV	Num	4	61	3.1		Percent duct insulated
48	DCTOPCP	Num	4	205			Percent duct in open cond space
16	DCTOPNP	Num	4	77			Percent duct in open non-cond space
17	DCTSLBP	Num	4	81			Percent duct in slab
14	DCTVATP	Num	4	69			Percent duct in vented space
86	DHE	Num	4	357			Standard duct heating efficiency
78	DHE1	Num	4	325			Standard duct heating efficiency paramet

#	Variable	Type	Len	Pos	Format	Informat	Label
80	DHE2	Num	4	333			Standard duct heating efficiency paramet
82	DHE3	Num	4	341			Standard duct heating efficiency paramet

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
84	DHE4	Num	4	349			Standard duct heating efficiency paramet
25	DHTEFF	Num	4	113	6.2		Duct heating efficiency
93	DIFF	Num	4	385			Budget minus proposed
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64	HEATAB	Num	4	269			Heating as built
63	HEATDCT	Num	4	265			Heating duct savings
69	HEATEFF	Num	4	289			Heating standard minus furnace savings
65	HEATSAV	Num	4	273			Heating savings
62	HEATSHL	Num	4	261			Heating shell savings
61	HEATSTD	Num	4	257			Heating standard
68	HFURSAV	Num	4	285			Heating duct savings minus as built
66	HOTHSAV	Num	4	277			Heating standard minus shell savings
29	HTPRO	Num	4	129	9.2		Application heating proposed
26	HTSTD	Num	4	117	9.2		Application heating standard
23	HTTYPX	Num	4	105	11.1		AFUE
90	H_PRO	Num	4	373			Calculated heating proposed
88	H_STD	Num	4	365			Calculated heating standard
72	LDEF	Num	4	301			Water heating proposed budget parameter
7	NUMLVL	Num	4	41			Number of levels in home
3	OC_THM	Num	4	9			Oven cooking therms
22	PART	Num	4	101			Participant in comfort home program
96	PCTADIFF	Num	4	397			% difference in application difference
94	PCTDIFF	Num	4	389			Percent difference
91	PROPOSED	Num	4	377			Total proposed
2	SC_THM	Num	4	5			Stove cooking therms
33	SEER	Num	4	145	9.2		SEER
8	SFCON	Num	4	45			Conditioned square footage
74	STIC	Num	4	309			Water heating proposed budget parameter
76	SUMUCON	Num	4	317			Sum of unconditioned duct return percent
73	TSA	Num	4	305			Water heating proposed budget parameter
10	WDPAN1	Num	4	53			Number of window panes

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
42	WFR	Num	4	181	7.3		Window to floor ratio
19	WHBLKT	Num	4	89			Water heater blanket
18	WHCAP	Num	4	85			Water heater capacity
32	WHEF	Num	4	141	7.2		Water heater efficiency
20	WHPIPE	Num	4	93			Water heater pipes insulated
31	WHPRO	Num	4	137	9.2		Water heater proposed
28	WHSTD	Num	4	125	9.2		Water heater standard
41	WINAREA	Num	4	177	10.3		Window area
9	WLINSR1	Num	4	49			Percent wall insulated
75	W_PRO	Num	4	313			Water heater proposed
70	W_STD	Num	4	293			Water heater standard

CONTENTS PROCEDURE

Data Set Name:	E.NETSAMP	Observations:	101
Member Type:	DATA	Variables:	1
Engine:	V612	Indexes:	0
Created:	12:24 Wednesday, February 23, 2000	Observation Length:	5
Last Modified:	12:24 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size: 8192
Number of Data Set Pages: 1
File Format: 607
First Data Page: 1
Max Obs per Page: 1595
Obs in First Data Page: 101

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
1	CNTL	Num	5	0	10.	10.	Control number

CONTENTS PROCEDURE

Data Set Name:	E.WEIGHTS	Observations:	159
Member Type:	DATA	Variables:	31
Engine:	V612	Indexes:	0
Created:	12:21 Wednesday, February 23, 2000	Observation Length:	202
Last Modified:	12:21 Wednesday, February 23, 2000	Deleted Observations:	0
Protection:		Compressed:	NO
Data Set Type:		Sorted:	NO
Label:			

-----Engine/Host Dependent Information-----

Data Set Page Size: 8192
Number of Data Set Pages: 5
File Format: 607
First Data Page: 1
Max Obs per Page: 40
Obs in First Data Page: 19

-----Alphabetic List of Variables and Attributes-----

#	Variable	Type	Len	Pos	Format	Informat	Label
1	CECWZN	Num	5	0			CEC climate zone
7	CNTL	Num	8	45	10.	10.	Control number
28	COOKING	Num	8	170			Cooking enduse
24	COOL	Num	8	138			Cooling enduse
29	DRYER	Num	8	178			Drying enduse
25	DUCT	Num	8	146			Duct improvement
13	EBILL	Num	8	86			Has elec bills
26	ENFORCE	Num	8	154			Enforcement measure
30	FURNACE	Num	8	186			Furnace measure
12	GBILL	Num	8	78			Has gas bills
8	KW	Num	8	53	10.5	10.5	Ex ante kW savings
2	KWH	Num	8	5	11.4	11.4	Ex ante kWh savings
27	LIGHTS	Num	8	162			Lighting enduse
11	LO	Char	2	76			Local office
9	MEAS	Char	7	61			Measure

CONTENTS PROCEDURE

#	Variable	Type	Len	Pos	Format	Informat	Label
14	NETSAMP	Num	8	94			Used in net analysis
10	NKW	Num	8	68			Ex ante net kW savings
3	NKWH	Num	8	13			Ex ante net kWh savings
4	NTHERMS	Num	8	21			Ex ante net therm savings
6	PAYID	Num	8	37	10.	10.	PAYID
19	WCONKWH	Num	4	118	4.1		Cooling weight
20	WCONTHM	Num	4	122	4.1		Heating weight
16	WCOOKKWH	Num	4	106			Cooking kWh weight
15	WCOOKTHM	Num	4	102	4.1		Cooking therm weight
18	WDRYKWH	Num	4	114			Drying kWh weight
17	WDRYTHM	Num	4	110	4.1		Drying therm weight
31	WINDOWS	Num	8	194			Window enduse
23	WLITKWH	Num	4	134	4.1		Lighting weight
21	WNCONKWH	Num	4	126	4.1		Net cooling weight
22	WNCONTHM	Num	4	130	4.1		Net heating weight
5	WNKW	Num	8	29			Net kW weight