Evaluation of Southern California Edison's Residential Audit Programs: Final Report

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1. EXECUTIVE SUMMARY

1.1 Background

During program year (PY) 2000, the Southern California Edison Company (SCE) sponsored a variety of residential energy audits. The Mail-In, On-Line, In-Home, and Telephone audits were designed and implemented by SCE while the CHEERS and Time-Of-Sale (TOS) audits were designed and implemented by third parties who were under contract to SCE. Each of these audits is briefly described below.

Mail-In Audit. Both the Mail-In and On-Line (see below) energy audits take survey information from the customer or auditor, combines it with weather and billing data, and produces an energy analysis report containing customer-specific results. The audit results typically include: 1) An end-use breakdown of electricity, water, waste, and natural gas usage, 2) monthly usage trend graph (when billing data are available), and 3) a set of recommendations, with corresponding estimated savings that are appropriate for each customer based on their survey responses. The results of the audit can be received by mail or accessed via the Internet.

On-Line Audit. The On-Line Audit is essentially the same as the Mail-In Audit except that the former allows the customer to complete the energy survey on-line and immediately access the results of the survey on-line. The customer sees the exact same results whether they complete the survey via the mail option or the Internet option.

In-Home Audit. The In-Home Audit provides customers with a personalized energy survey. A specially trained energy auditor inspects the home and provides immediate feedback with specific recommendations on how customers can save energy and manage costs based on their home and lifestyle.

Telephone Audit. The Telephone Energy Survey is offered to customers who originally signed up for the In-Home Audit, but who did not, for whatever reasons, wish to have an energy auditor come to their home.

TOS Audit. Inspectech®, a home inspection company, offers homebuyers and sellers a network of highly trained certified inspectors. Inspectech® uses the VISTA Advanced Inspection Management System™, which can provide the customer with a report at the conclusion of the inspection. Under contract to SCE, Inspectech® offered to its customers an extension of their regular home inspection to focus specifically on energy efficiency. This extension, paid for by SCE, constitutes the TOS Audit.

CHEERS. The California Home Energy Efficiency Rating System, CHEERS, is a non-profit, home energy rating service offered to the residential retrofit market. Owners of existing homes can obtain a CHEERS rating for a subsidized fee that evaluates the current energy efficiency of the home. CHEERS will then make recommendations on cost-effective ways for the buyer or the seller to improve the efficiency of the home and will link the homeowner to beneficial financing via an energy-efficient mortgage.

In PY 2000, participation in these six types of audits varied considerably. Table 1-1 presents participation in each audit type.

Table 1-1.
PY 2000 Participation,
by Audit Type

Audit Type	Frequency	Percent
Mail-In	32,542	66.13%
In-Home	7,920	16.09%
TOS	4,170	8.47%
Telephone	2,390	4.86%
On-Line	2,167	4.40%
CHEERS[1]	22	0.04%
Total	49,211	100%

1.2 Evaluation Objectives

There are several motives for this study. Concerns have been raised about the cost-effectiveness of the residential audit programs, concerns that have focused on the persistence of savings. Concerns have also been raised about whether the effective useful life of the energy and demand savings currently used in benefit-cost calculations for residential audits should be revised, whether reports of program impacts should be submitted quarterly or annually, and what should be contained in these reports. An update, based on the PY 2000 audit programs, of the energy savings and the extent to which customers are satisfied with their audits was also needed. Finally, questions have been raised about what types of customers choose to participate in SCE's audit programs, how they differ by type of audit, and whether it would be useful to explore further target marketing as a way to improve rates of participation and, therefore, cost-effectiveness.

Thus, the key objectives of this evaluation can be grouped into process, impact, and marketing objectives:

Process Objectives

- Describe participants in terms of their demographic characteristics, attitudes toward energy conservation, awareness of ENERGY STAR®, access to the Internet, and geographic location
- Estimate overall and audit-specific customer satisfaction

Impact Objectives

- Estimate overall and audit-specific adoption rates for recommended measures and practices

[1] Note that the low number of audits of existing homes during 2000 and the first half of 2001 is due to the fact that CHEERS focused primarily on the *new construction* during this period.

- Estimate per-household and per-program *gross* and *net* savings for recommended measures and practices adopted for each type of audit
- Investigate the reasonableness of the effective useful life (EUL) of two years that is currently used in calculating the benefit-cost ratio for SCE's residential energy audits
- Explore the timing of residential audit impact reports.

Marketing Objective

- Explore whether target marketing should be further pursued to improve participation rates.

1.3 Results

The results are summarized below.

1.3.1 Customer Descriptions

While a full battery of demographic questions was asked in the customer interviews, we present here only a few highlights.

- The distribution of participants does not differ in any important ways by CEC weather zones.
- All participants have very positive attitudes toward energy conservation.
- Across all audit types awareness of ENERGY STAR®is less than 50 percent.

1.3.2 Customer Satisfaction

The levels of customer satisfaction with the audits are high and remarkably similar across the six audit types. There are no statistically significant differences across the six audit types.

1.3.3 Impacts

The mean number of recommendations and adoptions, as well as the adoption ratio, is presented for each audit type in Table 1-2. The overall adoption ratio across all audit types is 0.54 with a 90 percent confidence interval of +/- 0.018. The overall mean number of recommendations and adoptions are 12.1 and 6.5, respectively.

Table 1-2.
Mean Recommendations, Adoptions, and Adoption Ratio, by Audit Type

Audit Type	Recom-mendations	Adoptions	Ratio
On-Line	5.9	2.9	.49
Mail-In	7.1	3.3	.46
In-Home	14.5	8.3	.57
Telephone	20.8	14.0	.67
TOS	11.8	3.7	.31
CHEERS	8.1	3.9	.48

The estimated mean gross and net kWh and kW impacts per household for the sample are presented in Table 1-3. The total estimated gross and net kWh and kW impacts for the population of participants in each program are presented in

Table 1-4. Note that the methods used in this study were selected because they were the most cost-effective approaches to obtaining reasonably reliable estimates of kWh and kW impacts.

Table 1-3.
Gross and Net Per-Dwelling KWh Impacts, by Audit Type

Audit Type	Gross First-Year kWh Savings Per Dwelling	Gross First-Year kW Reductions Per Dwelling	Net First-Year kWh Reductions Per Dwelling	Net First-Year kW Reductions Per Dwelling
On-Line	171.4	0.082	123.4	0.059
Mail-In	171.4	0.082	123.4	0.059
In-Home	611.7	0.132	440.4	0.095
Telephone	257.2	0.055	185.2	0.040
TOS	657.4	Not Available	473.3	Not Available
CHEERS[2]	1,098.3[3]	Not Available	790.8	Not Available

[2] The full report of the savings from the eight respondents to the telephone interview is contained in Appendix J.
[3] Note that one case was discarded since it produced savings that were implausibly large, representing a reduction of 56% (3,323 kWh/year) in base case consumption.

Table 1-4.
Per-Program KWh Impacts, by Audit Type

Audit Type	Total First-Year Gross kWh Savings	Total First-Year Gross kW Reductions	Total First-Year Net kWh Reductions	Total First-Year Net kW Reductions
On-Line	371,490.0	177.7	267,472.8	127.9
Mail-In	5,578,693.1	2,668.4	4,016,659.1	1,921.3
In-Home	4,844,918.6	1,046.3	3,488,341.4	753.3
Telephone	614,784.8	132.4	442,645.1	95.3
TOS	2,741,358.0	Not Available	1,973,777.8	Not Available
CHEERS	24,162.6	Not Available	17,397.1	Not Available
Total	14,175,407.1	4,024.9	10,206,293.1	2,897.9

1.4 Recommendations

1.4.1 Effective Useful Life

The EULs for the On-Line, Mail-In, In-Home, and Telephone Audits should at least be doubled. The EULs for the TOS and the CHEERs Audits, which only recommend measures, should be increased by at least a factor of 6 and 7, respectively.

1.4.2 Content and Timing of Evaluation Reports

One should not survey participating customers regarding the adoption of any recommended measures and practices until at least *one full year after* the conclusion of the program year. *During* the program year, quarterly surveys could be conducted but restricted to describing program expenditures, audits conducted, levels of participation, basic customer characteristics such as annual usage, geographic location, recommendations made, and the estimated resulting savings.

1.4.3 Marketing

Relatively little work has recently been done to target-market SCE's residential audits. If this were done, we would expect that these acceptance rates could increase and customer needs could be better met, resulting in even higher levels of satisfaction. We recommend that SCE determine whether there is a sufficient amount of existing data to support an investigation of current program designs and target marketing. If there is not, we recommend the collection of any necessary additional data to support this effort. Once assembled and analyzed, these data could then be provided to SCE's DSM program planners in a way that would maximize their use.

2. INTRODUCTION

2.1 Background

During program year (PY) 2000, the Southern California Edison Company (SCE) sponsored a variety of residential energy audits. The Mail-In, On-Line, In-Home, and Telephone audits were designed and implemented by SCE while the CHEERS and Time-Of-Sale (TOS) audits were designed and implemented by third parties who were under contract to SCE. Each of these audits is briefly described below.

2.1.1 Mail-In Audit

Both the Mail-In and On-Line (see below) energy audits use the RECAP software, which takes survey information from the customer or auditor, combines it with weather and billing data, and produces an energy analysis report containing customer-specific results. The RECAP audit results typically include:

- An end-use breakdown of electricity, water, waste, and natural gas usage,
- Monthly usage trend graph (when billing data are available), and
- A set of recommendations, with corresponding estimated savings that are appropriate for each customer based on their survey responses.

The end-use breakdown graphs or tables can be provided whether billing data are available or not. The results are most accurate if monthly or bi-monthly billing data are available. For natural gas, the customer can provide estimates of their typical winter and summer gas bill and this information would be used to help produce the end-use breakdown estimates. The RECAP software estimates usage by end-use if no billing data is available but the results will clearly not be as accurate as they would be with billing data. The Mail-In audit is targeted to those residential customers who consume at least 10,950 kWh/year. The results of the audit can be received by mail or accessed via the Internet.

2.1.2 On-Line Audit

The On-Line Audit is essentially the same as the Mail-In Audit except that the former allows the customer to complete the energy survey on-line and immediately access the results of the survey on-line. The customer sees the exact same results whether they complete the survey via the mail option or the Internet option. One important implication is that, because the On-Line audit is available over the Internet, one cannot target the audit to those customers who consume at least 10,950 kWh/year. Any SCE customer who finds the On-Line audit on the Internet can participate.

2.1.3 In-Home Audit

The In-Home Audit provides customers with a personalized energy survey. A specially trained energy auditor inspects the home and provides immediate feedback with specific recommendations on how customers can save energy and manage costs based on their home

and lifestyle. No software or engineering algorithms are used in estimating the savings for the various measures and practices recommended in the In-Home Audit. Rather, the recommendations are based on the judgment of the auditor.

The In-Home Audit was marketed to 50,000 specially targeted residential customers whose characteristics were identified in a study conducted by SCE's Market Research Department. Note that beginning in August 2000 the In-Home energy survey was changed to resemble the CHEERS energy survey in terms of data collected and software used to estimate savings. Because the version of the survey that was used prior to August 2000 was considered to be the most likely version implemented in the SCE service territory in PY 2002 or beyond, we only sampled from those customers who participated in the In-Home audit during the period January 1, 2000 through July 31, 2000.

2.1.4 Telephone Audit

The Telephone Energy Survey is offered to customers who originally signed up for the In-Home Audit, but who did not, for whatever reasons, wish to have an energy auditor come to their home. As in the In-Home Audit, no software or engineering algorithms are used in estimating the savings for the various measures and practices. Rather, the recommendations are based on the judgment of the person conducting the audit over the telephone.

2.1.5 TOS Audit

Inspectech®, the West Coast's largest home inspection company, offers home buyers and sellers a network of highly-trained certified inspectors. Inspectech® utilizes the VISTA Advanced Inspection Management System™, which can provide the customer with a report at the conclusion of the inspection. During PY 2000, savings were estimated using the DOE 2.2 energy simulation model[4]. This model produces estimates of usage with and without the energy efficiency measures as well as savings and bill reductions.

Under contract to SCE, Inspectech® offered to its customers an extension of their regular inspection to focus specifically on energy efficiency. This additional energy audit, paid for by SCE, required on average 15 minutes.

2.1.6 CHEERS Audit

The California Home Energy Efficiency Rating System, CHEERS, is a non-profit, home energy rating service offered to the residential retrofit market. Owners of existing homes can obtain a CHEERS rating for a subsidized fee that evaluates the current energy efficiency of the home. CHEERS will then make recommendations on cost-effective ways for the buyer or the seller to improve the efficiency of the home and will link the homeowner to beneficial financing via an energy-efficient mortgage. Estimates of energy savings are made using

[4] DOE-2.2 is a computer program that predicts the hourly energy use and energy cost of a building given hourly weather information and a description of the building and its HVAC equipment and utility rate structure.

CNE, a computer program which calculates the heating and cooling loads and energy in buildings and is a component of the CHEERS Ratetool 2.0 rating software[5].

2.2 Audit Comparisons

Savings due to audits depend on the number of participants and on the mix of measures and practices that are recommended. In PY 2000, participation in these six types of audits varied considerably. Table 2-1 presents participation in each audit type.

Table 2-1.
PY 2000 Participation,
by Audit Type

Audit Type	Frequency	Percent
Mail-In	32,542	66.13%
In-Home	7,920	16.09%
TOS	4,170	8.47%
Telephone	2,390	4.86%
On-Line	2,167	4.40%
CHEERS	22	0.04%
Total	49,211	100%

Each of these audits also varied in terms of the type of information that was collected during the audit. Appendix A presents the type of information collected by each audit type.

They also vary in terms of the types and number of measures that can be recommended. For example, the number of measures that can be recommended by the CHEERS audit are fewer than in the other audits and the types of measures tend to be more permanent (unlikely to be removed from the home) and longer lasting such as central air conditioners, water heaters, furnaces, and shell improvements such as insulation, and windows rather than such measures/practices as setting back the thermostat or replacing refrigerators and clothes washers that can be easily removed and have shorter effective useful lives. Another example is that for renters who receive the in-home audit there is no recommendation regarding energy efficient clothes washers and clothes dryers since it is assumed that a washer and dryer come with the rental unit. Figure 2-1 compares the possible recommendations made by each audit type in terms of end uses.

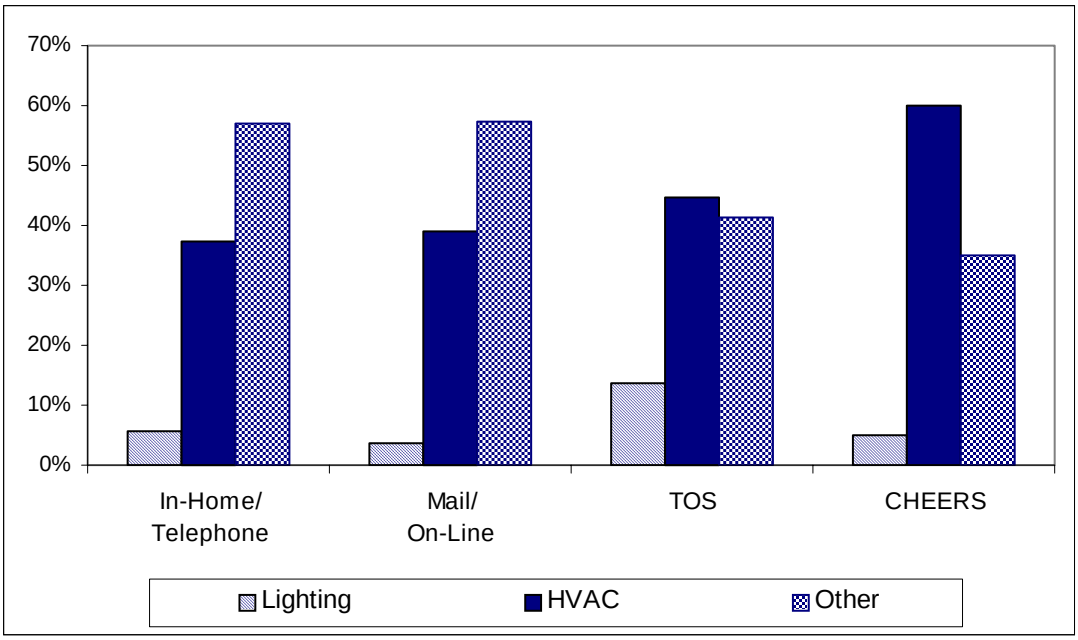
As one can see, the In-Home/Telephone and the Mail/Online have very similar patterns of end uses while the TOS audit has more lighting recommendations, more HVAC recommendations and a greater number of recommendations falling in the Other category

[5] CNE is a public domain computer program developed over the past 15 years by Berkeley Solar Group. CHEERS has used this simulation engine as part of its proprietary energy rating software since 1994.

that includes such measures as planting trees and low-flow toilets. Finally, the CHEERS audit contains the greatest number of HVAC recommendations.

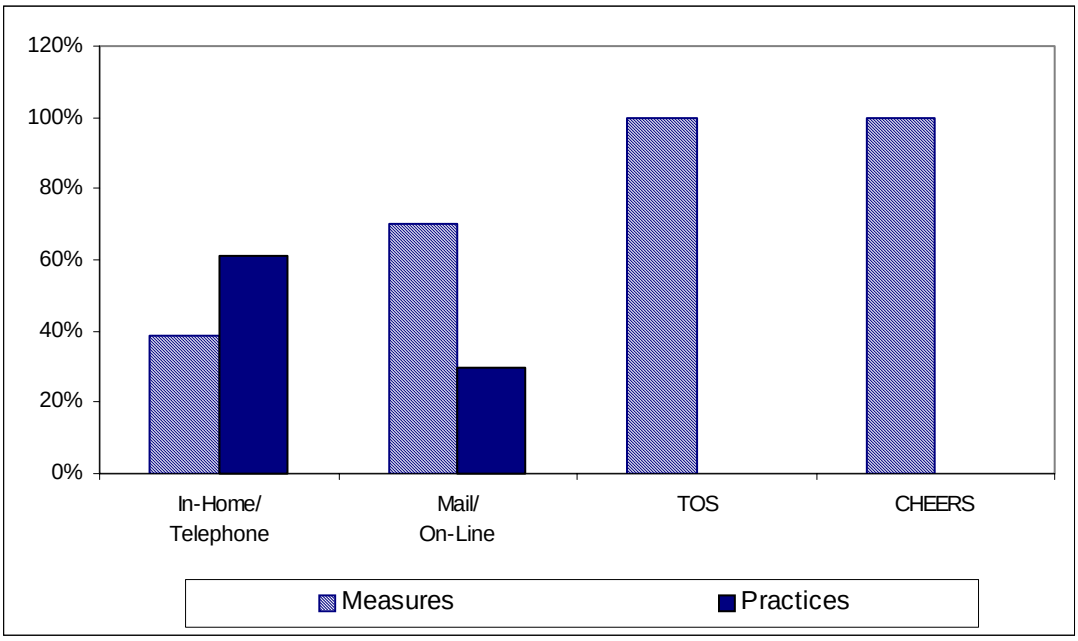
Figure 2-2 compares the audit types by measures versus practices. The TOS and CHEERS audits recommend only measures that will remain with the home when the current occupant moves. With respect to the other two types of audits, the In-Home/Telephone[6] audits recommend more practices than the Mail-In/On-Line while the reverse is true for the measures. Appendix B presents the possible recommendations for each audit type.

Figure 2-1.
Audit Types, by End Uses



[6] Note that, while not a part of the formal set of recommendations, recommendations to install an energy efficient refrigerator, clothes washer, dishwasher, or room air conditioner were made informally when appropriate. These four measures are included in Figure 2-2 for the In-Home and Telephone Audits.

Figure 2-2.
Audit Types, by Measures Versus Practices



2.3 Evaluation Objectives

This evaluation of these six PY 2000 audit programs has been undertaken because of questions that have been raised about the cost-effectiveness of these programs. The last persistence study of the Mail-In and Telephone Audits found two years of savings, based on a billing analysis. However, given the actions taken, it appeared that further analysis could demonstrate that savings persist well beyond the value of two years that is currently accepted by the California Public Utilities Commission (CPUC). Persistence is largely a function of the mix of measures that involve the installation of energy efficient equipment and practices that involve the adoption of energy efficient behaviors. In California, the latter are assumed to have an effective useful life (EUL) of only two years while the former are assumed to have a much longer EUL ranging from 5 to18 years. This raises the important question as to the mix of measures versus practices in SCE's audit programs and the possibility of modifying the current EUL of two years.

Further, a fall 2000 CPUC Administrative Law Judge ruling has required the utilities to report on both a quarterly and annual basis on the actions undertaken by 2001 audit participants. Previous studies of audit programs show that quarterly reporting would have to be lagged by *at least two* quarters after a set of audits. This is because one must allow a minimum implementation period of four to six months after an audit, before asking participants what actions they have undertaken as a result of their audit. This study addressed the question of whether it would be prudent to wait at least a full year in order to capture the full impact of the program.

Also needed was an update of the energy savings for the various audits. Note that the methods used in this study were selected because they were the most cost-effective approaches to obtaining reasonably reliable estimates of kWh and kW impacts.

In addition, questions have been raised regarding the extent to which customers are satisfied with the various audits that SCE offers its customers. The causes of any dissatisfaction could be addressed through program modifications.

Finally, it is of interest to know what types of customers choose to participate in SCE's audit programs, how they differ by type of audit, and whether it would be useful to explore further target marketing as a way to improve rates of participation and, therefore, cost-effectiveness.

Thus, the objectives of this evaluation can be grouped into process, impact, and marketing objectives:

Process Objectives

- Describe participants in terms of their demographic characteristics, attitudes toward energy conservation, awareness of ENERGY STAR®, access to the Internet, and geographic location
- Estimate overall and audit-specific customer satisfaction

Impact Objectives

- Estimate overall and audit-specific adoption rates for recommended measures and practices
- Estimate per-household and per-program *gross* and *net* savings for recommended measures and practices adopted for each type of audit
- Investigate the reasonableness of the effective useful life (EUL) of two years that is currently used in calculating the benefit-cost ratio for SCE's residential energy audits
- Explore the timing of residential audit impact reports.

Marketing Objective

- Explore whether target marketing should be further pursued to improve participation rates.

3. METHODS

This section covers the evaluation design, sample design, data collection, and analysis approach.

3.1 Evaluation Design

This evaluation entailed both a process and an impact evaluation that involved the use of a pre-experimental design (Campbell and Stanley, 1963) in which data are collected from subjects after participating in a program. This is a cost-effective design given that we are using the CPUC approved default net-to-gross ratio of 0.72 (CPUC, 2001). We collected data during February 2002 from random samples of participants who participated in the six types of audits offered by SCE during PY 2000. No data were collected from non-participants. These data were used to conduct both a process and impact evaluation.

3.1.1 Process Evaluation

The process evaluation focused on a variety of issues. Stratified random samples of participants in the six types of audits were interviewed by telephone and asked about their satisfaction with a number of program components such as length of the survey, and the timeliness, intelligibility, and credibility of the recommendations. They were also asked other questions concerning, for example, their attitudes toward energy conservation, whether they have access to the Internet, and whether they are aware of ENERGY STAR®. A variety of demographic data were also collected.

3.1.2 Impact Evaluation

The impact evaluation focused on customer self-reports regarding the adoption and implementation of audit recommendations. These self-reported adoptions were used in conjunction with earlier evaluations of SCE audit programs and other data to estimate kWh and kW impacts. We also examined the timing of impacts reports. Details of the analysis are provided in Section 3.3.

3.2 Sample Design

There are three issues of sample design discussed in this section: 1) size of the sample, 2) stratification, and 3) the preparation of the sample frame.

3.2.1 Sample Size

The primary objective of the sample size was to estimate population parameters, such as the proportion of participants in each audit type who adopt any of the recommended measures and practices, at a reasonably high level of precision. The equation below was used to estimate the sample size required for each audit type.

$$n_0 = \frac{t^2 p(1-p)}{d^2} \qquad (1)$$

where:

n_0 = required sample size without finite population correction
t = critical value t associated with the desired level of confidence
d = desired level of accuracy
p = proportion of recommendations adopted (50 percent)

The sample size for this study is based on the following four criteria:

1. 90 percent level of confidence (t=1.645)
2. the estimate must be within +/- 7.5 percentage points (d=.075)
3. the proportion of recommendations adopted is 50 percent (p=.50)
4. a proportional stratified random sample within each audit type

Using these assumptions in conjunction with Equation 1, we estimated that, for each audit type, a minimum sample size of 120 telephone interviews should be completed.

3.2.2 Stratification

For *each* audit type, a proportional, stratified random sample was drawn. Stratification has the effect of increasing the precision of the estimates over that produced by a simple random sample of the same size. The goal was to complete 120 interviews for each type of audit, except for CHEERS for which we took a census of all 22 participants in PY 2000 and the first half of PY 2001. Since we expect that adoption/implementation rates will vary by weather zone and annual kWh use, we stratified each audit type by the California Energy Commission (CEC) weather zones in the SCE service territory and by three annual kWh use categories. Note that, as was done in Study 528-A (SCE, 1997), we collapsed the nine CEC weather zones in SCE's service territory into five weather zones. This was done to insure that there were enough participants to sample within each weather zone. Table 3-1 presents how the nine weather zones were combined to form five weather zones.

Table 3-1.
Mapping of the Nine CEC Weather Zones
Into Five Weather Zones

Original Weather Zones	New Weather Zones
4, 5, 6 & 8	Coastal and LA Basin
9 & 10	Valley and Inland Empire
13 & 14	Joaquin and High Desert
15	Low Desert
16	Mountain

The boundaries for the three kWh strata were determined using the Dalenius-Hodges technique (Cochran, 1977). Low kWh consumption was defined as greater than 600 kWh and less than 6,900 kWh; medium kWh consumption was defined as greater than or equal to 6,900 kWh and less than 12,410 kWh; high kWh consumption was defined as greater than or

equal to 12,410 kWh. Thus, for the In-Home, Telephone, Mail-In, and On-line audits, there are 15 cells in the sample design. For the TOS and CHEERS Audits, there was no kWh stratification since participation in most of the cells was too sparse. For the TOS and CHEERS audits, this results in only four cells each, one for each weather zone, excluding the Mountain zone, which had no cases. Note that we used annual kWh use for PY 2000, which slightly underestimates the kWh use for the 12 months prior to participation. The magnitude of the underestimate depends on the month in 2000 in which the audit was performed, the type of audit received, and whether the customer installed any of the recommendations after the audit and during 2000. The use of PY 2000 kWh data was acceptable for the purpose of sample stratification. We also believe that the rank order of the six audit types in terms of their average annual kWh in PY 2000 is very similar to their rank order during the 12 months prior to their participation.

3.2.3 Sample Frame Preparation

The preparation of the samples from each audit type involved several steps. First, the recommendations made to each participating customer were obtained from the various program databases. During the interviews, respondents were asked only about these recommendations. Next, their telephone numbers were obtained from the various program databases. The program databases for the Mail-In, On-Line, and In-Home Audits contained the names, addresses, and, in many cases the telephone numbers, of the customer who requested the audit. They also contained the recommendations made as a result of the audit. In the process of extracting the billing data for the Mail-In, On-Line, and In-Home Audits, we determined which of these accounts were still active. Accounts in the audit program databases that are no longer active were dropped from the population since the person who requested the audit is no longer living at the address.

The TOS and CHEERS databases, while containing the name of the person requesting the audit, the address at which the inspection was conducted, as well as the recommendations resulting from the audit, did not contain the telephone numbers. Initially, we tried using the reverse directory to obtain telephone numbers for the audited sites. However, very few matches were obtained using this approach. We eventually used the telephone numbers, provided by SCE, of the customers currently residing at the addresses of the sites that were audited. This approach had the added advantage of avoiding the bias, mentioned by Conlon (2001), of the reverse directory approach. The bias stems from the fact that the reverse directory is not current to the extent that it has not been updated to capture recent moves, a problem that is no doubt more significant for the TOS and CHEERS audits.

Finally, we screened out customers who had inactive electricity accounts, had implausibly small or large monthly kWh consumption, or lived in master-metered complexes. Also, recall that in the case of the In-Home Audit, customers who received an audit after July 2000 were eliminated since they received a version of the audit that was not expected to be used in PY 2002. In summary, before the sample was drawn, customers with certain characteristics were eliminated:

- customers with less than 600 kWh/year,
- customers with greater than 70,000 kWh/year,

- customers living in master-metered complexes,
- accounts that are currently inactive, and
- customers with no record of consumption.

Table 3-2 presents the population of participants by audit type, kWh use, and CEC weather zone. These program populations represent the sample frame for each audit type. Note that after preparation of the data, the numbers in Table 3-2 do not necessarily agree with those in Table 2-1, which presents participation by audit type.

Table 3-2.
Sample Frame, by Audit Type and Weather Zone

	CEC Weather Zones					
kWh	**Coastal & LA Basin**	**Valley & Inland Empire**	**Joaquin & High Desert**	**Low Desert**	**Mountain**	**Total**
In-Home						
Low	546	531	153	60	14	1,304
Medium	402	595	258	152	13	1,420
High	200	343	111	123	5	782
Total	1,148	1,469	522	335	32	3,506
Telephone						
Low	232	270	127	35	12	676
Medium	186	428	170	90	11	885
High	70	129	61	38	4	302
Total	488	827	358	163	27	1,863
Mail-In						
Low	102	122	13	9	9	255
Medium	3,311	4,711	1,195	452	152	9,821
High	5,578	9,210	2,478	1,549	263	19,078
Total	8,991	14,043	3,686	2,010	424	29,154
On-Line						
Low	535	329	47	6	16	933
Medium	266	326	100	15	16	723
High	50	79	44	21	3	197
Total	851	734	191	42	35	1,853
TOS						
Low						0
Medium						0
High						0
Total	1,846	1,518	28	4	-	3,396
CHEERS						
Low						0
Medium						0
High						0
Total	8	9	4	1	0	22
Grand Total	13,332	18,600	4,789	2,555	518	39,794

The interview completion quotas, by weather zone and kWh use, are presented in Table 3-3.

Table 3-3.
Interview Quotas

	CEC Weather Zones					
kWh	**Coastal & LA Basin**	**Valley & Inland Empire**	**Joaquin & High Desert**	**Low Desert**	**Mountain**	**Total**
In-Home						
Low	19	18	5	2	0	45
Medium	14	20	9	5	0	49
High	7	12	4	4	0	27
Total	39	50	18	11	1	120
Telephone						
Low	15	17	8	2	1	44
Medium	12	28	11	6	1	57
High	5	8	4	2	0	19
Total	31	53	23	10	2	120
Mail-In						
Low	0	1	0	0	0	1
Medium	14	19	5	2	1	40
High	23	38	10	6	1	79
Total	37	58	15	8	2	120
On-Line						
Low	35	21	3	0	1	60
Medium	17	21	6	1	1	47
High	3	5	3	1	0	13
Total	55	48	12	3	2	120
TOS						
Low						0
Medium						0
High						0
Total	65	54	1	0	0	120
CHEERS						
Low						0
Medium						0
High						0
Total	4	4	2	0	0	10
Grand Total	232	267	71	33	7	610

3.3 Data Collection

This evaluation drew on both existing data as well as additional data collected through telephone interviews.

3.3.1 Existing Data

Existing data came from two primary sources: 1) program databases, and 2) weather and billing data maintained by Edison. Existing data, contained in the various program databases were used to describe the number of participants, dates of participation, measures and practices recommended, geographic location, etc.

Weather data were obtained that includes heating degrees days (base temperature of 65) and cooling-degree days (base temperature of 74) for each service account. In addition, each customer's average monthly kWh consumption in 2000 and rate class (tariff) were obtained from SCE's billing system.

3.3.2 Additional Data

New data were collected via telephone interviews from samples of participants in the six audit types. The data collected included:

- self-reported recall, awareness, and adoption of specific measures and practices recommended as a result of the audits,
- attitudes toward energy efficiency and energy conservation,
- awareness of ENERGY STAR®and utility- and state-sponsored DSM programs,
- past participation in the DSM programs,
- satisfaction with the audit program, and
- demographic characteristics.

The questionnaire is presented in Appendix C.

3.3.2.1 Telephone Interviews

We provided the interview team with an adequate pool of participants from each of the cells in the sample design described above. For customers whose telephone numbers were not in any of the various databases, the interview team used the customers' addresses in conjunction with reverse directory lookup to determine their telephone numbers.

Before beginning, the interview team conducted specific training for interviewers assigned to this project. The training described the objectives of the project, reviewed probing techniques, guided interviewers question-by-question through the questionnaire, and involved each interviewer in several mock interviews.

Twenty telephone interviews were first conducted to evaluate the questionnaire length and content and the incidence of eligible respondents prior to full project start. This pre-test resulted in a number of adjustments to the questionnaire.

Interviews were conducted seven days a week with up to five call attempts made on different days to reach eligible respondents. From Monday through Friday, one interview attempt was made between 9 a.m. and 5 p.m. The remaining attempts were made on Monday through Friday between 5 p.m. and 9 p.m. and on Saturday and Sunday between 10 a.m. and 5 p.m. Interviews were conducted in English only. Callback arrangements were made at the convenience of respondents. The interviews lasted an average of 16 minutes.

3.3.2.2 Achieved Sample

The interview effort resulted in 639 completions. The completions, or *achieved sample*, are presented in Table 3-4. In Table 3-5 we provide various rates, the pool efficiency rate, the gross completion rate, and the eligible completion rate. The pool efficiency rate is a measure

Table 3-4.
Achieved Sample

	CEC Weather Zones					
kWh	Coastal & LA Basin	Valley & Inland Empire	Joaquin & High Desert	Low Desert	Mountain	Total
In-Home						
Low	19	21	5	2	0	47
Medium	14	22	9	5	0	50
High	7	14	5	4	0	30
Total	40	57	19	11	0	127
Telephone						
Low	19	21	8	2	1	51
Medium	13	32	11	6	1	63
High	5	9	4	0	0	18
Total	37	62	23	8	2	132
Mail-In						
Low	0	1	0	0	0	1
Medium	15	19	5	2	1	42
High	25	39	11	7	1	83
Total	40	59	16	9	2	126
On-Line						
Low	39	22	3	0	1	65
Medium	17	23	6	1	1	48
High	3	5	3	2	0	13
Total	59	50	12	3	2	126
TOS						
Low						0
Medium						0
High						0
Total	65	54	1	0	0	120
CHEERS						
Low						0
Medium						0
High						0
Total	8	0	0	0	0	8
Grand Total	249	282	71	31	6	639

of how efficient the sample frame was in reaching working numbers. That is, of all the numbers called, what percent were working residential telephone numbers. The gross completion rate is the number of completions divided by the total number of call sheets. A more relevant number is the eligible completion rate, which is the number of completions

divided by the number of households reached that were eligible. Ineligible households were ones in which English was not spoken, the respondent was hearing impaired, there was no answer, telephones were disconnected, telephone number was blocked, etc. The eligible completion rate of 51.4 percent was reasonably high. The detailed disposition of the sample is presented in Appendix D.

Table 3-5.
Efficiency and Completion Rates

Completion Rates	Percent
Pool Efficiency Rate	85.4%
Gross Completion Rate	13.0%
Eligible Completion Rate	51.4%

3.4 Analysis

The analysis flows from the seven research objectives listed in Section 2.3. There were three categories of research objectives: Process, Impact, and Marketing. Each will be presented below.

3.4.1 Process Objectives

To address the process objectives, descriptive statistics were used to characterize participants by program in terms of such demographic characteristics as the number of people in the household, square footage of the home, household income, and tenure (owner versus renter). In addition, participant satisfaction for each program was estimated for a variety of program components.

We also mapped (using the ArcView software) program participants into zip codes and into the following CEC weather zones:

- Coastal and LA Basin,
- Valley and Inland Empire,
- Joaquin and High Desert,
- Low Desert, and
- Mountain.

Participants were also characterized in terms of their attitudes toward energy conservation. Each respondent was read the following six statements.

1. My life is too busy to worry about making energy related improvements to my home.
2. Scarce energy supplies will be a major problem in the future.
3. Instead of building new power plants, customers should use less electricity.
4. It is possible to save energy without sacrificing comfort by being energy efficient.
5. It is worth it to me for my household to use less energy in order to help preserve the environment.
6. Conservation efforts helped reduce the effects of the energy crisis during the summer of 2001.

On a 10-point scale (1=Strongly Disagree; 10=Strongly Agree)[7], each respondent was asked the extent to which they agreed with each of these statements. Each of these statements has face validity, meaning that each appears on its face to be measuring what it is intended to measure.

We also attempted to form an attitude scale by calculating the mean of these six items. Such a scale composed of multiple items can have greater reliability than any single item. Before using the six statements, an assessment of the reliability[8] of the scale was conducted using Cronbach's alpha (Hair et al., 1998), which measures the consistency of the entire scale. The generally agreed-upon lower limit for a useful scale is a Cronbach's alpha of 0.70. Analysis revealed that Item 1 should be dropped from the scale. Cronbach's alpha for the remaining five items forming the scale was 0.68. This scale was adopted since .68 was considered sufficiently close to 0.70.

3.4.2 Impact Objectives

To estimate the kWh and kW impacts for the six audit types, a number of different techniques were required since SCE and the CPUC agreed that a billing analysis would not be required. The techniques chosen were a function of available data and cost.

3.4.2.1 Adoption Ratios

PY 2000 Adoption ratios were calculated using self-report data collected in the telephone interviews. A particular measure or practice was considered adopted when the respondent said that they had adopted it. When they said that they were *in the process* of adopting it, a value of 0.50 was assigned to reflect a partial adoption. The adoption ratio was calculated by dividing the sum of the full and partial adoptions divided by the total number of recommendations.

3.4.2.2 Savings Estimates

Below, we present the estimates of kWh and kW impacts for all six audit types. Note that the methods used in this study were selected because they were the most cost-effective approaches to obtaining reasonably reliable estimates of kWh and kW impacts. The same method was used for the Mail-In, On-Line, In-Home, and Telephone audits while unique methods were devised for the TOS and CHEERS Audits.

3.4.2.2.1 Savings Estimates for the Mail-In, On-Line, In-Home, and Telephone Audits

Net savings for the current study were estimated, in part, using some of key parameter estimates from two prior studies. The parameter estimates included gross kWh, gross kW, and adoption rates from two prior studies:

1. "Evaluation of SCE's In-Home Energy Audit Program (Study 528-A)," Prepared for the Southern California Edison Company by RER, 1996, and

[7] The scoring of the first statement was reversed so that a high score would reflect a more favorable attitude toward energy conservation.

[8] Reliability is defined as the extent to which a variable or set of variables is consistent in what it is intended to measure. If multiple measurements are taken, reliable measures will all be very consistent in their values. It differs from validity in that it does not relate to *what* should be measured, but instead to *how* it is measured.

2. "Evaluation of SCE's Mail-In Audit Program (Study 528-B)," Prepared for the Southern California Edison Company by RER, 1997.

Study 528-A addressed the evaluation of SCE's 1995 In-Home Audit Program while Study 528-B addressed the evaluation of SCE's 1993 Energy Use Profiles Program, also known as the Mail-In Audit Program). Each of these studies estimated the per-household, gross normal-weather energy savings. Table 3-6 presents the essential information for these two studies.

Table 3-6.
Key Parameter Estimates
from Studies 528-A and 528-B

Parameter Estimate	Study 528-A (In-Home)	Study 528-A (Telephone)	Study 528-B (Mail-In)
Per-Household, normal-weather gross kWh	611.7	257.2	171.4
Per-Household, normal-weather gross kW	.132	.055	.082
Net-To-Gross Ratio	.72	.72	.72
Overall Adoption Rate	.56	.56	N/A

Using the data from Studies 528-A and 528-B, we attempted to calculate the overall adoption ratios for the Mail-In Audit, the In-Home Audit, and the Telephone Audit. Unfortunately, the original participant survey data from Study 528-B could not be retrieved. As a result, the ratio of the adoption rate for the PY 2000 Mail-In and On-Line Audits to the adoption rate for Study 528-B was assumed to be one. Also, note that the Net-To-Gross Ratio (NTGR) for 528-B is the same as for Study 528-A because the former did not estimate gross savings but only net savings. This meant that Study 528-B could not estimate a NTGR, which is the ratio of the net kWh to the gross kWh. Thus, to estimate gross savings for Study 528-B, we divided the net kWh and kW savings from Study 528-B by the NTGR from Study 528-A.

With respect to Study 528-A, note that the NTGRs and the Overall Adoption Rate are the same for the In-Home and the Telephone Audits because they were not presented separately in that report.

Also note that Study 528-A analyzed the In-Home and Telephone Audits together, producing estimates of gross *kWh* savings for each of the audit types (In-Home and Telephone) as well as for the combination of the two. However, separate gross *kW* estimates were not made, only an estimate for the combined audits. For the current study, a separate gross kW estimate for the In-Home Audit was made by first calculating the ratio of the In-Home gross kWh savings to the gross kWh savings for the combination of the two audits. This ratio was then multiplied by the kW estimate for the combination of the two programs to produce an estimate of the gross kW for the In-Home Audit. This same approach was used to produce an estimate of the gross kW for the Telephone Audit.

Using the In-Home Audit as an example, we used the following two algorithms to estimate net kWh and kW.

$$\text{Net kWh Savings} = \left(\frac{\text{Adoption Ratio}_{2000}}{\text{Adoption Ratio}_{528\text{-A}}}\right) \times \text{Per Household Gross kWh Savings}_{528\text{-A}} \times \text{NTGR} \qquad (2)$$

$$\text{Net kW Savings} = \left(\frac{\text{Adoption Ratio}_{2000}}{\text{Adoption Ratio}_{528\text{-A}}}\right) \times \text{Per Household Gross kW Reduction}_{528\text{-A}} \times \text{NTGR} \qquad (3)$$

Note that the value for the NTGR was 0.72 is currently the default NTGR for residential audits (CPUC, 2001). This number is based on the NTGR estimated in Study 528-A.

This approach will work reasonably well for the On-Line Audit, Mail-In Audit, In-Home Audit, and the Telephone Audit. The reason is that the In-Home and the Telephone Audits in PY 2000 are very similar in terms of the measures and practices covered to the PY 1995 In-Home Audit, which was evaluated in 1996 (Study ID 528-A). The PY 2000 Mail-In and the On-Line Audits are identical, and both are very similar to the PY 1996 Mail-In Audit, which was evaluated in 1997 (Study ID 528-B).

3.4.2.2.2 Savings Estimates for the TOS Audit

A separate analysis was conducted for the TOS Audit since it differs significantly from the other four in terms of recommended measures and practices. During PY 2000, savings were estimated using the DOE 2.2 energy simulation model. This model produces estimates of usage with and without the energy efficiency measures as well as savings and bill reductions. However, the only savings-related datum in the TOS Program database was the amount of the annual bill savings, which is the annual savings assuming that the customer adopted *all* of the recommended measures and practices. KWh savings was estimated by dividing the estimate of bill savings by the price per kWh that each customer faced in 2000. The resulting kWh savings were then adjusted by multiplying them by the estimated adoption rate that was based on self-reports obtained from customers in the telephone interviews from the current study. Equation 4 was used to calculate the price per kWh.

$$\text{Price Per kWh} = (A + B + C + D + E)/F \qquad (4)$$

where

A = Bill amount for kWh consumed at or under baseline during the summer

B = Bill amount for kWh consumed over baseline during the summer

C = Bill amount for kWh consumed at or under baseline during the winter

D = Bill amount for kWh consumed over baseline during the winter

E = Fixed charge per meter

F = Annual kWh

To develop the inputs for Equation 5 for each customer in the sample of 122 required several steps. We first had to determine how much of each customer's usage was consumed at the baseline rate compared to the above baseline rate recognizing that the number of kWh per day that are allocated to baseline depends on the season (summer versus winter) and the Baseline Region in which one lives. Table 3-7 presents the Baseline Regions for the sample of customers, while Table 3-8 presents the baseline kWh allocation, by Baseline Region and season.

Table 3-7.
Customers,
by Baseline Region

Baseline Region	Frequency	Percent
10	45	37
16	2	2
17	75	61
Total	122	100

Table 3-8.
kWh Allocation,
by Baseline Region and Season

Baseline Region	KWh/Day Summer	KWh/Day Winter
10	9.1	9.2
16	9.2	10.1
17	13.1	10.5

Note that SCE defines the summer season as beginning at 12:00 a.m. on the first Sunday in June and continuing until 12:00 a.m. of the first Sunday in October of each year. SCE defines the winter season as beginning at 12:00 a.m. on the first Sunday in October of each year and continuing until 12:00 of the first Sunday in June of the following year. In 2000, there were 127 summer days and 238 winter days. Also note that SCE has determined that residential customers typically consume 52 percent of the annual kWh during the summer and 48 percent of their kWh during the winter.

Another variable was the tariff in which each customer was enrolled. Table 3-9 presents the frequency of customers for each tariff.

Table 3-9.
TOS Customers,
by Tariff

Tariff	Frequency	Percent
D-CARE	6	4.9
DE	2	1.7
DE-APS	1	0.8
Domestic	112	91.8
TOU-D-2	1	0.8
Total	122	100

SCE's filed rates were used to determine the price for baseline and above energy use[9]. For the customers in the DE-APS, and TOU-D-2, the Domestic tariff was used. This was done since determining the $/kWh for these two tariffs requires knowing the tonnage of a customer's air conditioner, information that was not available. Using the higher Domestic tariff for these customers produces a slightly lower estimate of the energy savings. The Domestic Tariff effective during 2000 is presented below in Table 3-10.

Table 3-10.
Domestic Tariff

Cents/Meter per Day Basic Charge		Cents/kWh Baseline Service	Cents/kWh Non-Baseline Service
Single Family	Multi-Family		
3.30	2.50	12.009	14.157

The DE tariff is designed for SCE employees and retirees and provides for a 25 percent discount off their regular domestic service.

The following example of how these data were combined for a single hypothetical customer will be instructive. Consider a customer who

1. is on the domestic tariff
2. lives in a single-family dwelling
3. lives in Baseline Region #17, and
4. consumes 6,000 kWh annually.

[9] Advice 1245-E-B, Decision 97-08-056, Effective Jan 1, 1998.

Also assume that the TOS audit made eight recommendations to this customer and estimated that, if the customer adopted all eight of these recommendations, they would save $150.00 annually. Finally, assume that the customer, in the telephone interview, indicated that they adopted four of the eight recommendations made to them during the audit.

This customer consumes 3,120 kWh (52 percent) in the summer and 2,880 kWh (48 percent) in the winter. During the summer (127 days), this customer is allowed 13.1 baseline kWh per day. Thus, total kWh *baseline* consumption during the summer is 1,663.70 (127 x 13.1 kWh). The total kWh *above* baseline consumption during the summer is 1,456.30 (3,120- 1,663.70 kWh).

During the winter (238 days) this customer is allowed 10.5 baseline kWh per day. Thus, the total kWh *baseline* consumption during the winter is 2,499.0 (238 x 10.5 kWh). Total *above* kWh baseline consumption during the winter is 381 (2,880 - 2499).

Equation 5 is repeated below with the calculated numbers assigned to the variables A, B, C, D, E, and F.

$$\text{Price/KWh Savings} = (A + B + C + D + E)/F \qquad (5)$$

where

A = $199.79 (.12009 x 1,663.70 kWh)

B = $206.17 (.14157 x 1,456.30 kWh)

C = $300.10 (.12009 x 2,499 kWh)

D = $53.93 (.14157 x 381 kWh)

E = $12.04 (365 x $0.033/day)

F = 6,000 kWh

Thus, the price/kWh= $0.1287 [(($199.79 + $206.17 + $300.10 + $53.93 + $12.04)/6,000 kWh)]. Therefore, assuming the customer adopts all eight recommendations, the estimated gross kWh savings for this customer is 1,166 kWh/year ($150/$0.1287/kWh). However, we must apply the adoption ratio of 0.50 (4/8) to the 1,166 kWh/year to yield 583 kWh/year, or a reduction of 9.7 percent. This 583 kWh/year is further reduced by applying the NTGR of .72 to yield a net reduction of 420 kWh, or a reduction of 7.0 percent.

3.4.2.2.3 Savings Estimates for the CHEERS Audit

This analysis estimated the energy performance of seven residential buildings with the essential data located in the electric service area of Southern California Edison Company[10], each of which had a home energy rating performed by a CHEERS-certified Rater. It

[10] The billing data that were provided for this study included information for eight homes. However, one was eliminated because data were available only for the post period, *after* the improvements were made, as opposed to the other seven cases in which data were available for the period prior to the improvements.

compares the pre-existing condition for each with an improved condition following the installation of a known set of measures recommended by the energy rating. The predicted results are calibrated to actual kWh data for each of the subject cases. Predicted gas usage is reported without any adjustment.

A number of factors must be considered in interpreting the results of this analysis. The most important of these is the fact that a home energy rating evaluates the performance of selected energy systems compared to a baseline reference for its energy efficiency to obtain the rating score. Consequently the predicted energy use is based on standardized behaviors for operation. Also, the features evaluated in the rating are limited to heating, cooling, domestic hot water and hardwired lighting. Additional use is predicted a priori for certain other hardwired appliances, pools and spas. Additional 'plug-in' loads are not included in the predicted energy.

The analysis also made a number of systematic adjustments to the simulated energy results to moderate the magnitude of the predicted change in the older homes.

There are twelve months kWh use billing data for each of the seven cases as well as a listing of energy improvement measures that were previously verified as having been installed. Using the rating data obtained from CHEERS, each of the cases was simulated in the original configuration (BASECASE) and in the improved configuration (ENHANCED). The energy simulations are made using CNE, a computer program which calculates the heating and cooling loads and energy in buildings and is a component of the CHEERS Ratetool 2.0 rating software[11]. Using the data obtained for each CHEERS participant who completed the telephone interview, the savings estimates were calculated in six steps:

1. Simulate BASECASE energy use under initial (pre-audit conditions)
2. Prepare CNE input with installed improvements
3. Simulate ENHANCED post-improvement energy use
4. Disaggregate use data
5. Calibrate simulation results with disaggregated energy use data
6. Compile savings

The simulation results of the BASECASE configuration were calibrated with the billing data and the results of the ENHANCED configuration were examined for the relative change in energy performance to the BASECASE. The annual energy use from the billing data was adjusted to account for the impact of the energy improvements. A more complete description is contained in the full report in Appendix J.

We emphasize that there is a fair amount of uncertainty surrounding these savings estimates since the budget did not allow for a more complete analysis that involved not only the detailed data extracted from the rating simulation models contained herein but also a more

[11] CNE is a public domain computer program developed over the past 15 years by Berkeley Solar Group. CHEERS has used this simulation engine as part of its proprietary energy rating software since 1994.

complete set of data from post-improvement measured use and a detailed behavioral profile for each.

The next section addresses another key issue that directly affects the lifecycle savings for the audit programs, the effective useful life (i.e., how long the savings persist).

3.4.2.3 Estimates of Effective Useful Lives

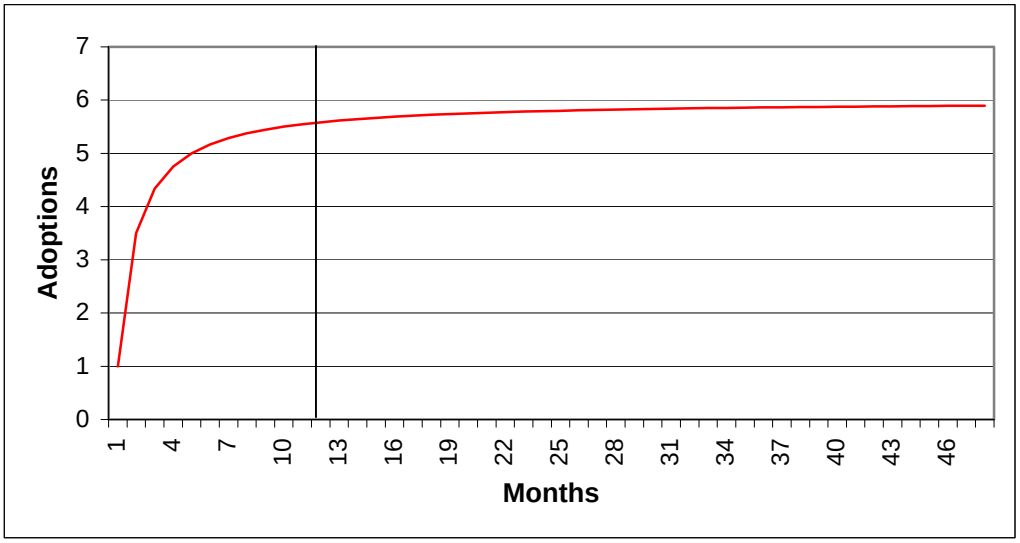
Another key concern was whether the effective useful life (EUL) of two years that is currently assigned to residential audits is reasonable. To answer this question, we examined the specific recommended measures and practices that respondents say they adopted. Next, for each adopted practice we assigned an EUL of two years. Depending on the adopted measure, we assigned the values proposed by PG&E, SCE, SDG&E, and SoCal Gas (2000) (see Appendix E). When there was no EUL available for a given measure, we applied the EUL from a similar measure, or when that proved impossible, we use the most conservative estimate of two years. For each respondent across all audit types, we then calculated the average EUL across all adopted measures and practices. For each audit type, we then calculated a recommendations-weighted average EUL. The results of this analysis are presented in Section 4.4.3.

3.4.2.4 Timing of Residential Audit Impact Reports

As mentioned earlier, previous studies of audit programs have shown that quarterly reporting will have to be lagged by at least two quarters after a set of audits, because one must allow a minimum implementation period of four to six months after an audit, before asking participants what actions they have undertaken as a result of their audit. This study addressed whether it would be prudent to consider even longer lags in order to capture the full impact of the audit programs.

We recognize that we know nothing about the effect of time on adoptions *during* the first year after the audit. We know only the number of adoptions for periods of one to two years after the audit. While there is a large family of possible adoption curves that might describe the first 12 months after the audit, all have one basic characteristic in common. They all assume that most of the adoptions occur in the first 12 months with the number of adoptions trails off over time, eventually reaching asymptote. So, for the moment, let's assume that the shape of the curve is logarithmic with an upper limit, or asymptote, as depicted in Figure 3-1. In this curve, the number of adoptions increases during the first year with the rate of increase decreasing after the first year eventually reaching asymptote. The portion of the curve to the left of the line represents adoptions in the first 12 months. This curve also assumes that the average number of adoptions does not exceed six, the asymptote.

Figure 3-1.
Assumed Functional Form of Adoptions Over Time



If this curve were correct, surveying customers six months after their audits would not capture the full impact of the program. Note that, in addition to customer motivation, the time to implement a given recommended measure depends on *at least* two things: 1) whether the recommended measures require a customer investment and 2) the time to accumulate the necessary funds or the time needed to apply for and receive the necessary funds. The point of this analysis was to see if there is a statistically significant relation between time and the number of adoptions during the period starting one year after the audit. A significant relation would suggest that the asymptote has not been reached.

Our analysis is restricted to observations regarding the relationship of time to adoptions from one year after the audit to two years after the audit. To estimate the impact of time on the installation and adoption of measures and practices, we first determined the total number of installations and adoptions. We then calculated the number of days between February 1, 2002, the date when participant interviews were completed, and the specific date of each customer's audit in PY 2000. Finally, we estimated a regression model, which took the following basic form:

$$Y_i = \alpha + \beta_1 X_i + \varepsilon_i \qquad (6)$$

where

Y_i = The total number of measures and practices adopted for the ith participant.

α = Constant (mean of the population when X = 0)

β_1 = A coefficient that reflects the change in installations/adoptions associated with a one-unit change in the explanatory variable

X_i= The difference in days between 2/1/2002 and the date of the ith customer's audit

ε_i = Captures the differences in adoption among the various participants that are not explained by the model

The results of this regression model are provided in the Section 4.4.4.

3.4.3 Marketing Objectives

For each audit type, we describe participants in terms of their demographic characteristics, attitudes toward energy conservation, awareness of ENERGY STAR®, access to the Internet, annual kWh consumption, and geographic location. We also discuss, based on our review of SCE market research and marketing activities, whether target marketing should be further explored to improve participation rates. Note that the TOS and CHEERS audits will be excluded from this marketing analysis since they are triggered by a very different set of motivations (i.e., selling or buying a house) and thus represent a different market segment.

3.5 Weights

When estimating parameters, such as the proportion of renters versus owners, among the participants within a given audit type, no weights were necessary since the sample was a proportional, stratified random sample. That is, the sample for each audit type is self-weighting.

However, when estimating certain parameters, such as the adoption rate for all participants, *regardless* of the audit type, the situation is no longer self-weighting, because each audit type is now considered a stratum and the sampling is disproportionate within each stratum. Some weighting is required.

One could use the expansion weight (Lee, Forthofer, and Lorimor, 1993), which is simply the reciprocal of the selection probability and is calculated as follows:

$$\text{Expansion Weight} = \frac{N_h}{n_h} \qquad (7)$$

where

N_h = Population in stratum h

n_h = Sample in stratum h

These expansion weights return the number of participants for each audit type in each weather zone and kWh stratum. These expansion weights are presented in Appendix F.

However, while the expansion weights are reasonable for estimating population totals and means, they may play havoc with the standard error and significance tests, such as that for the Chi-square and analysis of variance. To deal with this problem, the expansion weight was adjusted to produce the relative weight, rw_i, which is defined as the expansion weight divided by the mean of the expansion weights (Lee, Forthofer, and Lorimor, 1993):

$$\text{Relative Weight} = \frac{w_i}{\overline{w}} \qquad (8)$$

where

$$\overline{w} = \frac{\sum w_i}{n}$$

The relative weights, applied to respondents in each audit type, return the number of completed questionnaires (n=639). While the use of expansion weights and the relative weights result in the same estimates of means and proportions, with some rounding error, we chose to use the all-purpose relative weight since the use of the expansion weight can, as mentioned above, play havoc with the standard error and other statistical measures, such as the chi square and t-tests, and significance tests. The relative weights are also presented in Appendix F.

3.6 Confidence Intervals

The 90 percent confidence interval for the various adoption ratios was calculated for each program and for each end use within each program. Since this is the critical ratio, these confidence intervals were calculated in two steps. First, the variance of the ratio was estimated using the following equation:

$$v(\hat{R}) = \frac{(1-f)}{n\bar{x}^2}(s_y^2 + \hat{R}^2 s_x^2 - 2\hat{R}s_{yx}) \qquad (9)$$

where

$v(\hat{R}) =$ Variance of the adoption ratio

$\hat{R} = \frac{\bar{y}}{\bar{x}}$,the adoption ratio

$f =$ Sampling fraction

$n =$ Size of sample

$\bar{x} =$ Mean of recommendations

$\bar{y} =$ Mean of adoptions

$s_x^2 =$ Variance of recommendations

$s_y^2 =$ Variance of adoptions

$s_{yx} =$ Covariance of adoptions and recommendations

Once the variance of $\hat{R}$ was estimated, then the following equation was used to estimate the 90 percent confidence interval:

$$\hat{R} = \pm z\sqrt{v(\hat{R})} \qquad (10)$$

where z = the critical value for the 90 percent level of confidence is 1.645.

For means, we have provided the standard error, which provides a measure of variability. By multiplying this standard error by 1.645, one can also derive the 90 percent confidence interval around each mean. The formula for calculating the confidence intervals for these variables is presented below:

$$\bar{y} \pm ts_{\bar{y}} \qquad (11)$$

where t = the critical value from the t distribution (1.645)

s = the standard error of $\bar{y}$, the NTGR.

The precision of each estimated proportion can also be easily determined. For proportions (e.g., the percent saying "Yes" to a question), refer to Table G-1 in Appendix G. Find the cell corresponding to the proportion and the market actor (or all market actors). The number in this cell represents the 90 percent confidence interval. That is, the proportion plus or minus the number in the cell.

3.7 Data Documentation

All data sets used in the evaluation were thoroughly documented. All the data sets and documentation produced are consistent with respect to format and content and are in accordance with and follow SCE's internal database guidelines.

Data documentation is provided in Appendix H. In this Appendix, we provide in Table H-1 the sequence of SAS code and the resulting SAS and Excel files for all key steps in the development of the sample frame, implementation of the sample, and the conduct of the analysis. In Figures H-1 through H-5, we provide a graphic description of the development of all key SAS and Excel files. All relevant SAS and Excel files are stored on the CDs in Appendix H.

4. RESULTS

4.1 Customer Characteristics

4.1.1 Demographics

In this section, we present the demographic characteristics for those participating in the six types of audits. We present here the key findings and comparisons among the various audit types.

We caution the reader not to make too much of any differences reported in the following tables. For the most part, these differences are not the result of customers self-selecting into any particular type of audit but rather the result of targeting by SCE of specific customer segments within a single market (e.g., Mail-In Audit in the residential market) or a result of SCE implementing an audit, such as the TOS Audit, that was designed for specific customers in a specific market, such as the home-purchase market. As a result, there is no point in testing the statistical significance of any observed differences.

Table 4-1 presents the square footage of participant's homes. Here, one can see that the homes participating in the Mail-In Audit were by far the most likely to have greater than 3,000 square feet and the least likely to have less than 1,000 square feet. Also, the CHEERS audit has the greatest number of homes that are between 1,000 and 2,000 square feet.

Table 4-1.
Square Footage, by Audit Type

Audit Types	< 1000	1000-2000	2000-3000	> 3000	Don't Know	Refused	Respond-ents
On-Line	10%	52%	29%	6%	2%	0%	126
Mail	1%	43%	33%	19%	4%	0%	126
In-Home	10%	50%	23%	7%	10%	0%	127
Telephone	12%	57%	11%	5%	15%	0%	132
Time-Of-Sale	2%	58%	32%	8%	1%	1%	120
CHEERS	0%	75%	13%	13%	0%	0%	8

Information was collected about the annual household income. Table 4-2 presents these data, by audit type. As one can see, the TOS audit has the greatest percentage of households that have annual incomes greater than $100,000. Also noteworthy is that the CHEERS and TOS Audits have the greatest percentage of households in the $75,000-$100,000 category and the greater than $100,000 category.

Respondents were also asked about their educational level. Table 4-3 presents these results. Participants in the CHEERS audit have the highest level of educational attainment with 38 percent having some graduate school experience or having a graduate degree. Another 38 percent have graduated from college. The Telephone Audit has the greatest number of respondents who have only a high school diploma.

Table 4-2.
Household Income, by Audit Type

Audit Types	< $25,000	$25,000 - < $40,000	$40,000 - < $75,000	$75,000 - < $100,000	> $100,000	Refused	Respond-ents
On-Line	9%	17%	20%	15%	15%	24%	126
Mail	8%	13%	18%	13%	15%	33%	126
In-Home	25%	7%	20%	10%	14%	24%	127
Telephone	39%	11%	17%	2%	10%	21%	132
Time-Of-Sale	2%	7%	23%	18%	30%	22%	120
CHEERS	0%	13%	13%	25%	25%	25%	8

Table 4-3.
Level of Educational Attainment, by Audit Type

Audit Type	High School/ Some High School	Trade/Some College	College Graduate	Some Graduate/ Graduate Degree	Don't Know	Refused	Respond-ents
On-Line	14%	32%	31%	21%	0%	2%	126
Mail	20%	34%	25%	21%	0%	1%	126
In-Home	26%	34%	27%	10%	2%	2%	127
Telephone	33%	33%	20%	14%	0%	1%	132
Time-Of-Sale	17%	22%	38%	23%	0%	1%	120
CHEERS	13%	13%	38%	38%	0%	0%	8

Table 4-4 presents the race of participants, by audit. The CHEERS, Mail-In and On-Line audits have the greatest percentage of Caucasians, while the In-Home and TOS audit have the greatest percentage of Hispanics.

Table 4-4.
Race, by Audit Type

Audit Type	Hispanic	African American	Caucasian	Asian American	Other	Don't Know	Refused	Respond-ents
On-Line	10%	2%	71%	6%	6%	0%	5%	126
Mail	8%	2%	76%	5%	3%	0%	6%	126
In-Home	21%	7%	59%	5%	4%	0%	4%	127
Telephone	14%	8%	62%	3%	10%	1%	3%	132
Time-Of-Sale	17%	6%	60%	8%	6%	0%	4%	120
CHEERS	13%	0%	75%	0%	0%	0%	13%	8

Table 4-5 presents the number of people in the household, by audit type. CHEERS has by far the greatest percent of 1-2 person and 7-8 person households. The vast majority are one-to-four person households across all types of audits. The TOS has the greatest percent of 3-4 person households.

Table 4-5.
Number of People in Household

Audit Type	1 to 2	3 to 4	5 to 6	7 to 8	9 to 10	Don't Know	Refused	Respond-ents
On-Line	45%	36%	17%	1%	0%	1%	0%	126
Mail	40%	44%	11%	4%	1%	0%	1%	126
In-Home	47%	40%	10%	2%	1%	0%	0%	127
Telephone	53%	33%	8%	5%	0%	0%	2%	132
Time-Of-Sale	28%	53%	16%	3%	0%	0%	0%	120
CHEERS	75%	0%	13%	13%	0%	0%	0%	8

Table 4-6 presents the year that the dwelling was built, by audit type. The only discernable pattern is that the CHEERS audit has the oldest homes with greatest percentage of homes that were built before 1977 and the lowest percentage of homes that were built within the last five years. It may also be true that, given the vintage of these homes, the energy savings potential is the greatest.

Table 4-6.
Year Dwelling Was Built, by Audit Type

Audit Type	W/In Last 5 Years	1987-1996	1977-1986	Before 1977	Don't Know	Respond-ents
On-Line	9%	14%	12%	63%	3%	116
Mail	5%	20%	17%	55%	4%	126
In-Home	6%	19%	19%	54%	2%	111
Telephone	5%	20%	24%	49%	3%	105
Time-Of-Sale	8%	21%	17%	54%	0%	119
CHEERS	13%	0%	0%	88%	0%	8

Table 4-7 presents the type of dwelling by audit. Most dwellings are by far single-family detached, followed by single-family attached. The CHEERS and TOS audits have the greatest percent of dwellings that were single-family detached, while the In-Home and Telephone audits have the greatest percent of dwellings that were apartments.

Table 4-7.
Type of Dwelling, by Audit Type

Audit Type	Single-Family Attached	Single-Family Detached	Apartment	Other	Don't Know	Respond-ents
On-Line	18%	71%	8%	2%	0%	126
Mail	14%	79%	0%	2%	0%	126
In-Home	16%	62%	13%	9%	0%	127
Telephone	18%	53%	21%	12%	1%	132
Time-Of-Sale	13%	86%	1%	0%	0%	120
CHEERS	0%	100%	0%	0%	0%	8

The results with respect to tenure (owner versus renter) are presented in Table 4-8. Clearly, most of the participants are owners, with the Mail-In, TOS, and CHEERS audits having the greatest percent of owners. The On-Line, In-Home, and Telephone audits have the greatest percent of renters.

Table 4-8.
Tenure, by Audit Type

Audit Type	Own	Rent	Don't Know	Refused	Respond-ents
On-Line	79%	21%	0%	0%	126
Mail	93%	6%	0%	1%	126
In-Home	80%	20%	0%	0%	127
Telephone	72%	27%	1%	0%	132
Time-Of-Sale	100%	0%	0%	0%	120
CHEERS	100%	0%	0%	0%	8

4.1.2 Attitudes

All respondents were presented with six statements regarding energy efficiency and conservation. On a 10-point scale (1=Strongly Disagree; 10=Strongly Agree), respondents were asked the extent to which they agreed with each statement[12]. The results are presented in Table 4-9. While there are some differences across audit types, clearly, all respondents have very positive attitudes toward energy efficiency/conservation. The overall mean across all audit types is 7.2.

We then compared the means of the overall conservation attitude scale across the audit types. The difference between the participants in the Mail-In Audit and the participants in the Telephone and TOS Audits are statistically significant at the 95 percent level of confidence. Note that while the difference between the Mail-In Audit and the CHEERS Audit is large,

[12] The scoring of the first statement was reversed so that a high score would reflect a more favorable attitude toward energy conservation.

the size of the CHEERS Audit sample is too small for this difference to emerge as statistically significant.

Table 4-9.
Attitudes Toward Energy Efficiency/Conservation

Attitude Statement	On-Line	Mail-In	In-Home	Telephone	TOS	CHEERS
My life is too busy to worry about making energy related improvements to my home.	7.9 (.21)	7.6 (.24)	8.0 (.24)	7.4 (.27)	7.5 (.24)	8.6 (.75)
Scarce energy supplies will be a major problem in the future.	7.3 (.23)	6.9 (.25)	6.7 (.27)	7.7 (.24)	7.7 (.23)	7.3 (.92)
Instead of building new power plants, customers should use less electricity.	6.1 (.24)	5.7 (.27)	5.8 (.24)	6.8 (.27)	6.5 (.27)	7.3 (.96)
It is possible to save energy without sacrificing comfort by being energy efficient.	7.8 (.20)	7.3 (.22)	8.0 (.21)	8.2 (.20)	8.4 (.17)	9.6 (.26)
It is worth it to me for my household to use less energy in order to help preserve the environment.	8.3 (.17)	7.8 (.23)	8.3 (.19)	8.7 (.19)	8.6 (.18)	9.1 (.35)
Conservation efforts helped reduce the effects of the energy crisis during the summer of 2001.	7.7 (.23)	7.9 (.23)	8.0 (.21)	8.0 (.22)	8.1 (.21)	9.3 (.41)
Overall Attitude	7.4 (.24)	7.1 (.15)	7.4 (.14)	7.9 (.13)	7.8 (.15)	8.5 (.42)

4.1.3 The Internet

Respondents were also asked whether they had access to the Internet. Table 4-10 presents these results.

Table 4-10.
Access to the Internet

Audit Type	Yes	No	Don't Know	Refused	Respond-ents
On-Line	99%	1%	0%	0%	126
Mail-In	73%	27%	0%	0%	126
In-Home	62%	37%	1%	0%	127
Telephone	50%	48%	1%	1%	132
Time-Of-Sale	92%	8%	0%	0%	120
CHEERS	75%	25%	0%	0%	8

Of course, nearly all of the On-Line audit participants claim to have access to the Internet. That it is not 100 percent is probably due to a data collection error. While the percent of participants with Internet access in the other five audit types is reasonably high, the Telephone Audit participants have are the lowest at 50 percent.

We then asked those who claimed to have access to the Internet, from what location(s) do they access the Internet. Respondents could mention multiple locations. Table 4-11 and Table 4-12 present the results as a percent of responses and as a percent of respondents, respectively. The most frequent *response* place is the home followed by the office, library,

and friend's or neighbor's house. From Table 4-12, one can see that nearly all of the respondents have access from home, followed by the office, library, and a friend's or neighbor's house.

Table 4-11.
Place of Access to Internet (Percent of Responses)

Audit Type	Home	Office	School	Library	Friend's/ Neighbor's House	Café	Other	Don't Know	Refused	Responses
On-Line	46%	22%	4%	11%	11%	3%	2%	0%	0%	255
Mail	48%	27%	3%	9%	11%	1%	2%	0%	0%	176
In-Home	50%	19%	7%	13%	9%	1%	1%	0%	0%	151
Telephone	48%	20%	7%	7%	13%	3%	2%	0%	0%	123
Time-Of-Sale	49%	32%	5%	6%	4%	2%	0%	0%	0%	213
CHEERS	38%	25%	0%	13%	19%	6%	0%	0%	0%	16

Table 4-12.
Place of Access to Internet (Percent of Respondents)*

Audit Type	Home	Office	School	Library	Friend's/ Neighbor's House	Café	Other	Don't Know	Refused	Respond-ents
On-Line	94%	46%	9%	23%	22%	6%	5%	0%	0%	125
Mail	92%	51%	5%	16%	22%	1%	3%	0%	0%	92
In-Home	96%	35%	14%	24%	16%	3%	3%	0%	0%	79
Telephone	89%	36%	12%	14%	24%	6%	5%	0%	0%	66
Time-Of-Sale	95%	63%	10%	12%	8%	5%	1%	0%	1%	110
CHEERS	100%	67%	0%	33%	50%	17%	0%	0%	0%	6

* Note that the percentages sum to greater than 100 percent due to multiple responses.

4.1.4 Awareness of ENERGY STAR®

Respondents were asked whether they were aware of ENERGY STAR®. These results are presented in Table 4-13.

Table 4-13.
Awareness of ENERGY STAR®

Audit Type	Yes	No	Don't Know	Respond-ents
On-Line	72%	26%	2%	126
Mail	37%	60%	3%	126
In-Home	37%	61%	2%	127
Telephone	33%	67%	1%	132
Time-Of-Sale	61%	39%	0%	120
CHEERS	75%	13%	13%	8

Participants in the CHEERS audit are the most aware, followed by participants in the On-Line and TOS Audits. For the remaining three audits, the percentages are far below 50 percent.

4.1.5 Awareness of and Participation in DSM Programs

We first asked respondents whether they were aware of any energy conservation programs sponsored by electric utilities and others, including the State of California. Table 4-14 presents these results. Awareness is at or below 50 percent for participants in the six audit types, which seems low. The lowest level of awareness is among participants in the TOS Audit, while the highest is among participants in the CHEERS Audit.

Table 4-14.
Awareness of Energy Conservation Programs

Audit Type	Yes	No	Don't Know	Respond-ents
On Line	47%	53%	0%	126
Mail	30%	68%	2%	126
In Home	35%	64%	1%	127
Telephone	25%	74%	1%	132
Time-Of-Sale	25%	74%	1%	120
CHEERS	50%	50%	0%	8

Those who were aware of energy conservation programs were asked which programs they recalled. Table 4-15 presents these results, by audit type. By far, rebate programs are the most frequently mentioned program type, followed by refrigerator recycling.

Table 4-15.
Awareness of Program, by Audit Type

Audit Type	Rebate	Giveaway/ Turn-In Event	Refrigerator Recycling	Home Repair/ Retrofit	New Construction	Don't Know	Other	Responses
On-Line	65%	4%	12%	10%	1%	3%	4%	121
Mail-In	60%	3%	12%	10%	0%	10%	3%	58
In-Home	68%	1%	10%	3%	1%	8%	9%	77
Telephone	40%	5%	13%	5%	8%	18%	13%	40
Time-Of-Sale	51%	6%	16%	16%	0%	6%	6%	51
CHEERS	81%	0%	6%	6%	6%	0%	0%	16

Those who were aware of conservation programs were then asked whether they had participated in any of these programs. Table 4-16 presents these results, by audit type.

Table 4-16.
Participation in Energy Conservation Programs,
By Audit Type

Audit Type	Yes	No	Don't Know	Respond-ents
On-Line	46%	53%	2%	59
Mail-In	42%	58%	0%	38
In-Home	38%	62%	0%	45
Telephone	58%	42%	0%	33
Time-Of-Sale	30%	70%	0%	30
CHEERS	50%	50%	0%	4

Among those who are aware, past participation is high. Nearly 40 percent or more of the participants in all the audit types, except for the TOS Audit, report that they have participated in at least one other energy conservation program.

Those who report participating in at least one additional energy conservation program were then asked who sponsored the program(s). Table 4-17 presents these results. Not surprisingly, SCE is the most frequently mentioned response followed by SoCalGas.

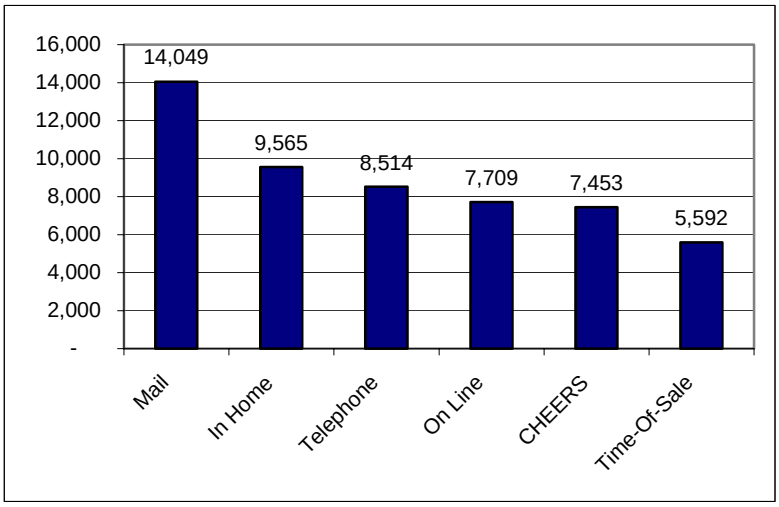
Table 4-17.
Sponsor of Energy Conservation Program

Audit Type	SCE	SoCal Gas	City/State	Other	Don't Know	Responses
On-Line	61%	6%	6%	17%	11%	36
Mail-In	65%	18%	0%	0%	18%	17
In-Home	62%	10%	0%	5%	24%	21
Telephone	48%	12%	8%	20%	12%	25
Time-Of-Sale	50%	0%	10%	20%	20%	10
CHEERS	75%	0%	0%	0%	25%	4

4.1.6 Annual kWh Use

Participants were identified in the SCE billing system and their monthly kWh data retrieved. The annual kWh consumption, by audit type is presented in Figure 4-1. Clearly, participants in the Mail-In Audit have the highest average annual kWh consumption. This is a function of the fact that SCE targets those customers with annual kWh consumption greater than 10,950. That the participants in the TOS Audit have the lowest annual kWh consumption is likely due to the fact that these homes were in the process of being sold and may have not been fully occupied during some portion of 2000.

Figure 4-1.
Annual kWh Use, by Audit Type



4.1.7 Participation, by Geographic Regions and Weather Zones

The geographic regions in which participants live can play an important role in terms of cost-effectiveness. Certain measures, such as insulation and air conditioning, may be more cost-effective in more extreme climates. The CEC weather zones are illustrated in Figure 4-2. Table 4-18 presents the six audit types by CEC weather zone. Also presented in Table 4-18 are the original CEC weather zones that comprise the new weather zones in column 2. As mentioned earlier in Section 3.2.1.2, this was done to insure that there were enough participants to sample in each weather zone. This is consistent with the approach taken in Study 528-A.

Figure 4-2. CEC Weather Zones

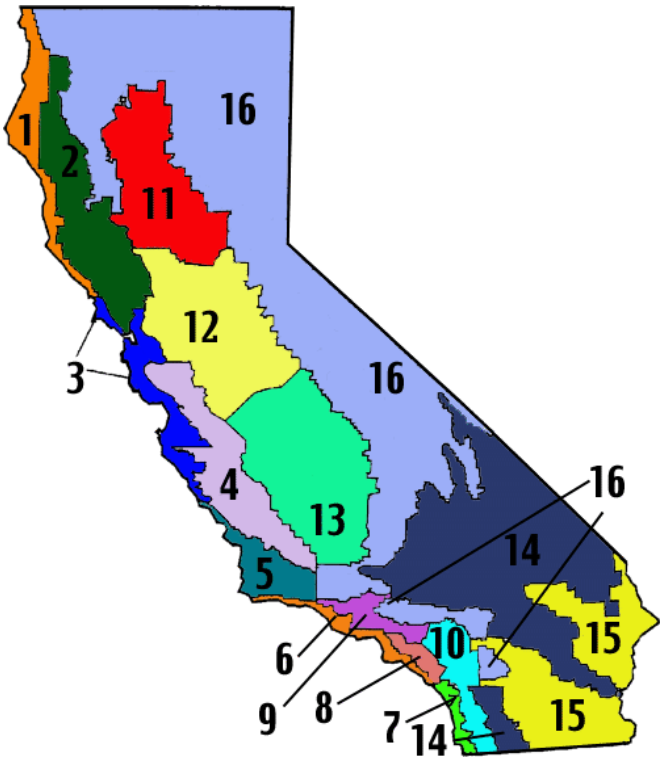


Table 4-18.
Audit Type, by CEC Weather Zones

CEC Weather Zones	Grouped CEC Weather Zones	Mail-In	In-Home	Telephone	On-Line	CHEERS	Time-Of-Sale
4, 5, 6, & 8	Coastal & L.A. Basin	31.8%	32.2%	27.3%	48.5%	31.8%	56.0%
9 & 10	Valley & Inland Empire	43.6%	38.1%	39.9%	35.2%	40.9%	41.3%
13 & 14	Joaquin & High Desert	12.6%	16.3%	19.4%	9.7%	13.6%	0.8%
15	Low Desert	7.2%	9.3%	8.6%	2.2%	4.5%	0.1%
16	Mountain	4.7%	4.2%	4.7%	4.3%	9.1%	1.7%
Base		32,074	7,674	2,344	2,138	22	3,538

Based on these data, it is clear that the distribution of participants in SCE's residential audits does not differ in any important ways by weather zone. Maps of PY 2000 participants by CEC weather zone and by Zip code are presented for each audit type in Appendix I.

4.2 The Energy Audit and Report

4.2.1 Recall

Participants were asked whether they recalled the energy survey being conducted. Table 4-19 presents these results, by type of audit.

Table 4-19.
Recall of Energy Audit,
by Type of Audit

Audit Type	Yes	No	Don't Know	Respond-ents
On-Line	81%	18%	1%	126
Mail	75%	23%	2%	126
In-Home	88%	11%	1%	127
Telephone	81%	17%	2%	132
Time-Of-Sale	23%	74%	3%	120
CHEERS	100%	0%	0%	8

With the exception of the TOS Audit, the vast majority of the respondents recall the audit. The low percent for the TOS Audit might be due to the fact that the 15-minute energy audit was added to home inspector's regular home inspection. Thus, to the homeowner it might not have been apparent that an energy audit was even being conducted. In order to make the audit more memorable, it might be useful to make the energy audit portion of the regular home inspection more obvious to the homeowner. It might also be useful to develop other procedures to increase the probability that the TOS's comprehensive energy report reaches each customer.

Regardless of whether the respondent recalled the audit, customers were asked if they remembered the energy report and the list of recommendations. Table 4-20 presents these results.

Table 4-20.
Recall List of Recommendations

Audit Type	Yes	No	Don't Know	Respond-ents
On-Line	74%	25%	1%	126
Mail	73%	23%	4%	126
In-Home	71%	26%	3%	127
Telephone	67%	24%	9%	132
Time-Of-Sale	27%	67%	7%	120
CHEERS	88%	13%	0%	8

As one can see, while the percent recalling the report and its recommendations is still quite high, it is, not surprisingly, always smaller than the percent recalling the audit itself. With respect to the TOS Audit, the fact that the 27 recalled the list but only 23 percent recall the audit may be due to the fact that the current occupant might not have been present for the audit but the report eventually was forwarded to them through the real estate agent or the U.S. Postal Service.

4.2.2 Reading of Audit Report

Those recalling the audit report were then asked the extent to which they read it. These results are presented in Table 4-21.

Table 4-21.
Extent To Which Energy Report Was Read

Audit Type	Read Thoroughly	Read Some Portions	Just Glanced At It	Did Not Read At All	Don't Know	Respond-ents
On-Line	73%	19%	6%	0%	1%	93
Mail-In	72%	14%	12%	0%	2%	92
In-Home	72%	19%	8%	0%	1%	90
Telephone	74%	11%	10%	0%	5%	88
Time-Of-Sale	41%	22%	25%	13%	0%	32
CHEERS	100%	0%	0%	0%	0%	7

The vast majority of the respondents across all the audit types, except for the TOS, read it thoroughly or read some portions of it. The low percentage of readers for the TOS Audit may in part be due to the fact that the report never made it to the current occupant of the house, or the person who received the audit was not the one who originally requested it, and, as a result, was simply not interested.

4.2.3 Funding of Measures

Respondents who indicated that they had implemented any of the recommended measures and practices were asked whether the implementation of any of these recommendations cost any money. Table 4-22 presents these results.

Table 4-22.
Implementation of Measures That Cost Money

Audit Type	Yes	No	Respond-ents
On-Line	64%	36%	114
Mail	62%	38%	114
In-Home	62%	38%	124
Telephone	59%	41%	124
Time-Of-Sale	84%	16%	99
CHEERS	100%	0%	8

Across all audit types, the majority of the respondents reported that the implementations cost money, with participants in the TOS and CHEERS audits showing the highest percentages, probably because they received only measure recommendations.

Those indicating that the implementations cost money were then asked whether the implementations were paid for by alternative sources of money, such as bank loans or utility rebates. Table 4-23 presents these results.

Table 4-23.
Implemented Measures Covered by Alternate Source of Money?

Audit Type	Yes	No	Don't Know	Respond-ents
On-Line	16%	78%	5%	73
Mail	14%	83%	3%	71
In-Home	23%	65%	12%	77
Telephone	16%	68%	15%	73
Time-Of-Sale	22%	70%	8%	83
CHEERS	25%	63%	13%	8

The majority of the implementations were not funded by alternate sources of money. The presumption is that the customers paid for the measures and practices implemented.

Those who indicated that they used alternate sources of money were then asked the percent of the costs that were covered by the alternate sources of money. Table 4-24 presents the mean percentages of alternate funding, by audit type.

Table 4-24.
Mean Percent Covered
by Alternate Funding

Audit Type	Mean	Standard Error
On-Line	13.4	2.4
Mail	25.7	11.2
In-Home	34.2	8.7
Telephone	15.3	4.7
Time-Of-Sale	25.4	6.5
CHEERS	7.5	2.5

The TOS, In-Home, and Mail-In Audits have the largest percentage covered by alternate sources of funding.

Finally, those who indicated that they used alternate sources of money were asked about the sources of this money. Table 4-25 presents these results, by audit type.

Table 4-25.
Source of Alternate Funding, by Audit Type

Audit Type	Bank Loan	Rebate From Utility	Rebate From Manufacturer	Rebate From Retailer	Other	Don't Know	Respond-ents
On-Line	7%	71%	14%	7%	0%	0%	14
Mail	9%	91%	0%	0%	0%	0%	11
In-Home	16%	48%	12%	4%	20%	0%	25
Telephone	33%	50%	0%	8%	8%	0%	12
Time-Of-Sale	24%	43%	10%	0%	19%	5%	21
CHEERS	0%	67%	0%	0%	33%	0%	3

Respondents mention the rebates from utilities most often, followed by bank loans.

4.3 Program Satisfaction

To measure satisfaction with the audit, participants were asked the extent to which they agreed on a four-point scale with a series of statements about the audit (1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree). Most of the statements were relevant to all six types of audits, while others were relevant to only a subset of the audits. Table 4-26 presents the means and standard errors (in parentheses below the means) for those statements that were relevant to all six types of audits.

Table 4-26.
Means for Participant Satisfaction, by Audit Type

Satisfaction Statements	On-Line	Mail-In	In-Home	Telephone	TOS	CHEERS
Amount of time to complete audit was about right	3.2 (.05)	3.1 (.05)	3.3 (.06)	3.1 (.07)	3.3 (.11)	3.4 (.18)
Energy survey report delivered in a timely manner	3.3 (.07)	3.1 (.06)	3.2 (.08)	3.2 (.06)	3.3 (.11)	2.4 (.26)
The energy survey report was easy to understand	3.4 .06)	3.2 (.06)	3.3 (.07)	3.2 (.07)	3.2 (.12)	3.0 (.31)
The recommendations in the energy survey report were relevant to my house	3.1 (.07)	3.0 (.08)	3.1 (.07)	3.1 (.07)	3.2 (.09)	3.0 (.22)
The energy survey report was informative	3.2 (.06)	3.1 (.06)	3.3 (.07)	3.3 (.06)	3.3 (.08)	3.0 (.31)
The estimates of energy savings were believable	3.1 (.06)	3.2 (.06)	3.2 (.07)	3.2 (.06)	3.2 (.09)	3.2 (.17)

Clearly, the levels of satisfaction are high and remarkably similar across the six audit types. Note that the precision of the satisfaction estimates for the CHEERS Program is lower due to the small sample size (n=8). An analysis of variance (using the relative weights), conducted to determine whether any of the differences in the means for any of these measures of satisfaction are statistically significant, revealed no significant differences.

Next, we present the results of satisfaction statements that were relevant to only a subset of the audits. Those customers who participated in the *Mail-In and On-Line Audits* were asked whether the energy survey that was mailed to their house or sent via the Internet was easy to follow and complete. The means were also very similar at 3.2 and 3.3, respectively.

Customers who participated in the *In-Home, TOS, and CHEERS* Audits were asked whether the energy survey was scheduled within a reasonable amount of time. Customers who participated in the *In-Home, TOS, CHEERS, and Telephone* Audits were asked whether the auditor who came to their house or the person who conducted the audit over the telephone was courteous. The results, presented in Table 4-27, show that the means are very similar.

Table 4-27.
Means for Participant Satisfaction, by Selected Audit Type

Satisfaction Statements	In-Home	TOS	CHEERS	Telephone
Energy Survey scheduled within a reasonable timeframe	3.2 (.06)	3.0 (.13)	3.3 (.16)	n/a
The In-Home/Telephone auditor was courteous	3.5 (.05)	3.5 (.11)	3.4 (.18)	3.5 (.06)

Finally, customers who participated in the *CHEERS* Audit were asked whether the cost for the CHEERS rating was worth the recommendations they received regarding energy efficiency. The mean was reasonably high at 2.9.

4.4 Program Impacts

4.4.1 Adoptions

In this section, we present the mean number of recommendations, adoptions, and the ratio of the latter to the former. Table 4-28 presents the overall adoption ratio, by audit type.

Table 4-28.
Recommendations, Adoptions, and Adoption Ratio,
by Audit Type

Audit Type	Recom-mendations	Adoptions	PY 2000 Ratio	90% Confidence Interval
On-Line	5.9	2.9	.49	0.037
Mail-In	7.1	3.3	.46	0.034
In-Home	14.5	8.3	.57	0.028
Telephone	20.8	14.0	.67	0.025
TOS	11.8	3.7	.31	0.033
CHEERS	8.1	3.9	.48	0.102

Participants in the Telephone Audit have the highest overall adoption ratio, while the participants in the TOS Audit have the lowest. The overall adoption ratio across all audit types is 0.54 with the 90 percent confidence interval of +/- 0.018. The lower adoption rates for the

Table 4-29 breaks down the ratio by end use. Here, one can see that the participants in the Telephone Audit again have the highest HVAC adoption ratio while the participants in the TOS have the lowest. All of the lighting ratios are reasonably high except for the TOS, which is only 31 percent.

Table 4-29.
Adoption Ratios,
by Audit Type, by End Use

Audit Type	HVAC Ratio	Lighting Ratio	Other Ratio
On-Line	0.51	0.63	0.4
Mail-In	0.57	0.64	0.3
In-Home	0.54	0.64	0.58
Telephone	0.68	0.60	0.67
TOS	0.28	0.34	0.37
CHEERS	0.52	0.69	0.27

It is also revealing when one examines the adoption ratios for measures versus practices. Table 4-30 presents these results.

Table 4-30.
Adoption Ratios,
by Audit Type, by Measures versus Practices

Audit Type	Measures	Practices
On-Line	.51	.44
Mail-In	.50	.36
In-Home[13]	.41	.70
Telephone	.46	.77
TOS	.31	n/a
CHEERS	.48	n/a

From Table 4-30, one can see that, on average, participants in the Mail-In and On-Line Audits have higher adoption ratios for measures than for practices, while for the Telephone and In-Home Audits the reverse is true.

4.4.2 Savings

Using the methods outlined in Section 3.3.2, we estimated the kWh savings for each of the six types of audits. The gross and net kWh and kW impacts per dwelling and by audit program are presented in Table 4-31 and Table 4-32. Note that the CPUC approved net-to-gross (NTGR) ratio for residential audits of 0.72 was used to derive net impacts.

[13] Note that, while not a part of the formal set of recommendations, recommendations to install an energy efficient refrigerator, clothes washer, dishwasher, or room air conditioner were made informally when appropriate. These four measures are included in the adoption ratios in Table 4-30 for the In-Home and Telephone Audits.

Table 4-31.
Gross and Net Per-Dwelling KWh Impacts, by Audit Type

Audit Type	Gross First-Year kWh Savings Per Dwelling	Gross First-Year kW Reductions Per Dwelling	Net First-Year kWh Reductions Per Dwelling	Net First-Year kW Reductions Per Dwelling
On-Line	171.4	0.082	123.4	0.059
Mail-In	171.4	0.082	123.4	0.059
In-Home	611.7	0.132	440.4	0.095
Telephone[14]	257.2	0.055	185.2	0.040
TOS	657.4	Not Available	473.3	Not Available
CHEERS[15]	1,098.3[16]	Not Available	790.8	Not Available

Table 4-32.
Per-Program KWh Impacts, by Audit Type†

Audit Type	Total First-Year Gross kWh Savings	Total First-Year Gross kW Reductions	Total First-Year Net kWh Reductions	Total First-Year Net kW Reductions
On-Line	371,490.0	177.7	267,472.8	127.9
Mail-In	5,578,693.1	2,668.4	4,016,659.1	1,921.3
In-Home	4,844,918.6	1,046.3	3,488,341.4	753.3
Telephone	614,784.8	132.4	442,645.1	95.3
TOS	2,741,358.0	Not Available	1,973,777.8	Not Available
CHEERS	24,162.6	Not Available	17,397.1	Not Available
Total	14,175,407.1	4,024.9	10,206,293.1	2,897.9

†For the purpose of estimating the total net savings for each audit type, the numbers in Table 2-1 were used in conjunction with estimates of net kWh/dwelling in Table 4-31.

[14] There is an apparent inconsistency in the higher adoption rate for the Telephone Audit than for the In-Home audit, while the Telephone Audit has far less savings, as estimated in Study 528-A. There are various possible reasons for this inconsistency. First, the error in the self-reported adoption rates might be higher for the participants in the Telephone Audits than for the participants in the In-Home Audits. This may be due to a greater desire on the part of Telephone Audit participants to provide socially desirable responses or to simply misremember. In addition, in a billing analysis, such phenomena as take-back can reduce the energy savings due to the installation of efficient equipment. The differences in kWh savings observed in Study 528-A may be due to differences in take-back between the customers in the two types of audits. There are also differences in the mix of measures and practices adopted that might also account for large differences in savings. Finally, in the post installations period, there have been more changes in energy using equipment, in the number of people in the household, or in the square footage of the home among the participants in the Telephone Audits than participants in the In-Home Audits. All of these factors may have, to some extent, played a role in producing this discrepancy.

[15] The full report of the savings from the eight respondents to the telephone interview is contained in Appendix J.

[16] Note that one case was discarded since it produced savings that were implausibly large, representing a reduction of 56% (3,323 kWh/year) in base case consumption.

For the In-Home and Telephone Audits, the adjustments to the savings reported earlier in Study 528-A were relatively minor and provide no surprises. No adjustments to the savings reported in Study 528-B were made since, as reported earlier in Section 3.4.2.2.1, the original participant survey data from Study 528-B could not be retrieved. As a result, the ratio of the adoption rate for the PY 2000 Mail-In and On-Line Audits to the adoption rate for Study 528-B was assumed to be one. Also not surprisingly, the savings for the TOS and CHEERS Audits were the greatest since they recommend only measures, which have greater savings. We estimate that customers who received a CHEERS audit experienced a 16.7 percent reduction in their annual kWh consumption. The difference in the savings for the TOS Audit versus the CHEERS Audit was mainly a reflection of two factors. First, the homes in the CHEERS sample were slightly older than homes in the TOS sample (see Table 4-1). Older homes have greater savings potential particularly in the area of shell improvements. The other, more significant, factor is the difference in the adoption ratios of .31 and .48, respectively.

Another interesting question is how the various audits compare with respect to their costs and benefits, sometimes measured in terms of $/kWh and $/kW. A more refined and comprehensive benefit-cost test is the Total Resource Cost Test (TRC) and its variant, the Public Purpose Test (PPT), which are currently used in California[17]. Unfortunately, to calculate TRCs or PPTs *using any of the data from this current study,* such as the EULs, was beyond the scope of this study. In SCE's "2001 Energy Efficiency Annual Report" submitted in May of 2001, a TRC is calculated for Energy Management Services (EMS), which is an overall TRC representing all the various audits. A TRC was not reported for each audit type.

4.4.3 Estimates of Effective Useful Lives

In California, the approved EUL for a practice is only two years. That is, it is assumed that the energy conservation behavior, after two years, is extinguished. Measures, because they involve the installation of hardware items, are assumed to last much longer. As one can see in Appendix B, the On-Line, Mail-In, In-Home, and Telephone Audits offer a mix of measures and practices, which suggests that the EUL for residential audits ought to be longer than two years. Our more detailed analysis of the specific measures and practices adopted by participation in the PY 2000 audits along with the CPUC-approved EULs for each supports this conclusion. Our analysis suggests that the EUL should not only be dramatically increased for all audit types but should be allowed to vary by audit type, in ways that reflect each audit type's unique mix of measures and practices. Table 4-33 presents the calculated EULs for PY 2000 participants, by audit type.

[17] These tests calculate the benefit-cost ratio of the present dollar value of lifecycle energy savings created by a program compared to the full social costs of implementing the program. The benefits are measured in terms of the avoided costs, i.e., the value of the net kWh and kW that would have to be procured and delivered in the absence of a program. The net kWh and kW impacts are translated into monetary terms by using the avoided kWh and kW costs that vary by season and time of day. These avoided costs are adjusted upward as a way of recognizing the environmental benefits of not having to generate the kWh and kW saved by the program. Also included are the avoided transmission and distribution costs. The costs include all the participant costs as well and the program administrative costs. Note that incentives are treated as a transfer from all ratepayers to participants through increased revenue requirements. Using a $/kWh or $/kW approach ignores many of these important effects.

The EULs for the On-Line, Mail-In, In-Home, and Telephone Audits should at least be doubled, while the EULs for the TOS and the CHEERs Audits, which only recommend measures, should be increased by at least a factor of 6 for the former and 7 for the latter.

Table 4-33.
Estimated Effective Useful Lives,
By Audit Type

Audit Type	Mean EUL	Standard Error
On-Line	4.50	0.21
Mail	4.70	0.20
In-Home[18]	4.60	0.18
Telephone	3.60	0.10
TOS	13.30	0.46
CHEERS	14.00	1.50

4.4.4 Timing of Residential Audit Impact Reports

Earlier we noted that previous studies of audit programs show that quarterly reporting should be lagged by at least two quarters after a set of audits, because one must allow a minimum implementation period of four to six months after an audit, before asking participants what actions they have undertaken as a result of their audit. Our analysis suggests that this is indeed the *minimum*. We go even further and suggest that it would be imprudent not to wait until at least a full year after the end of the program year to assess the full impact of the audit. Our rationale follows.

If the functional form depicted earlier in Figure 3-1 is correct, surveying customers six months after their audits would not capture the full impact of the program. The point of this analysis was to see if time continues to have an impact after the first year, suggesting that the asymptote has not been reached.

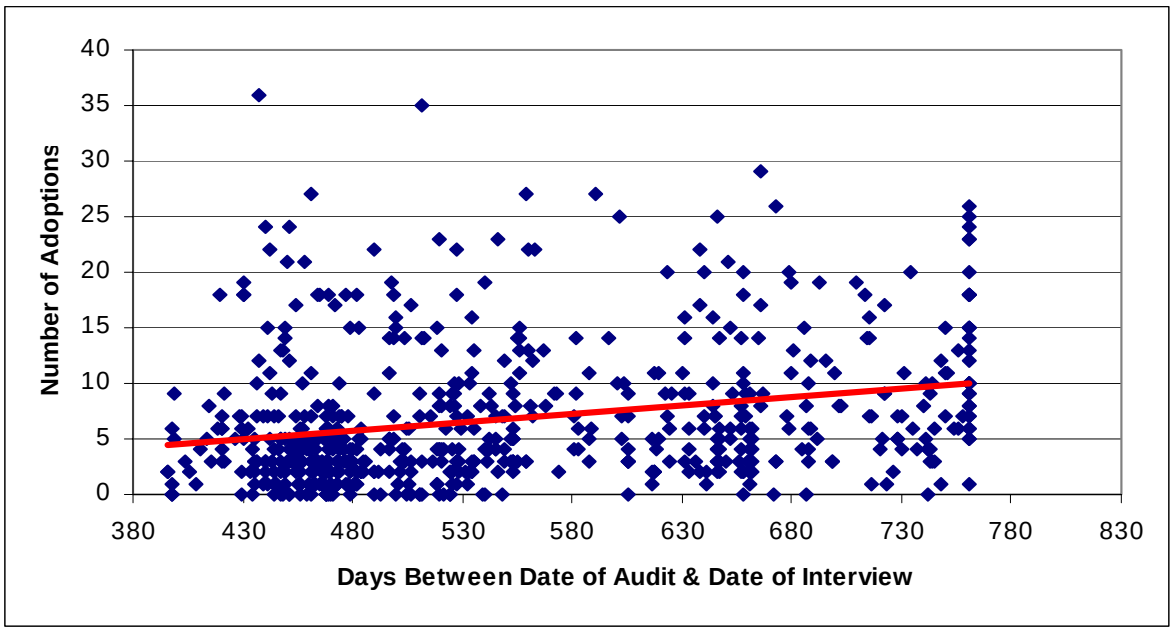
To estimate the impact of time on the installation and adoption of measures and practices, we first plotted the "number of days between the date of the audit and the date of the telephone interview" and the "number of adoptions." This is presented in Figure 4-3. This figure also contains the ordinary least squares regression line fitted through the observations. A slight upward slope can be detected.

[18] Note that, while not a part of the formal set of recommendations, recommendations to install an energy efficient refrigerator, clothes washer, dishwasher, or room air conditioner were made informally when appropriate. These four measures are included in the mean EULs in Table 4-33 for the In-Home and Telephone Audits. The In-Home and Telephone Audits should consider formally including these four measures in the set of possible recommendations.

The participants in the range of 750 days are ones who participated early in 2000 and they have had the longest period of time, nearly two years, in which to adopt recommended measures and practices. Those in the range of 400 days are ones who participated late in 2000 and they have had the shortest period of time, a little more than a year, in which to adopt recommended measures and practices. Recall that we know nothing about the effect of time on adoptions *during* the first year after the audit. We know only the number of adoptions reported by participants after one to two years.

The results of the regression analysis indicate a small positive effect of the passage of time. The coefficient is 0.0151, indicating that an increase of one day results in an increase of 0.0151 adoptions. The R^2 of the 0.0669 indicates that 6.7 percent of the variation in the number of adoptions is explained by the passage of time after the first year. If the coefficient were zero, then one would conclude that the asymptote had been reached. That the coefficient is a positive non-zero number (0.0151) indicates that the asymptote has not yet been reached and that adoptions are still occurring. Since there is an increase in adoptions after the first year, it is likely that the increase is even greater during the second half of the first year (which of course we cannot observe in this dataset). This suggests that the slope of the curve during the second six months of the first year was even steeper. This is especially true given that some *measures* which might require a customer investment and some time to accumulate the necessary funds or to apply for and receive the necessary funds. To wait only two quarters before surveying participants would potentially miss some important kWh and kW impacts due to the audits. Thus, one should not make any conclusions regarding the effects of any audit program until at least *one full year* after the conclusion of the program year.

Figure 4-3.
Days Between Audit Date & Interview Date And Adoptions



Still, SCE and the CPUC may want timely information on the impacts of their audit programs. Consider the following example of how this could be achieved. Take PY 2002 as an example. During PY 2002 quarterly reports could be produced that describe program expenditures, levels of participation, basic customer characteristics such as annual usage, geographic location, and recommendations made, and the estimated resulting savings. This would not involve any customer surveys.

In April of 2003, surveys could be conducted of customers who participated in the first quarter of PY 2002 to determine what recommendations they actually adopted. A billing analysis of these customers could also be conducted at this time if deemed necessary. Three more surveys would be conducted in the second, third, and fourth quarters of 2003 of customers who participated in the second, third, and fourth quarters of PY 20002 to determine what recommendations they actually adopted. Such an approach would allow for at least a full year to elapse for each participant before estimating the impacts of the audit. Of course, one could reduce evaluation costs even further if only one survey of participants in a given program year were conducted one year after the completion of that program year.

4.5 Marketing

Each year, SCE mails the Mail Energy Survey to nearly 190,000 residential customers with annual kWh use greater than 10,950, which is 68 percent higher than the typical residential customer who consumes approximately 6,500 kWh annually. This strategy of mailing to these relatively large customers is based on long experience, which suggests that larger customers will be more likely to participate since their energy savings and bill reductions are expected to be greater. Note, however, that since the threshold of 10,950 kWh/year is not based on any rigorous empirical analysis, it is possible that the threshold could be lowered with no substantial reduction in the acceptance rate.

Each year SCE also mails information to 50,000 specially-targeted customers about the benefits of the In-Home Audit and how to participate. Some customers choose to participate and schedule an in-home audit while others decide to complete the survey over the telephone. For the Mail-In and In-Home Audits, we present in Table 4-34 the number of mailers, the number of participants who accept, and the acceptance rate. The numbers for the In-Home and Telephone Audits are for *PY 2000* while for the Mail-In Audit they are for *PY 2001*. Also no data are available for either program year for the On-Line, CHEERS, and the TOS Audits.

Table 4-34.
Mailers Sent, Customers Accepting,
and the Acceptance Rates

Audit Type	Mailers	Acceptance	Acceptance Rate
In-Home /Telephone	50,000	7,920	16%
Mail-In	186,156	39,277	21%

The Mail-In Audit has a larger acceptance rate of 21 percent followed by the In-Home Audit with 16 percent. Interpretation of this difference is difficult. On the face of it, the marketing of the Mail-In Audit is more efficient than the marketing of the In-Home/Telephone Audit. However, the customer profile used by SCE to target-market the In-Home/Telephone Audit is far more complex than that used for the Mail-In-Audit, which takes the conservative approach of mailing to customers with very high kWh consumption. This approach insures a relatively high acceptance rate since these customers have the greatest potential savings. The In-Home/Telephone Audit takes a more complex and perhaps riskier approach, resulting in a lower acceptance rate.

The goals of marketing different types of audits (the Mail-In and the In-Home/Telephone) are to insure customer equity (providing and opportunity for an energy audit to any Edison customer who might benefit) and to recognize that customers have unique sets of needs that may make one type of audit more appealing than another. The Mail-In and the In-Home/Telephone Audits have each defined their respective markets. However, what is the population of customers in each profile, what is the extent of any overlap, and which customers might be underserved? Answers to these questions are not clear. Perhaps the acceptance rate for the In-Home and Telephone Audits could be increased given an improved customer profile, while the acceptance rate for the Mail-In Audits could be increased by using a more complex customer profile that takes into account other customer characteristics beyond annual kWh use. It is also possible that the acceptance rate for the Mail-In Audit could remain the same or only slightly decrease if the pool of eligible customers were increased by decreasing the annual kWh threshold. With the exception of the In-Home Audit, very little work has been done to target-market SCE's existing DSM programs and/or to develop and target-market new DSM programs. SCE currently has, or will have very soon, a fair amount of information regarding the residential sector that could be used to reassess the design of its residential DSM programs and improve its target marketing. These data include, among other information, equipment saturation, measure costs, savings potential, customer needs and wants, price forecasts, customer growth projections, and information on emerging technologies. If this were done, we would expect that these acceptance rates would increase and customer needs would be better met, resulting in even higher levels of satisfaction.

We recommend that SCE investigate whether there is a sufficient amount of existing data to support an investigation of current program designs and target marketing. If there is not, we recommend the collection of any necessary additional data to support this effort. Once assembled and analyzed, these data could then be provided to SCE's DSM program planners in a way that would maximize their use.

Appendix A

Information Collected During Audit, by Audit Type

Table A-1. Information Collected During the Audit, by Audit Type

Customer Info/Property Info/Basic Construction Info						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
Name, Address	Name, Address (picked up via internet when provide SSA # upon beginning the audit).	Name, Address, Phone, SCE service acct #, mailing address	Name, Address, Phone	Name, Address, Phone	Owner Info: Name, Address, City, State, Zip, Phone, Fax, Email	Client Name, owner vs. buyer, address, phone, fax, email
Time in home this yr	Time in home this yr	Audit Date	Audit Date	Audit Date	Customer Info: same as above	inspection address
Housing Type: SF, MH, MF: low rise, high rise, town/row house	Housing Type: SF, MH, MF: low rise, high rise, town/row house	Bldg Type: SF, Condo/Townhouse; 2, 3,4 Plex; other?	Ann kWh, Summer Peak use, Winter Peak use (kWh), kWh/day	Ann kWh, Summer Peak use, Winter Peak use (kWh), kWh/day	Site info: name, certif name (?), address, city, state, zip	sq ft
Own vs rent	Own vs rent	Number of occupants?	House type: SF, Apartment, MH, Condo	House type: SF, Apartment, MH, Condo	# of zones, year built, # of stories?	age
Yr Built	Yr Built	Year built: <1966, 66-77, 78-82, 83-87, 88-95, 96+	Own vs rent	Own vs rent	Zones 1, 2: std living, sleeping?	# of occupants
Attic/Ceiling Insulation?	Attic/Ceiling Insulation?	Number of stories?	age of home	age of home	Floor type -- crawl, slab, basement?	# of bedrroms
General amt of coverage	General amt of coverage	Conditioned floor area (sq ft): <650, 850-1300, 1300-1600, 1600-2000, 2000-3000, >3000.	Ceiling Ins (in)	Ceiling Ins (in)	Shell Lkg: cfa, volume?	floors (?)
# rms in home	# rms in home	Floor type: raised wood flr, concrete slab, finished basement?	Construction: wood, brick/masonry	Construction: wood, brick/masonry	Use default infiltration y/n?	attached garage y/n
# people in home by group	# people in home by group	Ceiling insulation: R11 or less, R11-19, >R19, DK?	sq ft	sq ft	If no: cfm50, ELA, SLA, air changes/hr?	altitude (ft)
# home during wkday (10 AM to 6 PM)	# home during wkday (12 NOON to 6 PM)		basement: full, crawl space, exposed?	basement: full, crawl space, exposed?	Front azimuth, attached y/n?	house tightness L, A, T
Permanently disabled?	Permanently disabled?		# of people	# of people	General info: climate zone, elec utility co, rate sched, all elec y/n, fuel util co, rate sched, follow-up y/n?	
Low Inc program qualified? Indicate income: <=17,000; 17,001-20,000; 20,001-24,000; 24,001-28,000; 28,001-32,000; 32,001-36,000; 36,001+	Low Inc program qualified? Indicate income: <=17,000; 17,001-20,000; 20,001-24,000; 24,001-28,000; 28,001-32,000; 32,001-36,000; 36,001+					

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Cooling System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
Cooling cost in condo fee?	Cooling cost in condo fee?	Central Air Distr ducts: Y/N?	May ask since an in-home audit and for relevancy of recommendation.	May ask since an in-home audit and for relevancy of recommendation.	Type: No cooling; central AC; direct evap; direct/indir evap; AA Ht pump; room AC	# of systems; fuel type -- ng, elec
Type: central AC; evap cooler; heat pump; central w/evap pre-cool; W/W.	Type: central AC; evap cooler; heat pump; central w/evap pre-cool; W/W.	Type: central AC, hp, window AC, room hp, evap cooler, whole hse fan, none?	Type: central AC, heat pump, room AC, evap (Y/N), #, size: tons, BTU	Type: central AC, heat pump, room AC, evap (Y/N), #, size: tons, BTU	Make, model, serial #, age	system type: split (hp); pkg (hp), split (AC), pkg (AC), swamp cooler
age of central cooling system.	age of central cooling system.	Age: <4 yrs, 4-10, >10 , DK?	Age	Age	Location: garage, attic, crawl space, closet, outside, floor, wall, other	capacity: tons; model #, manufacturer
temp settings (By time of day -- 10-6; evening; bedtime)	temp settings (By time of day -- 10-6; evening; bedtime)		Thermostat setting -- summer?	Thermostat setting -- summer?	Efficiency/SEER: 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, other	condition: satisf, questionable, failed
usage, distinguished by peak vs off peak	usage, distinguished by peak vs off peak		# hrs use/day	# hrs use/day	Distribution Syst Y/N?	age
# window wall units used?	# window wall units used?				Setback Y/N?	air temps: near supply, DB; return, wb; return, db
age of unit most used?	age of unit most used?				Whaole Hse Fan Y/N?	psychrometer proced temp diff.
How often use AC peak/all other times: never/seldom, rarely (20%), sometimes (50%), often (80%).	How often use AC peak/all other times: never/seldom, rarely (20%), sometimes (50%), often (80%).				Capacity?	whole house fan y/n?
# fans used by type: ceiling; portable; whole hse; attic.	# fans used by type: ceiling; portable; whole hse; attic.					
How often use fans by peak/off peak	How often use fans by peak/off peak					

Heating System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
What is the main fuel used to ht home: elec, ng, propane, no heating system.	What is the main fuel used to ht home: elec, ng, propane, no heating system.		Fuel? (exact rpt)	Fuel? (exact rpt)	Make, serial #, model, age	# of systems; Fuel Type: electric, natural gas, oil, LPG (?)
What type of systems are used for main/ addt'l: elec -- resis/baseboard, hp, wall/floor, portable elec, other elec; other -- ng syst, wood stove/fireplace, propane/other; no heating system.	What type of systems are used for main/ addt'l: elec -- resis/baseboard, hp, wall/floor, portable elec, other elec; other -- ng syst, wood stove/fireplace, propane/other; no heating system.	Type: gas furnace, heat pump, elec resis/baseboard, room heat pump, hot water radiator (gas), wall/floor heater (gas), wood or pellet stove, fireplace insert, propane?	Eqpt Type: Resistance, heat pump, portable htrs, furnance.	Eqpt Type: Resistance, heat pump, portable htrs, furnance.	Type: Gas, elec, oil, baseboard, radient, heat pump, propane, boiler gas, other?	Stystem Type: furnace, hydronic, heaat pump; Distribution: central ducted forced air, wall or floor furnace, base board, radiant floor, ceiling.
Temp setting winter?	Temp setting winter?	Age: <4 yrs, 4-10, >10, DK?	Size: Tons, BTU	Size: Tons, BTU	Location: garage, attic, crawlspace, closet, outside, floor, wall?	programmable thermostat y/n?
Temp setting day, eve, bedtime?	Temp setting day, eve, bedtime?		Thermostat setting winter?	Thermostat setting winter?	Capacity?	capacity: BTU; Model #; Manufacturer; age
How many portable elc htrs use?	How many portable elc htrs use?		Setback hrs?	Setback hrs?	Efficiency: AFUE -- .55, .60, .65, .70, .75, .80, .90, .95?	Condition: satisfactory, questionable, failed
How often use main syst in winter: never/seldom, rarely (20%), sometimes (50%), often (80%)	How often use main syst in winter: never/seldom, rarely (20%), sometimes (50%), often (80%)		Age of system?	Age of system?	Efficiency: HSPF -- 5.0, 6.0, 7.0, 8.0, 9.0, 10? Other?	fireplace/wood stove: fuel -- wood, gas; #; doors present y/n?
Heating cost included in condo fee?	Heating cost included in condo fee?					

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Air Distribution (DUCT) System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
			Visual Inspection	Visual Inspection	Duct location (supply, return): conditioned space, attic, crawl space, basement, mixed, other?	distrib: central ducted forced air, window/wall, radiant (for cooling?), floor
			Customer Interview	Customer Interview	Duct area: use default Y/N (?); supply, return; ducts less than 12' Y/N?	duct leakage?
			% of ducts in: attic, full basement, crawl space, garage, living space?	% of ducts in: attic, full basement, crawl space, garage, living space?	Duct location (% area: supply, return): conditioned space, attic, crawl, basement, other?	
			% of access to ducts?	% of access to ducts?	Duct leakage (CFM25): Use default Y/N?; If no, lkg supply, lkg return.	
			Type of ducts in access areas?	Type of ducts in access areas?	Supply duct insulation: none, R1.0, 2.1, 4.2, 6.3, 8.0, 10, other?	
			Evidence of asbestos?	Evidence of asbestos?	Return duct insulation: none, R1.0, 2.1, 4.2, 6.3, 8.0?	
			Location of air handler: attic, full basement, crawl space, garage, living space, roof, outside.	Location of air handler: attic, full basement, crawl space, garage, living space, roof, outside.	Radiant Barrier Y/N?	
					# of supply registers?	
					# of return registers?	
					Duct material: flex, sheet metal, duct board?	

Water Heating						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
Included in condo/rental fee?	Included in condo/rental fee?				Make, model, age	Fuel Type: ng, elec
Elec -- std sep tank, heat pump, tank with solar collect, other	Elec -- std sep tank, heat pump, tank with solar collect, other	Fuel type: ng, elec, solar with elec bkup, propane - bottled gas?	Fuel Type? (exact rpt)	Fuel Type? (exact rpt)	Tank size: 30, 40, 50, 75, 100	storage vol: 30, 40, 50, other (gallons)
Other systems: Nat Gas (tank or solar asst); propane.	Other systems: Nat Gas (tank or solar asst); propane.	Pipe insulation: Y/N?	Type: Tank, demand, size	Type: Tank, demand, size	Type: stograge-gas, storage-electric, storage-heat pump, instant gas, instant elec, other?	energy factor (EF)?
		Low flow devices: Y/N?			Efficiency: EF, .45, .50, .55, .60, .65, other?	external insulating blanket y/n? Inlet y/n?
Age of wtr htr	Age of wtr htr	Tank Blanket Y/N?	Age	Age	RE: .75, .80, .85, .90. Other?	Pipe insulation?
Temp setting (H,M,L)	Temp setting (H,M,L)	Age: <4 yrs, 4-10, >10, DK?	Temp setting	Temp setting	Wrap: None, R4, 6, 12?	Manufacturer; model #
Insulation Wrap	Insulation Wrap		(capture based on rec's made)	(capture based on rec's made)	Distribution: Std, pipe insulation, pt of use, other?	Condition: satisf, questionable, failed
#baths/showers typ wkday (10 AM to 6 PM)	#baths/showers typ wkday (12 NOON to 6 PM)				Auxilliary: none, solar thermosiphon, solar ICS, solar active?	age
Low Flow Shwr hds?	Low Flow Shwr hds?		(capture based on rec's made)	(capture based on rec's made)	Pilot light Y/N?	
					Low Flow Y/N?	

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Constructions/ Construction Information						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
		Wall insulation: none, R11-13, R19, DK?			Wall Hgt, Overhang?	Roof Color: L, M, D
		Floor insulation: Y/N, DK?			Exterior Color: L, M, D?	Ceiling Insulation Thickness (in)?
		Weatherstripping on doors: Y/N, DK?			Bldg Shade: Full, Partial, None?	Cathedral ceilings y/n?
					Exterior Wall: Insulation; Type: 16oc, 24oc, other?	Exterior Walls: cavity insulation thickness (in); perimeter (ft), longest wall length (ft), longest wall direction; color -- L, M, D?
					Garage Wall: Insulation; Type: 16oc, 24oc, plaster, open, other?	Interior Walls: avg hgt (ft); mass wall y/n?
					Ceiling Insulation?	Ground Floor (type): slab, crawl space, heated basement, unhtd basement, insulation thick (in)?
					Type: attic, framed, open beam?	Basement: inside wall ins thick (in), ext wall insulation sheating (in)?
					Frame: 24oc, 16oc, other?	

Windows/Openings Information						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
		Window type: single pane, double pane, mixed?			Glazing: single, dbl, Low E, Low E2, Tint?	Orientation: s, w, e, n (answer the following for windows on each orientation)
		Shade screens: Y/N, DK?			Frame: metal, wood, vinyl, thermal break.	Amt of window: none (<10%), less than avg (~15%), above avg (>20%) - fill in exact % of window amt as a % of wall area if known or use "ranges" listed.
					Interior Shade: blinds: L, M; Drapes: std, roller shade, white, white, dark, other?	Type: single, dual, low-E
					Ext Shade: none, insect screen, ss 28, 32, 36, 40?	Frame type: metal, wood, vinyl
					Door type: wood dolid, wood hollow, metal, metal insulated; W, H?	Film y/n?
						Overhang depth (ft)?
						Fins depth (ft)?

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Washer/Dryer						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
washer Y/N	washer Y/N		fuel?	fuel?	Washer Y/N?	Clothes washer, Dryer Y/N? (answer following for each).
# of loads typ wk?	# of loads typ wk?		type: front, top	type: front, top		Approx age (yrs), location - in hse, garage, outside?
# loads during peak? (10 AM to 6 PM)	# loads during peak? (12 NOON to 6 PM)		age	age		Mfg, model #, vol (ft cubed)?
Water temps used H,W,C?	Water temps used H,W,C?		(capture via rec's made….)	(capture via rec's made….)		Condition: S, Q, F?
dryer Y/N	dryer Y/N					Dryer Only: elec y/n?
dryer fuel: elec, ng; propane/other; none.	dryer fuel: elec, ng; propane/other; none.	Main clothes drying fuel: elec, ng, propane?	fuel?, wattage?, age?	fuel?, wattage?, age?	Dryer: none, gas, elec?	
How many loads dry typical week?	How many loads dry typical week?		(see rec's)	(see rec's)		
How many loads dry during peak? (10 AM to 6 PM)	How many loads dry during peak? (12 NOON to 6 PM)					
Use a clothes line?	Use a clothes line?					

Refrigerator/Freezer						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
# in use	# in use	Refrig 1 - size: small (,13 cu ft), med (13-16), lg (17-20), very lg (>20)?	# of refrigerators	# of refrigerators	Refrigerator Y/N?	Refrig 1, 2: Built in y/n?
Main/2nd refrigerator style: single door, top/bott, side/side	Main/2nd refrigerator style: single door, top/bott, side/side	Refrig 1 - defrost type: auto (frost free), man def, DK?	Type (1, 2, 3): frost free, manual	Type (1, 2, 3): frost free, manual		Mfg, model #, vol (ft cubed)?
Size of first/sec: vs (<13), sm (13-16), md (17-20), lg (>20)	Size of first/sec: vs (<13), sm (13-16), md (17-20), lg (>20)	Refrig 1 - age: <3, 3-10, >10, DK?	Style (1, 2, 3): s/s, top mount.	Style (1, 2, 3): s/s, top mount.		Condition (S, Q, F)?
Defrost type 1st/2nd: auto, partial, manual	Defrost type 1st/2nd: auto, partial, manual	Refrig 2: Being used Y/N?	size (cu. ft) (1, 2, 3)?	size (cu. ft) (1, 2, 3)?		For # 2 only: location -- in hse, garage, outside
Age of 1st/2nd (range)	Age of 1st/2nd (range)	Freezer - Indep: Being used Y/N?	age (1, 2l 3)?	age (1, 2, 3)?		Approx age (yrs)?
# stand alone frzrs?	# stand alone frzrs?		# of freezers?	# of freezers?		Freezer: chest y/n?
style 1st/2nd: upright, chest.	style 1st/2nd: upright, chest.		Type (1, 2, 3): frost free, manual	Type (1, 2, 3): frost free, manual		Mfg, model #, vol (ft cubed)?
size of first/sec: sm (<13), md (13-16), lg (>16)	size of first/sec: sm (<13), md (13-16), lg (>16)		Style (1, 2, 3): chest, vertical	Style (1, 2, 3): chest, vertical		Condition (S, Q, F)?
Type of defrost 1st/2nd: auto, manual	Type of defrost 1st/2nd: auto, manual		size (cu. ft) (1, 2, 3)?	size (cu. ft) (1, 2, 3)?		Approx age (yrs)?
Age of 1st/2nd (range)	Age of 1st/2nd (range)		age (1, 2l 3)?	age (1, 2l 3)?		Location -- in hse, garage, outside?
			OTHER REFRG'TN: bottled water coolers, beer bev coolers, ice machine, wine bev cooler (Y/N, age, size)?	OTHER REFRG'TN: bottled water coolers, beer bev coolers, ice machine, wine bev cooler (Y/N, age, size)?		

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Basic Appliances/ Pool/Spa						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
How often prepare following: brkfst, lnch, dinner?	How often prepare following: brkfst, lnch, dinner?	Main cooking energy: elec stove, ng stove, propane?			Range: None, gas, gas-no pilot light, electric?	Type: Range/oven; oven; cooktop (answer following for each)
Type of range/oven used: combo ng/elec, elec only, ng only, propane/other	Type of range/oven used: combo ng/elec, elec only, ng only, propane/other		Type of range/oven: combo, separate, oven only, stove only.	Type of range/oven: combo, separate, oven only, stove only.		Elec y/n; approx age (yrs); model, mfg, model #?
Use microwave? Y/N	Use microwave? Y/N		Microwave? Y/N Size (S, M, L)	Microwave? Y/N Size (S, M, L)		condition: S, Q, F?
Auto Dishwasher?	Auto Dishwasher?		Dishwasher installed?	Dishwasher installed?		Dishwasher: # of, approx age (yrs)?
# of loads peak and off peak? (10 AM to 6 PM)	# of loads peak and off peak? (12 NOON to 6 PM)		Age/ Booster Heater/ Economy Cycle?	Age/ Booster Heater/ Economy Cycle?		Mfg, model #, vol (ft cubed)?
# of loads typical week?	# of loads typical week?					condition: S, Q, F?
Spa/Hot Tub? Y/N	Spa/Hot Tub? Y/N	Pool: Y/N; If yes, elec htr, gas htr, covered, pool filter?	Spa/Jacuzzi: above, below?	Spa/Jacuzzi: above, below?	Pool/Spa Y/N?	Pool: Y/N?; Spa: Y/N? (answer for ea)
How heated: elec, ng, ng/solar, elec hp, solar elec bkup, propane/other?	How heated: elec, ng, ng/solar, elec hp, solar elec bkup, propane/other?	Spa: Y/N; If yes, cover?	Pool: above, below?	Pool: above, below?	Pool size (sq ft), pool htr, cover y/n?	Heater type: none, ng, elec?
Cover?	Cover?		Motors (1, 2, 3): horsepower, hrs use?	Motors (1, 2, 3): horsepower, hrs use?	Spa htr type: elec, gas?	Heater timer y/n?
How often use winter/summer	How often use winter/summer		(see rec's…)	(see rec's…)	Spa pump size?	Cover y/n ?
How often peak? (10 AM to 6 PM)	How often peak? (12 NOON to 6 PM)				Spa cover y/n?	
Pool? (Y,N, Y -- don't pay for)	Pool? (Y,N, Y -- don't pay for)					
auto pool sweep?	auto pool sweep?					
filter usage, hrs typ day?	filter usage, hrs typ day?					
filter usage, hrs during peak? (10 AM to 6 PM)	filter usage, hrs during peak? (12 NOON to 6 PM)					
How pool heated: not, elec, ng, solar htr/cover/other?	How pool heated: not, elec, ng, solar htr/cover/other?					

Miscellaneous/Other						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
How many each of following: Color TV, B&W TV, VCR, Humidifier, De-humidifier, Stereo system, Aquarium, Heated waterbed, personal computer, well water pump, outdoor spotlights	How many each of following: Color TV, B&W TV, VCR, Humidifier, De-humidifier, Stereo system, Aquarium, Heated waterbed, personal computer, well water pump, outdoor spotlights	Indicate additional appliances: elec blanket, heated water bed, clothes washer, microwave, dishwasher, domestic well pump, portable heater, gas barbecue, other (e.g., electric yard care equip, compressors, etc.)?	No. of: TVs, VCRs, Printers -- laser, other; modems, computers, fax machines, copiers, other, waterbeds, web TV (Y/N)?	No. of: TVs, VCRs, Printers -- laser, other; modems, computers, fax machines, copiers, other, waterbeds, web TV (Y/N)?	Fireplace: none, gas, no fuel?	Faucets: low flow aerators y/n?; low flow showerheads y/n?
Large equipt Y/N?	Large equipt Y/N?	Fireplace: Y/N, if yes -- gas fueled?	PUMPS (Other): # of well pumps, ponds/fountains, large aquariums, irrigation (HP/gal size, hrs used)?	PUMPS (Other): # of well pumps, ponds/fountains, large aquariums, irrigation (HP/gal size, hrs used)?		Toilets Y/N?
Type: 2nd water htr, air compressor, kiln -elec, shop tools, golf cart charger, welding eqpt, other.	Type: 2nd water htr, air compressor, kiln -elec, shop tools, golf cart charger, welding eqpt, other.	Remodel potential?	# of elec motors/compressors (HP, hrs/day)?	# of elec motors/compressors (HP, hrs/day)?		Large lawn Y/N?
			# of humidifiers/air purifiers, elec golf carts, life support eqpt -- type (amps, volts, watts, hrs/day)	# of humidifiers/air purifiers, elec golf carts, life support eqpt -- type (amps, volts, watts, hrs/day)		Auto Irrigation Y/N?
			Lawn mower? Fuel: G/E?	Lawn mower? Fuel: G/E?		
			Hedge Trimmer? Fuel: G/E?	Hedge Trimmer? Fuel: G/E?		

Table A-1. Information Collected During the Audit, by Audit Type (Cont.)

Lighting						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
How describe usage at night: most, some, only rooms in use?	How describe usage at night: most, some, only rooms in use?	Lighting types: incandescent, cfl, full size fluorescent, halogen (torchiere), mercury (outdoor)?	# of CFLs, timer controls, photo cells, motion sensors: indoor, outdoor?	# of CFLs, timer controls, photo cells, motion sensors: indoor, outdoor?		
Types of bulbs in home: std incand, high effic incand, std fluor tubes, halog, cfl	Types of bulbs in home: std incand, high effic incand, std fluor tubes, halog, cfl	Lighting retrofit panel Y/N?	# of high pressure sodiums, halogen floods, mercury vapor: bulbs, fixtures?	# of high pressure sodiums, halogen floods, mercury vapor: bulbs, fixtures?		
			Dimmer Circuit?	Dimmer Circuit?		
			Security Lighting?	Security Lighting?		

NOTES						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Inspectech**
Age, other #'s reported in ranges for mail survey	Age, other #'s reported in ranges for mail survey	Also record SCE Energy Consultant ID info.	Auditor records exact #'s (self-report) not ranges.	Auditor records exact #'s (self-report) not ranges.	Includes a section for auditor notes.	Also a section of auditor comments.
Focus on usage so distinguish between peak and off-peak use	Focus on usage so distinguish between peak and off-peak use	Has space on audit for customer comments.			Also collects info on the rater: date, rater name, rater id#, file name.	A section for listing the inspector's name, id#, the inspect date, phone, email, and fax #.

Appendix B

Comparison of the Types of Measures and Practices Recommended By the Six Audits

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits

Customer Info/Property Info/Basic Construction Info						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Annual energy cost chart	Annual energy cost chart	EE comparison chart -- compares to a home built by today's standards. Covers: air infiltration, ceiling insulation, cooling (AC), heating (furnace), wall insulation, water htg, windows.	Gives info on wx pkgs and CFBs; asks if want info on CHEERS ratings?	Gives info on wx pkgs and CFBs; asks if want info on CHEERS ratings?	Provides EE improvement report with a summary page that lists the EE improvements recommended to the homeowner.	Brief Intro explains to customer how to use report - explains purpose of the report and the benefits of implementing the recommendations. Emphasizes that the recommendations are optional.
Monthly energy usage chart	Monthly energy usage chart	Provides phone # in case customers have Q's: these go to CHEERS first, then to SCE (prior to Energy Wizards?)			For each recommended measure: list the EUL (seem to be more in line with the mortgage length than with the CADMAC/CALMAC approved EULs); annual savings, present value of energy savings; and estimate installed cost or actual bid for the recommended measure. Information based on the specific details gathered at the customer's home. Tom Hamilton can explain details of algorithm's used to derive estimates, etc., if necessary.	Home Energy Efficiency Rating summary -- lists energy improvement measures and gives the following info for each measure: EUL, ann savings est., est. ann cost when financed as part of FHA loan, statewide est. avg cost of improvement, added cost for EE vs std model, greenhouse gas reduction estimate over useful life of measure.
20/20 California Rebate program	20/20 California Rebate program	Energy improvement options covering the end uses indicated below.			Gives initial energy rating and rating after improvements are made. Also, breaks down annual operating costs by end use initially and after improvements are made.	Gives initial energy rating and rating after improvements are made.
Informs participants of SCE rebate programs	Informs participants of SCE rebate programs	Gives info for getting help: SCE call-in #, web site address; CHEERS contact info; recommends using a qualified contractor -- recommends calif. league of homeowners as a resource.			Gives a summary of the existing energy features in the home in the second part of the report as a comparison to the recommendations given on the first page.	Provides a definition list of relevant terminology and a brief explanation of the home energy rating. Also explains each recommendation in more detail with tips and "features to look for" in some measures.
Phone # for assistance on report.	Phone # for assistance on report.	At end of report, gives everyday tips on saving energy and money at home (see end uses below); includes a glossary.				
Information provided on Edison's Customer Asst. Programs; go on-line and save money with Edison@Home Web Site Link.	Information provided on Edison's Customer Asst. Programs; go on-line and save money with Edison@Home Web Site Link.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Cooling System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Cooling Tips: clean your AC filter monthly; put up shading on east, south, and especially west facing windows; keep your drapes or blinds closed on these windows during the day; avoid using appliances such as dishwashers, clothes washers and dryers during the hottest times of the day.	Cooling Tips: clean your AC filter monthly; put up shading on east, south, and especially west facing windows; keep your drapes or blinds closed on these windows during the day; avoid using appliances such as dishwashers, clothes washers and dryers during the hottest times of the day.	Cooling AND Htg systems: reports efficiency of existing equip, then gives improvement (HSPF 8.0 -- heat pump, SEER 10 -- CAC) and the resulting savings.	Set thermostat setting 78 deg or higher; turn off AC when away for an extended period; decrease use of heat gener appliances during day; clean/replace dirty filters; use outside air for cooling when possible; shade windows from direct sunlight; use portable/whole house fans.	Set thermostat setting 78 deg or higher; turn off AC when away for an extended period; decrease use of heat gener appliances during day; clean/replace dirty filters; use outside air for cooling when possible; shade windows from direct sunlight; use portable/whole house fans.	Cooling eqpt upgrade; setback thermostat.	Basic/advanced cooling diagnostic and tune-up.
Increase thermostat temp and estimated annual energy savings range from doing so.	Increase thermostat temp and estimated annual energy savings range from doing so.	Tips: duct testing; consider wx the whole house if address htg and cooling issues b/c poor infiltration will erode possible savings; look for energy star appliances; clean/replace filters regularly.	Other measures: reflective coating; solar screens on windows; attic vents.	Other measures: reflective coating; solar screens on windows; attic vents.	Whole house fan.	Energy Star Central Air Conditioner
Add a whole house fan to reduce AC use -- but, be sure that you have enough attic ventilation to allow a large flow of air to move through the attic. Be sure to seal the fan opening to the attic in the winter with an insulated cover or polyethylene sheet.	Add a whole house fan to reduce AC use -- but, be sure that you have enough attic ventilation to allow a large flow of air to move through the attic. Be sure to seal the fan opening to the attic in the winter with an insulated cover or polyethylene sheet.	Options: Check filter/clean every 30 days.				Programmable Thermostat
Replace your evap cooler and consider an EE model uses less electricity than a std model.	Replace your evap cooler and consider an EE model uses less electricity than a std model.	Set thermostat for htg at 68 deg during the day and 58 deg at night; set the thermostat for AC at 78 degrees or higher.				
Replace your Primary/2nd/3rd room AC and consider that an EE model uses less electricity to operate than a std model.	Replace your Primary/2nd/3rd room AC and consider that an EE model uses less electricity to operate than a std model.	Use ceiling/portable fans with AC; reduce use of heat generating appliances in the day -- e.g. lighting.				
Replace your CAC unit and when you replace it, consider that an EE model uses less electricity to cool your home than a std model.	Replace your CAC unit and when you replace it, consider that an EE model uses less electricity to cool your home than a std model.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Heating System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Lower your heating thermostat setting to 68F.	Lower your heating thermostat setting to 68F.	See above.	Install an auto set back thermostat; install duct insulation.	Install an auto set back thermostat; install duct insulation.	Heating eqpt upgrade.	Basic/Advanced Heating diagnostic tune-up
Tips: Turn thermostat to 55F before going to bed to realize added savings; consider permanently lowering heating thermostat setting to 68F.	Tips: Turn thermostat to 55F before going to bed to realize added savings; consider permanently lowering heating thermostat setting to 68F.		Set thermostat at 68 deg during the day and 58 deg during the night; turn off/down when away for extended periods; close windows; limit use of bath/portable electric heaters; clean/replace dirty filters.	Set thermostat at 68 deg during the day and 58 deg during the night; turn off/down when away for extended periods; close windows; limit use of bath/portable electric heaters; clean/replace dirty filters.		Energy Star gas furnace or heat pump
Note, night set back of thermostat with a heat pump is not recommended. For a heat pump: check the filter monthly, and replace/clean as necessary. Inspect the hp unit once a yr and make sure the hp thermostat is properly matched to your system.	Note, night set back of thermostat with a heat pump is not recommended. For a heat pump: check the filter monthly, and replace/clean as necessary. Inspect the hp unit once a yr and make sure the hp thermostat is properly matched to your system.					(Programmable Thermostat -- see cooling)
Replace your electric heat with a heat pump.	Replace your electric heat with a heat pump.					
Air Distribution (DUCT) System						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
		See above.	Test ducts for lkg; seal ducts; test home for CO.	Test ducts for lkg; seal ducts; test home for CO.	Duct repair	Heating/Cooling Duct Testing/Sealing

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Water Heater						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Lower your water heater setting to 120F; use low flow shower heads and faucet aerators; insulate your water heater with an insulation blanket; insulate the first 6 ft of hot water pipes to the water htr tank if recommended for your water htr model.	Lower your water heater setting to 120F; use low flow shower heads and faucet aerators; insulate your water heater with an insulation blanket; insulate the first 6 ft of hot water pipes to the water htr tank if recommended for your water htr model.	Recommends one or more of the following: upgrade low effic water htr to EF 2.5 heat pump; check tank to see if should add a water htr blanket; add pipe insulation within first 5 ft of the take for hot and cold water; install low-flow faucets and showerheads; install solar water htr tank although suggests is most costly option. Also gives annual savings estimates as ranges OR percentage (up to 60% for the solar water htr tank).	Wrap water htr; insulate hot water pipes; install low flow showerheads and aerators; install a water htr timer; repair leaky faucets/pipes.	Wrap water htr; insulate hot water pipes; install low flow showerheads and aerators; install a water htr timer; repair leaky faucets/pipes.	Water heater upgrade; water heater distribution; water heater wrap.	High Efficiency Gas Water Heater
Replace your electric water heater (if >10 yrs old) -- when looking for a new one consider the most efficient water heater for your money.	Replace your electric water heater (if >10 yrs old) -- when looking for a new one consider the most efficient water heater for your money.	Tips: add insulation depending on age of tank; use low flow showerheads; pipe insulation to 1st five feet for hot and cold lines; suggests benefits and notes high costs of installing solar htr.	Turn down water htr temp to 120 deg; turn heat off/down when away for extended periods.	Turn down water htr temp to 120 deg; turn heat off/down when away for extended periods.	Low-Flow devices.	Faucet flow restrictors; low-flow showerheads.
		Options: set water htr temp at 120 deg.				Water heater pipe insulation.
Constructions/ Construction Information						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Caulking/ Weatherstripping cracks and gaps in the house and around door and windows -- tip.	Caulking/ Weatherstripping cracks and gaps in the house and around door and windows -- tip.	Insulation: indicates type existing (based on default values not actual info per home), how to improve (upgrade to R19 for ceiling, R11 for wall, and R19 for floor) and the resulting range of savings.	Install insulation: ceiling insulation -- R19; wall insulation -- R11; floor insulation.	Install insulation: ceiling insulation -- R19; wall insulation -- R11; floor insulation.	Infiltration reduction.	Attic Insulation; wall insulation; insulation package (wall and attic)
Upgrade your attic insulation -- also provides tips on the recommended level of attic insulation and tips regarding weatherstripping.	Upgrade your attic insulation -- also provides tips on the recommended level of attic insulation and tips regarding weatherstripping.	Provides tips for various insulation alternatives, but does not give specifics based on the existing conditions in the customer's home.	Wx doors/windows; install storm doors/windows; close fireplace dampers.	Wx doors/windows; install storm doors/windows; close fireplace dampers.	Ceiling insulation; wall insulation; floor insulation.	
Remove or cover your window AC to reduce air flow into the house.	Remove or cover your window AC to reduce air flow into the house.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Windows/Openings Information						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
		Windows: gives existing info, improvement (upgrade to double pane AND/OR shading), resulting savings -- shade screens, window replacements.			Window upgrade; sunscreens; door replacement.	Energy Star Windows
		Tips such as using window shades; closing/opening blinds at different times of day; using insulating drapes, installing window shades.				
Washer/Dryer						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Replace your washing machine -- consider that an EE model can reduce energy use by up to 70% and decrease your laundry costs by as much as 2/3. In addition, EE washers can cut water use 30-60% and reduce your detergent use.	Replace your washing machine -- consider that an EE model can reduce energy use by up to 70% and decrease your laundry costs by as much as 2/3. In addition, EE washers can cut water use 30-60% and reduce your detergent use.	Options: consider EE if buy new one; look for Energy Star label; check on rebates; use full loads when washing; drying; use cool/warm water when possible.	Wash full loads; use cool/warm water when possible; operate during cool times of day/eve.	Wash full loads; use cool/warm water when possible; operate during cool times of day/eve.		Energy Star clothes washer*; high-efficiency gas clothes dryer*.
Wash laundry in cold water.	Wash laundry in cold water.		Dry full and consecutive loads; operate during cool times of day/eve; clean lint filter regularly; vent exhaust to outside and check vent/filter regularly.	Dry full and consecutive loads; operate during cool times of day/eve; clean lint filter regularly; vent exhaust to outside and check vent/filter regularly.		
Use an outdoor clothes line.	Use an outdoor clothes line.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Refrigerator/Freezer						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Replace primary/2nd refrigerator (if > 10 yrs old) with efficient model and the estimated annual savings range from doing so.	Replace primary/2nd refrigerator (if > 10 yrs old) with efficient model and the estimated annual savings range from doing so.	Options: if are replacing old refrig, consider buying an EE one. (Verify general recommendations given -- not consistent among lists given to review).	Turn off extra refrig/freezer when not in use; maintain refrig temp at 37-40 deg; maintain freezer temp at 0-10 deg; check door seals; clean condenser coils; keep as full as possible.	Turn off extra refrig/freezer when not in use; maintain refrig temp at 37-40 deg; maintain freezer temp at 0-10 deg; check door seals; clean condenser coils; keep as full as possible.		Energy Star refrigerator*
Recycle old (replaced) refrigerator through SCE's refrigerator recycling program. (In PY2001 informed about Home energy rebates from SCE.)	Recycle old (replaced) refrigerator through SCE's refrigerator recycling program. (In PY2001 informed about Home energy rebates from SCE.)	Review use of 2nd unit and/or freezer unit; turn off extra refrig/freezer when not in use.	Other refrig: turn off when not in use; locate in conditioned space.	Other refrig: turn off when not in use; locate in conditioned space.		
Replace primary/2nd freezer (if > 10 yrs old) with an efficient model (or discard if not an essential use) plus the estimated annual savings range for doing so.	Replace primary/2nd freezer (if > 10 yrs old) with an efficient model (or discard if not an essential use) plus the estimated annual savings range for doing so.	Set refrig temp at 37 to 40 deg and the freezer temp at 0 to 10 deg; check refrig door seals to ensure they are not cracked; clean condenser coils every 6 months; keep refrig full.				
Consider recycling 2nd refrig if use is not absolutely necessary.	Consider recycling 2nd refrig if use is not absolutely necessary.					
Unplug your secondary freezer if its use is not absolutely necessary.	Unplug your secondary freezer if its use is not absolutely necessary.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Basic Appliances/ Pool/Spa						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Replace your dishwasher if it is old, inefficient, or in need of repairs -- consider replacing it with a new energy saving model.	Replace your dishwasher if it is old, inefficient, or in need of repairs -- consider replacing it with a new energy saving model.	Options: Use oven/range self-cleaning feature sparingly and during cool times of the day.	Range/oven/microw: use self cleaning sparingly and during cool times of day/eve; pre-heat only when nec; use microwave/toaster oven for small meals.	Range/oven/microw: use self cleaning sparingly and during cool times of day/eve; pre-heat only when nec; use microwave/toaster oven for small meals.	Pool/Spa cover	Energy Star Dishwasher*
Cover your spa or hot tub when not in use.	Cover your spa or hot tub when not in use.	Turn off dishwasher during dry cycle or use energy saving setting.	Turn off dishwasher during dry cycle; operate during cool times of day/eve; wash full loads.	Turn off dishwasher during dry cycle; operate during cool times of day/eve; wash full loads.		Spa Cover/Pool Cover
Replace your pool pump motor (if > 8 yrs old) and consider an EE model over a std design.	Replace your pool pump motor (if > 8 yrs old) and consider an EE model over a std design.	Turn off home electronics when not in use for extended periods of time.	Turn off home electronics when not in use for extended periods of time.	Turn off home electronics when not in use for extended periods of time.		
Install a timer for your pool filter pump.	Install a timer for your pool filter pump.	Operate pool eqpt during cool times of day/eve and keep pool filters and strainer clean; minimize operating time of pump and pool sweep (4-6 hrs during summer/2-3 hrs during winter).	Waterbeds: make bed with comforter; keep window closed; turn down temperature.	Waterbeds: make bed with comforter; keep window closed; turn down temperature.		
Tip: reduce your water heating use by purchasing a new automatic dishwasher.	Tip: reduce your water heating use by purchasing a new automatic dishwasher.		Pool/Spa/Jacuzzi: operate during cool times of day/eve (bfr 12 pm or after 6pm); minimize operating time of pump and pool sweep; keep filters and strainers clean; cover when not in use.	Pool/Spa/Jacuzzi: operate during cool times of day/eve (bfr 12 pm or after 6pm); minimize operating time of pump and pool sweep; keep filters and strainers clean; cover when not in use.		
A microwave oven is a good way to reduce your cooking costs and may be cheaper than you think -- they use less energy than a std elec range/oven, and they give off less heat.	A microwave oven is a good way to reduce your cooking costs and may be cheaper than you think -- they use less energy than a std elec range/oven, and they give off less heat.					

Table B-1. Comparison of the Types of Measures and Practices Recommended By the Six Audits (Cont.)

Lighting						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Recommendation to switch to CFLs to cut operating costs while holding amount of light constant.	Recommendation to switch to CFLs to cut operating costs while holding amount of light constant.	Options: replace old bulbs with CFLs; check SCE for rebates; turn off unnec or decorative lighting;	Replace incandescent lights with CFBs; install timers/photo cells on security lighting.	Replace incandescent lights with CFBs; install timers/photo cells on security lighting.	Lighting replacement	Screw-in CFLs
Recommendation to use times to switch on indoor lighting at preset times as opposed to leaving them on all night.	Recommendation to use times to switch on indoor lighting at preset times as opposed to leaving them on all night.		Turn off unnecessary or decorative lighting.	Turn off unnecessary or decorative lighting.		Hardwired Fluorescent lights (large and small fixtures).
Recommendation to use motion sensors for outdoor security lights OR automatic photo cells. Simple timers are also recommended as an effective option for this purpose.	Recommendation to use motion sensors for outdoor security lights OR automatic photo cells. Simple timers are also recommended as an effective option for this purpose.					
Miscellaneous/Other						
Mail-In	**Online**	**In-Home Homeowners**	**In-Home Renters**	**Phone-In**	**CHEERS**	**Time-Of-Sale**
Tip: Re -- waterbeds -- cover it with a comforter ea cay; use a polyfoam mattress pad and/or insulate the sides of the bed; don't overfill the waterbed.	Tip: Re -- waterbeds -- cover it with a comforter ea cay; use a polyfoam mattress pad and/or insulate the sides of the bed; don't overfill the waterbed.	Air lkg reduction: identifies various factors that may be affecting air leakage including -- H/C air ducts; windows/frames; wall outlets; exhaust fans; window AC; doors/frames; pipe penetration; fireplaces. Based on audit, gives possible annual savings by reducing air leakage through weatherization.	Pumps (other): operate during cool times of day/eve; repair leaky tanks, pipes, and faucets.	Pumps (other): operate during cool times of day/eve; repair leaky tanks, pipes, and faucets.		Low-Flow Toilets
Modify or replace your waterbed: purchase a "damask" thermal cover and use the water bed htr only on occasional cold spells; retrofit your bed with a custom-made "softside" waterbed with built-in insulative features, which allow you to remove your waterbed htr permanently; consider replacing your waterbed mattress with an air mattress and insulate it with a thermal cover, which will allow you to remove the waterbed heater and lower your electric bill.	Modify or replace your waterbed: purchase a "damask" thermal cover and use the water bed htr only on occasional cold spells; retrofit your bed with a custom-made "softside" waterbed with built-in insulative features, which allow you to remove your waterbed htr permanently; consider replacing your waterbed mattress with an air mattress and insulate it with a thermal cover, which will allow you to remove the waterbed heater and lower your electric bill.	Tip: work with a wx specialist to weatherize home.				Weatherstripping
		Tip: caulk, seal, weatherstrip, all seems, cracks and openings to the outside and possibly can save 10% or more.				

Appendix C

Questionnaire

Name: _____
Address: _____
Telephone Number: _____
Program: _____
ID: _____
Cell: ____
Account Number: _____

Introductory Script

Hello, my name is [FIRST/LAST NAME] from CSRS, calling on behalf of Southern California Edison. I'd like to speak with (INSERT NAME FROM LIST) about their participation in an Energy Survey Program.

INTERVIEWER: Re-introduce yourself if necessary.
(IF RESPONDENT IS NOT AVAILABLE SCHEDULE CALL BACK TIME)

Q: TYPE
(RECORD TYPE OF AUDIT FROM LIST)

1.	On-Line	Quota 120	24 sub quota by 5 weather zones (and 3 kWh levels)
2.	Mail In	Quota 120	24 sub quota by 5 weather zones (and 3 kWh levels)
3.	In-Home	Quota 120	24 sub quota by 5 weather zones (and 3 kWh levels)
4.	Telephone	Quota 120	24 sub quota by 5 weather zones (and 3 kWh levels)
5.	Time-Of-Sale	Quota 120	24 sub quota by 5 weather zones
6.	CHEERS	Quota AMAP	(Assume 10)

Q: INTRO1
(On-Line)
In the year 2000, you participated in an energy efficiency Program operated by Southern California Edison Company. As part of the Program, you obtained, using the Internet, an energy survey questionnaire to collect information about this home at [ADDRESS], the appliances you use, and the way you use them. After completing this energy survey, you returned it to Edison. Afterwards, Edison provided you with a report that listed recommendations for saving energy. The purpose of this telephone interview is to gather information on the effectiveness of this Program.

Q: INTRO2
(Mail-In)
In the year 2000, you participated in an energy efficiency Program operated by Southern California Edison Company. As a part of this Program, Edison mailed an energy survey questionnaire to you at [ADDRESS] to collect information about this home, the appliances you use, and the way you use them. After mailing the completed energy survey to Edison, Edison sent you a list of recommendations about how you could save energy and reduce your electricity bill. The purpose of this telephone interview is to gather information on the effectiveness of this Program.

Q: INTRO3
(IN - HOME)
In the year 2000, you participated in an energy efficiency Program operated by Southern California Edison Company. As part of the Program, a representative of Edison came to your home at [ADDRESS] and conducted an energy survey of this home, the appliances you use, and the way you use them. After completing this energy survey, Edison provided you with a report that contained a list of recommendations for saving energy. The purpose of this telephone interview is to gather information on the effectiveness of this Program.

Q: INTRO4
(TELEPHONE AUDIT)
In the year 2000, you participated in an energy efficiency program operated by Southern California Edison Company. As part of the program, you were interviewed over the telephone by a representative of Edison who conducted an energy survey of this home at [ADDRESS], the appliances you use and the way you use them. After completing this energy audit, Edison mailed to you a list of recommendations for saving energy. The purpose of this telephone interview is to gather information to improve the effectiveness of this Program.

Q: INTRO5
(Time-Of-Sale)
In the year 2000, the house at [ADDRESS] was part of an energy efficiency Program operated by Southern California Edison Company. As part of the Program, an energy survey was conducted at this home. In conjunction with a home inspection, a representative of Inspectech, that was under contract to Edison, came to this home and conducted an energy survey of this home, the appliances used, and the way they were used. After completing this energy survey, Inspectech provided a report that contained a list of recommendations for saving energy. The purpose of this telephone interview is to gather information on the effectiveness of this Program.

Q: INTRO6
(CHEERS)
In the year 2000, you participated in an energy efficiency Program operated by Southern California Edison Company. As part of the Program, you requested that an energy survey be conducted at the home at [ADDRESS]. A representative of the CHEERS Corporation, a non-profit organization working with Edison, came to this address and conducted an energy survey of this home, the appliances you use, and the way you use them. After completing this survey, the CHEERS Corporation provided you with a report that contained a list of recommendations for saving energy. The purpose of this telephone interview is to gather information on the effectiveness of this Program.

General Information

1. Do you recall this energy survey conducted at this [ADDRESS]?

   1 ____ YES
   2 ____ NO
   7 ____ NOT CORRECT ADDRESS – [NQ-Q1]
   8 ____ DON'T KNOW

ASK ONLY IF TIME-OF SALE/CHEERS SAMPLE TYPE and Q1=yes

2. Did you request this energy survey?

   1 ____ YES
   2 ____ NO
   8 ____ DON'T KNOW

ASK ONLY IF TIME-OF SALE/CHEERS SAMPLE TYPE and Q1=yes

3. At the time of the survey, were you in the process of buying, selling, refinancing, or renting this house, or just making improvements?

   1 ____ Buying
   2 ____ Selling
   3 ____ Refinancing
   4 ____ Renting
   5 ____ Making Improvements
   6 ____ NONE OF THE ABOVE
   8 ____ DON'T KNOW
   9 ____ REFUSED

4. Do you recall receiving a list of recommendations to reduce your energy consumption based on this energy survey?

   1 ____ YES
   2 ____ NO → **SKIP TO Q.7**
   8 ____ DON'T KNOW → **SKIP TO Q.7**
   9 ____ REFUSED → **SKIP TO Q.7**

ASK ONLY IF TIME-OF SALE/CHEERS SAMPLE TYPE

5. Who provided this report to you? [DO NOT READ]

   1 ____ UTILITY
   2 ____ ORGANIZATION UNDER CONTRACT TO THE UTILITY
   3 ____ REAL ESTATE AGENT
   4 ____ PREVIOUS OWNER
   8 ____ DON'T KNOW
   9 ____ REFUSED

6. Would you say that you . . .

1 ____ Read the report thoroughly
2 ____ Read some portions of the report
3 ____ Just glanced through it
4 ____ Did not read the report at all
8 ____ DON'T KNOW
9 ____ REFUSED

Habitation

7. Do you live at this residence year round?
(MUST LIVE AT ADDRESS AT LEAST 9 MONTHS OUT OF THE YEAR TO CODE AS "YES")

1 ____ YES
2 ____ NO → **THANK, TERMINATE, NQ.7**

8. When did you move to this address?

____ ____ MONTH

____ ____ ____ ____ YEAR

Q8B. Do you own or rent the home at [INSERT ADDRESS]?

1 ___ Own
2 ___ Rent
8 ___ Don't Know
9 ___ Refused

Q8C. Do you pay your own electric bill or is it included in your mortgage or rental payment each month?

1 Pay Own Electric Bill	**[CONTINUE]**
2 Included in Mortgage and Rental Payment	[**THANK, TERMINATE]**
8 Don't Know	[**THANK, TERMINATE]**
9 Refused	[**THANK, TERMINATE]**

Recollection and Implementation of Audit Recommendations: See Call Sheet for Complete List of Recommendations (Asking a maximum of 45 recommendations per respondent. Exception: In-Home & Telephone are asked a maximum of 49.)

It is our understanding that your energy survey was conducted in (INSERT MONTH FROM SAMPLE) of 2000. I'm going to read a series of recommendations that were made as a result of your energy survey. We would like you to provide up to three pieces of information for each of these recommendations.

IF "YES" TO Q. 4, ASK

R1a. From the list of recommendations you received, do you recall [INSERT FIRST RECOMMENDATION]?

1 ____ YES – RECALL
2 ____ YES – SOMEWHAT RECALL
3 ____ NO
8 ____ DON'T KNOW
9 ____ REFUSED

IF "YES" TO Q. 4, ASK

R1b. Before receiving the list of recommendations, were you aware that [INSERT FIRST RECOMMENDATION] could save energy?

1 ____ YES – AWARE
2 ____ YES – SOMEWHAT AWARE
3 ____ NO
8 ____ DON'T KNOW
9 ____ REFUSED

IF "YES" TO Q. 4, ASK

R1c. IF "NO" OR "DK" OR "RF" TO Q.R1a, SAY: (Even though you don't remember this recommendation,...)

after [INSERT MONTH FROM SAMPLE] of 2000, did you [INSERT FIRST RECOMMENDATION]?

1 ____ YES – COMPLETED
2 ____ YES – IN PROCESS OF COMPLETING
3 ____ NO
4 ____ DONE PRIOR TO SURVEY
5 ____ NO – LANDLORD
7 ____ DOES NOT APPLY
8 ____ DON'T KNOW
9 ____ REFUSED

SKIP TO NEXT RECOMMENDATION

IF "NO", "DON'T KNOW", OR "REFUSED" TO Q.4, ASK

R1d. Even though you don't recall receiving a list of recommendations to reduce your energy consumption, before [INSERT MONTH FROM SAMPLE] of 2000, were you aware that [INSERT FIRST RECOMMENDATION] could save energy?

1 ____ YES – AWARE
2 ____ YES – SOMEWHAT AWARE
3 ____ NO
8 ____ DON'T KNOW
9 ____ REFUSED

IF "NO", "DON'T KNOW", OR "REFUSED" TO Q.4, ASK

R1e. Even though you don't recall receiving a list of recommendations to reduce your energy consumption, did you [INSERT FIRST RECOMMENDATION] after [INSERT MONTH FROM SAMPLE] of 2000?

1 ____ YES – COMPLETED
2 ____ YES – IN PROCESS OF COMPLETING
3 ____ NO
4 ____ DONE PRIOR TO SURVEY
5 ____ NO – LANDLORD
7 ____ DOES NOT APPLY
8 ____ DON'T KNOW
9 ____ REFUSED

SKIP TO NEXT RECOMMENDATION

COMPLETE R1a-c FOR EACH RECOMMENDATION, ONCE ALL RECOMMENDATIONS HAVE BEEN COMPLETED CONTINUE

IF ANY RECOMMENDATIONS HAVE BEEN IMPLEMENTEDTHEN CONTINUE; OTHERWISE GO TO PROGRAM SATISFACTION INSTRUCTIONS.

9. Did the implementation of **any of these** recommendations, cost any money?

1 ____ YES
2 ____ NO → **SKIP TO PROGRAM SATISFACTION INSTRUCTIONS**
8 ____ DON'T KNOW → **SKIP TO PROGRAM SATISFACTION INSTRUCTIONS**
9 ____ REFUSED → **SKIP TO PROGRAM SATISFACTION INSTRUCTIONS**

10. What percent of the cost of implementing any of these recommendations was covered by alternate sources of money such a rebates and bank loans?

____ ____ ____ PERCENT
888 DON'T KNOW
999 REFUSED

IF PERCENT IN QUESTION Q10 IS GREATER THAN 0, CONTINUE; OTHERWISE GO TO PROGRAM SATISFACTION INSTRUCTIONS.

11. Can you please tell me the sources of that funding?

1 ____ BANK LOAN
2 ____ REBATE FROM UTILITY
3 ____ REBATE FROM MANUFACTURER
4 ____ REBATE FROM RETAILER
5 ____ OTHER (PLEASE SPECIFY: _____)
8 ____ DON'T KNOW
9 ____ REFUSED

Program Satisfaction

IF RESPONDENT PARTICIPATED IN THE MAIL-IN AUDIT THEN GO TO S1, ELSE
IF RESPONDENT PARTICIPATED IN THE ON-LINE AUDIT THEN GO TO S2, ELSE
IF RESPONDENT PARTICIPATED IN THE IN-HOME AUDIT THEN GO TO S3, ELSE
IF RESPONDENT PARTICIPATED IN THE TELEPHONE AUDIT THEN GO TO S4, ELSE
IF RESPONDENT PARTICIPATED IN THE TOS AUDIT THEN GO TO S5, ELSE
IF RESPONDENT PARTICIPATED IN THE CHEERS AUDIT THEN GO TO S6.

S1. Now, I'll read you a series of statements about the Mail-In Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c; If Q4=1 and Q6=1, 2, or 3, ask d, e, f, g; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The energy survey that was mailed to my house was easy to follow and complete						
b. The amount of time to complete the energy survey was about right						
c. The energy survey report was delivered to me in a timely manner						
d. The energy survey report was easy to understand						
e. The recommendations in the energy survey report were relevant to my house						
f. The information contained in the energy survey report was informative						
g. In general, the energy savings associated with the recommendations were believable						

S2. Now, I'll read you a series of statements about the On-Line Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c; If Q4=1 and Q6=1, 2, or 3, ask d, e, f, g; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The energy survey that I completed on the Internet was easy to follow and complete						
b. The amount of time to complete the energy survey was about right						
c. The energy survey report was delivered to me in a timely manner						
d. The energy survey report was easy to understand						
e. The recommendations in the energy survey report were relevant to my house						
f. The information contained in the energy survey report was informative						
g. In general, the energy savings associated with the recommendations were believable						

S3. Now, I'll read you a series of statements about the In-Home Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c, d; If Q4=1 and Q6=1, 2, or 3, ask e, f, g, h; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The energy survey was scheduled within a reasonable time frame						
b. The auditor who came to my home was courteous						
c. The amount of time to complete the energy survey was about right						
d. The energy survey report was delivered to me in a timely manner						
e. The energy survey report was easy to understand						
f. The recommendations in the energy survey report were relevant to my house						
g. The information contained in the energy survey report was informative						
h. In general, the energy savings associated with the recommendations were believable						

S4. Now, I'll read you a series of statements about the Telephone Audit Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c; If Q4=1 and Q6=1, 2, or 3, ask d, e, f, g; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The person who conducted the telephone energy survey was courteous						
b. The amount of time to complete the energy survey was about right						
c. The energy survey report was delivered to me in a timely manner						
d. The energy survey report was easy to understand						
e. The recommendations in the energy survey report were relevant to my house						
f. The information contained in the energy survey report was informative						
g. In general, the energy savings associated with the recommendations were believable						

S5. Now, I'll read you a series of statements about the TOS Audit Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c, d; If Q4=1 and Q6=1, 2, or 3, ask e, f, g, h; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The energy survey was scheduled within a reasonable time frame						
b. The inspector who came to my home was courteous						
c. The amount of time to complete the energy survey was about right						
d. The energy survey report was delivered to me in a timely manner						
e. The energy survey report was easy to understand						
f. The recommendations in the energy survey report were relevant to my house						
g. The information contained in the energy survey report was informative						
h. In general, the energy savings associated with the recommendations were believable						

S6. Now, I'll read you a series of statements about the CHEERS Program. For each statement, please tell me whether you strongly disagree, disagree, agree, or strongly agree. [If Q1=1 ask a, b, c, d; If Q4=1 and Q6=1, 2, or 3, ask e, f, g, h, i; otherwise skip to Attitudes section]

	SD 1	D 2	A 3	SA 4	DK -8	Refused -9
a. The energy survey was scheduled within a reasonable time frame						
b. The auditor who came to my home was courteous						
c. The amount of time to complete the energy survey was about right						
d. The energy survey report was delivered to me in a timely manner						
e. The energy survey report was easy to understand						
f. The recommendations in the energy survey report were relevant to my house						
g. The information contained in the energy survey report was informative						
h. In general, the energy savings associated with the recommendations were believable						
i. The cost for the CHEERS rating was worth the recommendations I received regarding energy efficiency.						

Attitudes

People have different opinions about energy efficiency and the availability of natural resources such as energy. Using a 10-point scale, with a "1" meaning you "Strongly Disagree" and a "10" meaning you "Strongly Agree," please tell me how much you disagree or agree with each of the following statements [ROTATE STATEMENTS]

		Strongly Disagree									Strongly Agree	Don't Know
a.	My life is too busy to worry about making energy related improvements to my home.	1	2	3	4	5	6	7	8	9	10	-8
b.	Scarce energy supplies will be a major problem in the future											
c.	Instead of building new power plants, customers should use less electricity											
d.	It is possible to save energy without sacrificing comfort by being energy efficient											
e.	It is worth it to me for my household to use less energy in order to help preserve the environment											
f.	Conservation efforts helped reduce the effects of the energy crisis during the summer of 2001											

Awareness

12. Have you ever seen or heard of ENERGY STAR?

1 ____ YES
2 ____ NO [SKIP TO Q13A]
8 ____ DON'T KNOW [SKIP TO Q13A]

13. What is your understanding of what it means? [DO NOT READ]

1 ____ SAVES ENERGY/USES LESS ENERGY
2 ____ LESS HARMFUL; TO THE ENVIRONMENT, LESS POLLUTION
3 ____ COSTS LESS TO OPERATE, SAVES MONEY ON ELECTRIC BILL
4 ____ REBATE AVAILABLE IF YOU PURCHASE ENERGY STAR APPLIANCE
5 ____ IT'S A GOVERNMENT STANDARD FOR ENERGY EFFICIENT EQUIPMENT
6 ____ OTHER (PLEASE SPECIFY: _____)
8 ____ DON'T KNOW

[SKIP TO Q14]

13A. ENERGY STAR is a label or symbol applied to or associated with appliances and products. It's usually blue and green and has the word "Energy" and a picture of a star on it. It's NOT the yellow Energy Guide sticker you find on appliances such as refrigerators and water heaters. **Hearing this description, now do you recall ever seeing or hearing about ENERGY STAR?**

1____Yes
2____No
8____Don't know

14. Over the years, the electric utilities and others, including the State of California, have offered a variety of energy conservation programs such as energy surveys. They have also offered energy efficiency programs that have provided rebates for such items as energy efficient refrigerators and insulation. Not counting the program we have been talking about, are you aware of any other energy conservation or energy efficiency programs?

1 ____ YES
2 ____ NO → **SKIP TO Q18**
8 ____ DON'T KNOW → **SKIP TO Q18**

15. What programs do you recall? IF PROGRAM NAMES GIVEN, RECORD VERBATIM. OTHERWISE CODE RESPONSES BY PROGRAM TYPE. DO NOT READ. CHECK ALL THAT APPLY]

01 REBATES [SPECIFY APPLIANCE/PRODUCT: [_____]
02 PRODUCT GIVE-AWAY/TURN-IN EVENT (CFLS, TORCHIERES)
03 REFRIGERATOR TURN-IN/RE-CYCLING
04 HOME REPAIR/RETROFIT (INSULATION, WINDOWS, ETC.)
05 ENERGY EFFICIENT MORTGAGES
06 ENERGY SURVEY/AUDIT DELIVERED ON-SITE
07 ENERGY SURVEY/AUDIT DELIVERED THROUGH THE MAIL
08 ENERGY SURVEY/AUDIT DELIVERED OVER THE TELEPHONE
09 ENERGY SURVEY/AUDIT DELIVERED VIA THE INTERNET
10 ENERGY SURVEY/AUDIT DELIVERED AT THE TIME OF SALE
11 NEW CONSTRUCTION
61 OTHER 1 (specify) _____
62 OTHER 2 (specify) _____
63 OTHER 3 (specify) _____
64 OTHER 4 (specify) _____
88 DON'T KNOW
99 REFUSED

Participation in DSM Programs

16. Have you participated in any of those programs you just mentioned within the past three years?

1 ____ YES
2 ____ NO → **SKIP TO Q18**
8 ____ DON'T KNOW → **SKIP TO Q18**
9 ____ REFUSED → **SKIP TO Q18**

17. In which year(s) did you participate, who was the sponsor, and did you receive a rebate?

A1. Year of first mention: _____
A2. Sponsor: 1 SCE 2 SoCal Gas 3 Other(_____) -8 Don't Know -9 Refused
A3. Rebate? 1 Yes (CONTINUE) 2 No -8 Don't Know -9 Refused

A4. For what did you receive this rebate? [DO NOT READ]

01__ Attic Insulation
02 __Central AC
03 __Central Heat Pump
04 __Efficient Water Heater
05 __ Gas Furnace
06 _ Evaporative Cooler
07 __ High Performance Windows
08 __ Programmable Thermostats
09 __ Room Air Conditioner
10 __ Refrigerator
11 __ Water Heater
12 __ Water Heater Pipe Insulation
13 __ Wall Insulation
14 __ Water-Saving Shower Heads
15 __ Whole House Fan
16 __ Swimming Pool Items (TIMERS/HEATERS/VACUUM CLEANERS, ETC.)
17 Dishwasher
18 Oven
77 OTHER (SPECIFY)
88 DON'T KNOW
99 REFUSED

B1. Year of second mention _____
B2. Sponsor: 1 SCE 2 SoCal Gas 3 Other(_____) -8 Don't Know -9 Refused
B3. Rebate? 1 Yes (Continue) 2 No -8 Don't Know -9 Refused
B4. For what did you receive this rebate? [DO NOT READ]

01__ Attic Insulation
02 __Central AC
03 __Central Heat Pump
04 __Efficient Water Heater
05 __ Gas Furnace
06 _ Evaporative Cooler
07 __ High Performance Windows
08 __ Programmable Thermostats
09 __ Room Air Conditioner
10 __ Refrigerator
11 __ Water Heater
12 __ Water Heater Pipe Insulation
13 __ Wall Insulation
14 __ Water-Saving Shower Heads
15 __ Whole House Fan
16 __ Swimming Pool Items (TIMERS/HEATERS/VACUUM CLEANERS, ETC.)
17 Dishwasher
18 Oven
77 OTHER (SPECIFY)
88 DON'T KNOW
99 REFUSED

C1. Year of third mention _____
C2. Sponsor: 1 SCE 2 SoCal Gas 3 Other(_____) -8 Don't Know -9 Refused
C3. Rebate? 1 Yes (Continue) 2 No -8 Don't Know -9 Refused
C4. For what did you receive this rebate? [DO NOT READ]

01__ Attic Insulation
02 __Central AC
03 __Central Heat Pump
04 __Efficient Water Heater
05 __Gas Furnace
06 _ Evaporative Cooler
07 __ High Performance Windows
08 __ Programmable Thermostats
09 __ Room Air Conditioner
10 __ Refrigerator
11 __ Water Heater
12 __ Water Heater Pipe Insulation
13 __ Wall Insulation
14 __ Water-Saving Shower Heads
15 __ Whole House Fan
16 __ Swimming Pool Items (TIMERS/HEATERS/VACUUM CLEANERS, ETC.)
17 Dishwasher
18 Oven
77 OTHER (SPECIFY)
88 DON'T KNOW
99 REFUSED

Internet Access

18. Do you have access to the Internet?

1 ____ YES
2 ____ NO → **SKIP TO Q20**
8 ____ DON'T KNOW → **SKIP TO Q20**
9 ____ REFUSED → **SKIP TO Q20**

19. *From where* do you have access to the Internet?
[READ AND CHECK ALL THAT APPLY]

01 ____ HOME
02 ____ OFFICE
03 ____ SCHOOL
04 ____ LIBRARY
05 ____ FRIEND'S/NEIGHBOR'S HOUSE
06 ____ CAFE
07 ____ OTHER
88 ____ DON'T KNOW
99 ____ REFUSED

Demographics Characteristics

20. What type of home do you live in?

IF MENTION CONDOMINIUM OR TOWNHOUSE, PROBE BY RE-READING LIST.

1 ____ Single family **attached** home
2 ____ Single family **detached** home
3 ____ An Apartment with **less** than 5 units **[SKIP TO Q23]**
4 ____ An Apartment with five or **more** units **[SKIP TO Q23]**
5 ____ Mobile home
7 ____ OTHER [PLEASE SPECIFY] _____
8 ____ DON'T KNOW **[SKIP TO Q23]**
9 ____ REFUSED **[SKIP TO Q23]**

21. In what year was your home built?

____ ____ ____ ____ YEAR [SKIP TO Q23]

88 DON'T KNOW [CONTINUE]
99 REFUSED [SKIP TO Q23]

22. Was it built . . . [READ RANGE]?

0 ____ Within the last five years (i.e., since 1997)
1 ____ Between 1992 and 1996
2 ____ Between 1987 and 1991
3 ____ Between 1982 and 19864 ____ Between 1977 and 1981?
5 ____ Between 1960 and 1976
6 ____ Between 1940 and 1959
7 ____ Before 1940
8 ____ DON'T KNOW
9 ____ REFUSED

23. How many square feet of living space do you now have?

_____ SQUARE FEET [SKIP TO Q25]

88 DON'T KNOW [CONTINUE]
99 REFUSED [SKIP TO Q25]

24. Is it . . . [READ]

01 ____ Less Than 800
02 ____ 800 to less than 1,000
03 ____ 1,000 to less than 1,250
04 ____ 1,250 to less than 1,500
05 ____ 1,500 to less than 1,750
06 ____ 1,750 to less than 2,000
07 ____ 2,000 to less than 2,250
08 ____ 2,250 to less than 2,750
09 ____ 2,750 to less than 3,000
10 ____ 3,000 to less than 3,500
11 ____ 3,500 to less than 4,000
12 ____ Or over 4,000
88 ____ DON'T KNOW
99 ____ REFUSED

25. How many people live at this residence?

_____ NUMBER OF PEOPLE
88 DON'T KNOW [SKIP TO Q27]
99 REFUSED [SKIP TO Q27]

26. In terms of the ages of these residents [INSERT NUMBER OF PEOPLE IN HOUSEHOLD], [READ]

a. How many are 17 years or younger? _____
b. How many are between 18 and 59? _____
c. How many are 60 or over? _____

88 = Don't Know
99 = Refused

27. What is the approximate annual household income from all sources in 2001, before taxes? This information will be kept confidential.

01 ____ Under $15,000
02 ____ $15,000 to less than $20,000
03 ____ $20,000 to less than $25,000
04 ____ $25,000 to less than $30,000
05 ____ $30,000 to less than $40,000
06 ____ $40,000 to less than $50,000
07 ____ $50,000 to less than $75,000
08 ____ $75,000 to less than $100,000
09 ____ $100,000 to less than $150,000
10 ____ Over $150,000
99 ____ REFUSED

28. What is the highest level of education you have completed? **READ IF NECESSARY**

0 ____ Less than High School
1 ____ Some High School
2 ____ High School Graduate
3 ____ Trade or Technical School
4 ____ Some College
5 ____ College Graduate
6 ____ Some Graduate School
7 ____ Graduate Degree
8 ____ DON'T KNOW
9 ____ REFUSED

29. Which of the following ***best*** describes your racial or ethnic background? **[ONE ANSWER ONLY]** READ LIST

1 ____ Hispanic
2 ____ African American
3 ____ Caucasian
4 ____ Asian American
5 ____ Native American
6 ____ Multi-racial
7 ____ OTHER (PLEASE SPECIFY: _____)
8 ____ DON'T KNOW
9 ____ REFUSED

Thank you very much for your time and your help.

Appendix D

Sample Disposition

Table J-1. Sample Disposition

Resolved Sample	
Completes	639
Refusals	282
Other Language	28
Terminates	160
Disconnects	286
Business Number	34
Spanish	83
Blocked Number	60
Hard of Hearing	7
Deceased	24
Wrong Number	270
Modem	69
Other Non-Interview	116
NQ Resolved	
Q.7 NO (Not year around residence)	34
Q.8c Electric bill included in mortage/rental payment	5
Q.8c Don't know	3
Q.8c Refused	3
Q.1 Not current address	112
Not Resolved	
No answer, busy, callbacks, answering machine	2,705
Total	4,920

Table J-2. Completion Rates

Completion Rates	Percent
Pool Efficiency Rate	85.4%
Gross Completion Rate	13.0%
Eligible Completion Rate	51.4%

Appendix E

Effective Useful Lives for Residential Measures

Table E-1. Effective Useful Life Values for Major Residential Energy Efficiency Measures

End Use	Measure	EUL
LIGHTING	CF SCREW-IN DISPOSABLE (INTEGRAL)	6.0
LIGHTING	CF HARDWIRE FIXTURE (MODULAR)	20.0
LIGHTING	INDOOR FIXTURES	20.0
LIGHTING	OUTDOOR FIXTURES	20.0
LIGHTING	TORCHIERE	9.4
LIGHTING	FLUORESCENT FIXTURES	17.0
LIGHTING	LIGHTING - RCP	16.0
MISCELLANEOUS	WHOLE HOUSE ENERGY USE	19.0
MISCELLANEOUS	ENERGY USAGE PROFILE AUDIT	1.0
MISCELLANEOUS	LOCAL GOVERNMENT INITIATIVES (Residential Housing)	38.6
MISCELLANEOUS	OTHER - RCP	10.0
MISCELLANEOUS	AUDITS	3.0
MISCELLANEOUS	INFORMATION	1.0
REFRIGERATION	REFRIGERATOR - HIGH EFFICIENCY	15.0
REFRIGERATION	SPARE REFRIGERATOR RECYCLING	6.0
SPACE CONDITIONING	AIR CONDITIONERS - CENTRAL HIGH EFFICIENCY	18.0
SPACE CONDITIONING	EVAPORATIVE COOLER	7.0
SPACE CONDITIONING	GLAZING - LOW E DOUBLE / LOW SHADE COEFFICIENT	25.0
SPACE CONDITIONING	HEAT PUMP - ELECTRIC	18.0
SPACE CONDITIONING	INSULATION FOR CEILING / FLOOR	25.0
SPACE CONDITIONING	INSULATION FOR WALLS	25.0
SPACE CONDITIONING	A/C WITH INTEGRATED WATER HEATING	15.0
SPACE CONDITIONING	ADVANCED HVAC TUNE UP	18.0
SPACE CONDITIONING	BASIC HVAC DIAGNOSTIC TUNE UP	10.0
SPACE CONDITIONING	PROGRAMABLE THERMOSTAT	12.0
SPACE CONDITIONING	INSULATION PACKAGE	25.0
SPACE CONDITIONING	DUCT TESTING (AND SEALING)	25.0
SPACE CONDITIONING	ROOM A/C	15.0
SPACE CONDITIONING	ADVANCED HVAC DIAGNOSTIC TUNE UP	15.0
SPACE CONDITIONING	HVAC / REFRIGERATION - RCP	20.0
SPACE CONDITIONING	RESIDENTIAL GAS A/C	25.0
WASHER*	CLOTHES WASHER - HORIZONTAL AXIS	14.0
WASHER*	DISHWASHER	13.0
WATER HEATING	INSULATION FOR PIPE	15.0
WATER HEATING	SHOWERHEAD - ENERGY EFFICIENT	10.0
WATER HEATING	WATER HEATER - EFFICIENT GAS	13.0
WATER HEATING	WATER HEATER CONTROLS	15.0

Appendix F

Expansion and Relative Weights

Table F-1. Expansion Weights, by Audit Type and Weather Zone

	CEC Weather Zones					
kWh	**Coastal & LA Basin**	**Valley & Inland Empire**	**Joaquin & High Desert**	**Low Desert**	**Mountain**	**Total**
In-Home						
Low	29	25	31	30	1	116
Medium	29	27	29	30	1	116
High	29	25	22	31	1	107
Total	86	77	81	91	3	338
Telephone						
Low	12	13	16	18	n/a	58
Medium	14	13	15	15	n/a	58
High	14	14	15	n/a	n/a	44
Total	41	41	47	33	0	160
Mail-In						
Low	n/a	122	n/a	n/a	1	123
Medium	221	248	239	226	1	935
High	223	236	225	221	1	907
Total	444	606	464	447	3	1965
On-Line						
Low	14	15	16	n/a	1	45
Medium	16	14	17	15	1	62
High	17	16	15	11	1	59
Total	46	45	47	26	3	166
TOS						
Low						0
Medium						0
High						0
Total	28	28	28	0	0	85
CHEERS						
Low						0
Medium						0
High						0
Total	1.000	0	0	0	0	1.000

Table F-2. Relative Weights, by Audit Type

	CEC Weather Zones					
kWh	**Coastal & LA Basin**	**Valley & Inland Empire**	**Joaquin & High Desert**	**Low Desert**	**Mountain**	**Total**
In-Home						
Low	0.47	0.41	0.50	0.49	0.02	1.90
Medium	0.47	0.44	0.47	0.50	0.02	1.90
High	0.47	0.40	0.36	0.50	0.02	1.75
Total	1	1	1	1	0	5.55
Telephone						
Low	0.20	0.21	0.26	0.29	n/a	0.96
Medium	0.23	0.22	0.25	0.25	n/a	0.95
High	0.23	0.24	0.25	n/a	n/a	0.71
Total	1	1	1	1	n/a	2.63
Mail-In						
Low	n/a	2.00	n/a	n/a	0.02	2
Medium	3.62	4.07	3.92	3.71	0.02	15
High	3.66	3.87	3.69	3.63	0.02	15
Total	7	10	8	7	0	32.21
On-Line						
Low	0.22	0.25	0.26	n/a	0.02	n/a
Medium	0.26	0.23	0.27	0.25	0.02	1
High	0.27	0.26	0.24	0.17	0.02	1
Total	1	1	1	0	0	1.99
TOS						
Low	n/a	n/a	n/a	n/a	n/a	n/a
Medium	n/a	n/a	n/a	n/a	n/a	n/a
High	n/a	n/a	n/a	n/a	n/a	n/a
Total	0.47	0.46	0.46	0.00	0.00	1.39
CHEERS						
Low	n/a	n/a	n/a	n/a	n/a	n/a
Medium	n/a	n/a	n/a	n/a	n/a	n/a
High	n/a	n/a	n/a	n/a	n/a	n/a
Total	0.016	0.00	0.00	0.00	0.00	0.016

Appendix G

Statistical Precision Table

Table G-1. Precision for Different Proportions, by Audit Type[1]

Proportion	Mail-In (n=126)	On-Line (n=126)	In-Home (n=127)	Telephone (n=132)	Time-Of-Sale (n=120)	CHEERS (n=8)
5% or 95%	0.0319	0.0308	0.0312	0.0301	0.0321	0.1011
10% or 90%	0.0439	0.0424	0.0430	0.0414	0.0442	0.1392
15% or 85%	0.0522	0.0505	0.0512	0.0493	0.0527	0.1657
20% or 80%	0.0585	0.0566	0.0573	0.0552	0.0590	0.1856
25% or 75%	0.0633	0.0613	0.0621	0.0598	0.0639	0.2009
30% or 70%	0.0670	0.0648	0.0657	0.0632	0.0676	0.2126
35% or 65%	0.0697	0.0675	0.0684	0.0658	0.0703	0.2213
40% or 60%	0.0716	0.0693	0.0702	0.0676	0.0723	0.2273
45% or 55%	0.0727	0.0704	0.0713	0.0687	0.0734	0.2308
50%/50%	0.0731	0.0707	0.0717	0.0690	0.0737	0.2320

[1] Note that these precision estimates are adjusted in cases where the sample is a significant fraction of the population. In such cases, this adjustment produces greater precision.

Appendix H

Data Documentation

Table H-1. File Documentation

Code	Input File(s)	Output Files	Purpose
In-Home Audit			
Regular01.sas	Ih00yaud.sas7bdata Renters.sas7bdat	In_Home.sas7bdat (Renamed from Ih00yaud_v1.sas7bdat)	Merges renter identifier with main file to create master in-home audit file.
Regular02.sas	In_Home.sas7bdat Ems00k.sas7bdat	Ih_Regular_v1.sas7bdat	Selects regular (i.e., non-phone) customers and merges with weather and billing data.
Regular04.sas	IH_Regular_v1.sas7bdat	In_Home_Sample_v1.sas7bdat In_Home_Sample_v2.sas7bdat	Selects stratified random sample and creates separate sample file.
DBSMS	In_Home_Sample_v2.sas7bdat	In_Home_Sample_v2.xls	Creates Excel file for survey house
Telephone Audit			
Regular01.sas	Ih00yaud.sas7bdata Renters.sas7bdat	In_Home.sas7bdat (Renamed from Ih00yaud_v1.sas7bdat)	Merges renter identifier with main file to create master in-home audit file.
Tel01.sas	In_Home.sas7bdat Ems00k.sasbdat	IH_Phone_v1.sas7bdat	Selects phone audit customers and merges with weather and billing data.
Tel03.sas	IH_Phone_v1.sas7bdat	Tel_Inhome_Sample.v1.sas7bdat Tel_Inhome_Sample.v2.sas7bdat	Selects stratified random sample and creates separate sample file.
DBSMS	Tel_InHome_Sample_v2.sas7bdat	Tel_InHome_Sample_v2.xls	Creates Excel file for survey house

Table H-1. File Documentation (Cont.)

Code	Input File(s)	Output Files	Purpose
Mail-In Audit			
Copy01.sas	See Figure H-3	See Figure H-3	Copy all xpt files into sas7bdat files
Mail02.sas	See Figure H-3	Mailin_OnLine.sas7bdat (Renamed from Population.sas7bdat)	Concatenates all files into master file.
Mailin03.sas	Mailin_online.sas7bdat Ems00k.sas7bdat	Mailin_v1.sas7bdat	Selects mail audit customers and merges with weather and billing data
Mailin04.sas	Mailin_v1.sas7bdat	Mail_Sample_v1. sas7bdat Mail_Sample_v2. sas7bdat	Selects stratified random sample and creates separate sample file.
DBSMS	Mail_Sample_v2.sas7bdat	Mail_Sample_v2.xls	Creates Excel file for survey house
On-Line Audit			
Copy01.sas	See Figure H-4	See Figure H-4	Copy all xpt files into sas7bdat files
Mail02.sas	See Figure H-4	Mailin_OnLine.sas7bdat (Renamed from Population.sas7bdat)	Concatenates all files into master file.
Web02.sas	Mailin_online.sas7bdat Ems00k.sas7bdat	On_Line_v1.sas7bdat	Selects on-line audit customers and merges with weather and billing data
Web04.sas	On_Line_v1.sas7bdat	On_Line_Sample_v1.sas7bdat On_Line_Sample_v1.sas7bdat	Selects stratified random sample and creates separate sample file.
DBSMS	On_Line_Sample_v2.sas7bdat	On_Line_Sample_v2.xls	Creates Excel file for survey house

Table H-1. File Documentation (Cont.)

Code	Input File(s)	Output Files	Purpose
TOS Audit			
TOS02.sas	TOS.sas7bdat (renamed from TOS00_CSS_Matched_Client_Recom.sas7bdat) Ems00k.sas7bdat	TOS_v1.sas7bdat	Merges master file with weather and billing data.
TOS04.sas	TOS_v1.sas7bdat	TOS_Sample_v1.sas7bdat TOS_Sample_v2.sas7bdat	Selects stratified random sample and creates separate sample file.
DBSMS	TOS_Sample_v2.sas7bdat	TOS_Sample_v2.xls	Creates Excel file for survey house
Accounts Sent to SCE			
Account01.sas	Ih00yaud_v1.sas7bdat Population.sas7bdat TOS00_CSS_Matched_Client_Recom.sas7bdat	Inhome_accounts.sas7bdat Mail_Online_Accounts.sas7bdat TOS_accounts.sas7bdat	Creates sas files with accounts for all participants that were passed to SCE for merging with billing and weather data.
Delanius-Hodge Application			
WB03.sas	Ems00k.sas7bdat	N/A	Determines strata boundaries using Delanius-Hodge technique.
Characteristics of Audits			
N/A	Recommendations By Audit and Year(v1).xls	N/A	Compares present and prior audits in terms of portfolios of possible recommendations

Table H-1. File Documentation (Cont.)

Code	Input File(s)	Output Files	Purpose
DBSMS	Dave.xls (act_meas_descript.xls & inact_meas_descript.xls) PY2000.xls	Dave.sas7bdat PY2000.sas7bdat	Takes all active and inactive measures provided by XENERGY and combines to list of all unique measures recommended in the PY2000 mail and on-line audit
varmatch01.sas	PY2000.sas7bdat Dave.sas7bdat	N/A	Counts unique recommendations for the mail and on-line audits
N/A	Variable Matching Mail In On Line V1.xls	N/A	Matches dave.xls and PY2000.xls in terms of recommendations.
Sample Design & Weights			
N/A	Sample Design and Weights(v3A).xls	N/A	Creates strata populations, target completions, and cell codes
N/A	Gensamp Residential Audits.xls	N/A	Determines sample sizes and expected precision of estimates
N/A	Audit Codes For CSRS(V4).xls	N/A	Creates numeric codes for each recommendation, for each audit type.
Analysis Files			
All01_New_C.sas	Ems00k.sas7bdat Inhome.sas7bdat Telephone.sas7bdat Online.sas7bdat Mailin.sas7bdat Cheers.sas7bdat Timeofsale.sas7bdat	All_Alt04.sas7bdat	Merges all survey files and kWh data into a master file and calculates adoption ratios.

Table H-1. File Documentation (Cont.)

Code	Input File(s)	Output Files	Purpose
All02_Alt.sas	All_Alt04.sas7bdat	N/A	Add labels to variables
All03.sas & all04.sas	All_Alt04.sas7bdat	N/A	Conducts key parts of the analyses

Figure H-1. Data Flow for In-Home Audit Sample

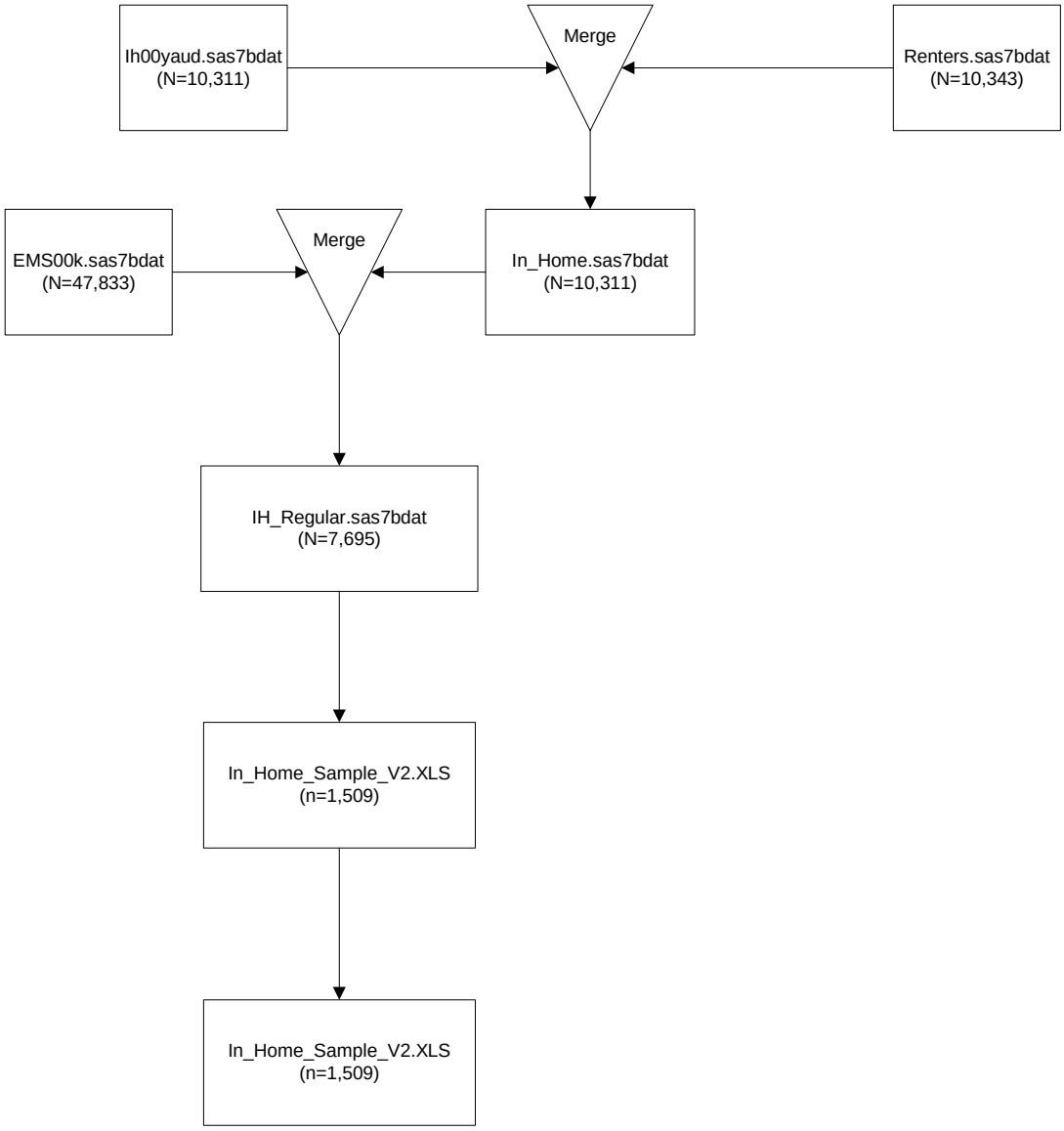


Figure H-2. Data Flow for Telephone Audit Sample

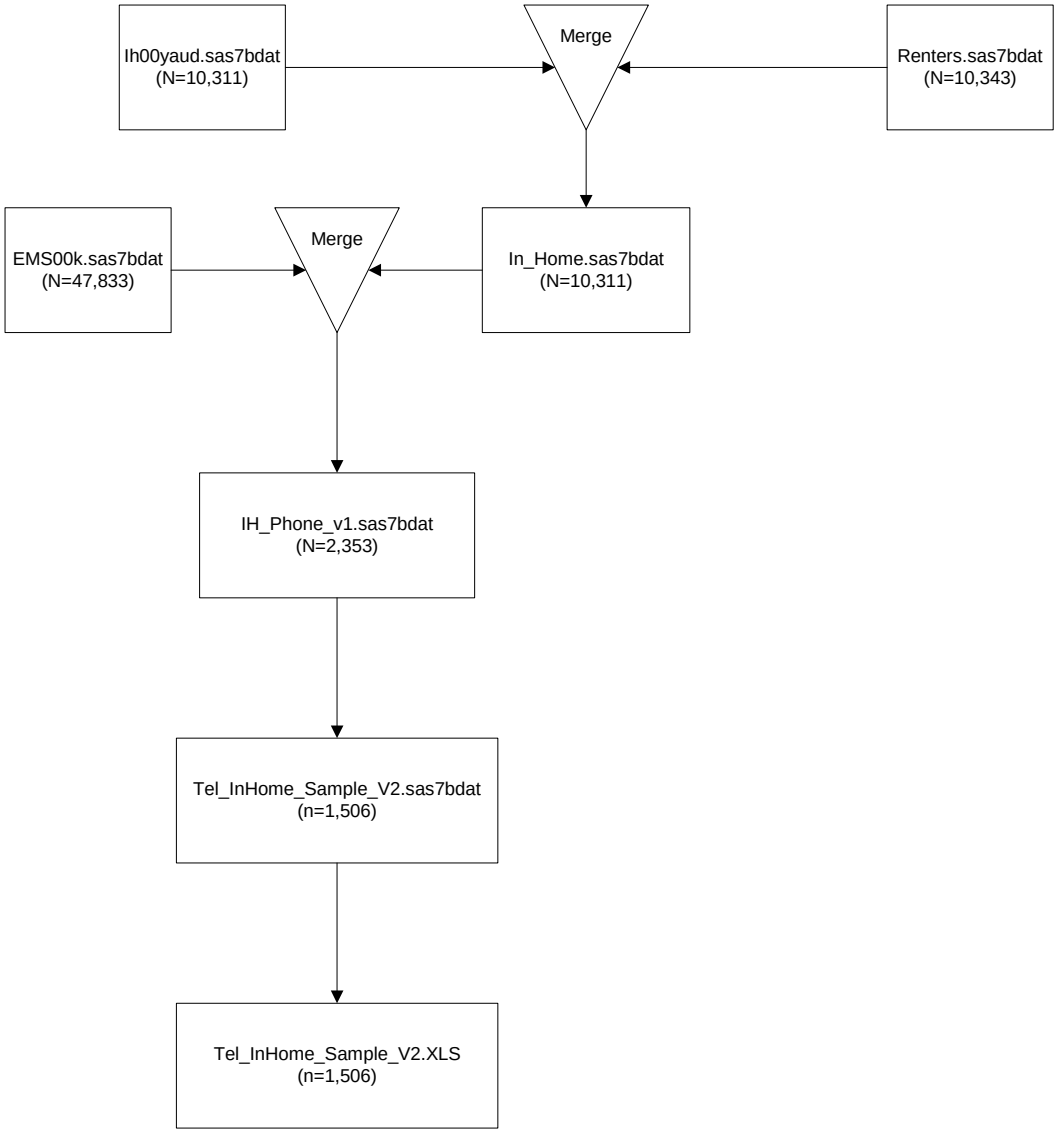


Figure H-3. Data Flow for Mail-In Audit Sample

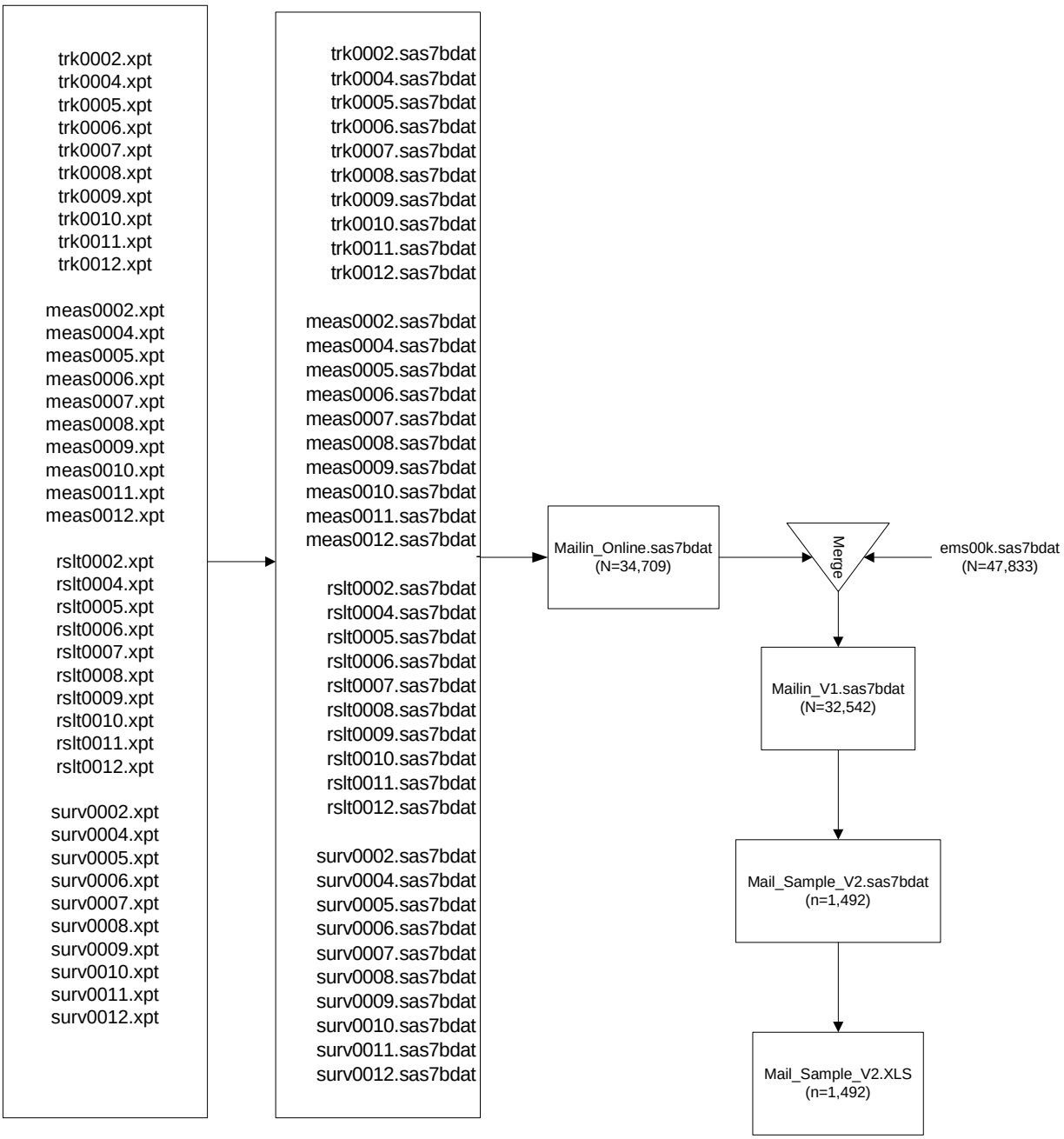


Figure H-4. Data Flow for On-Line Audit Sample

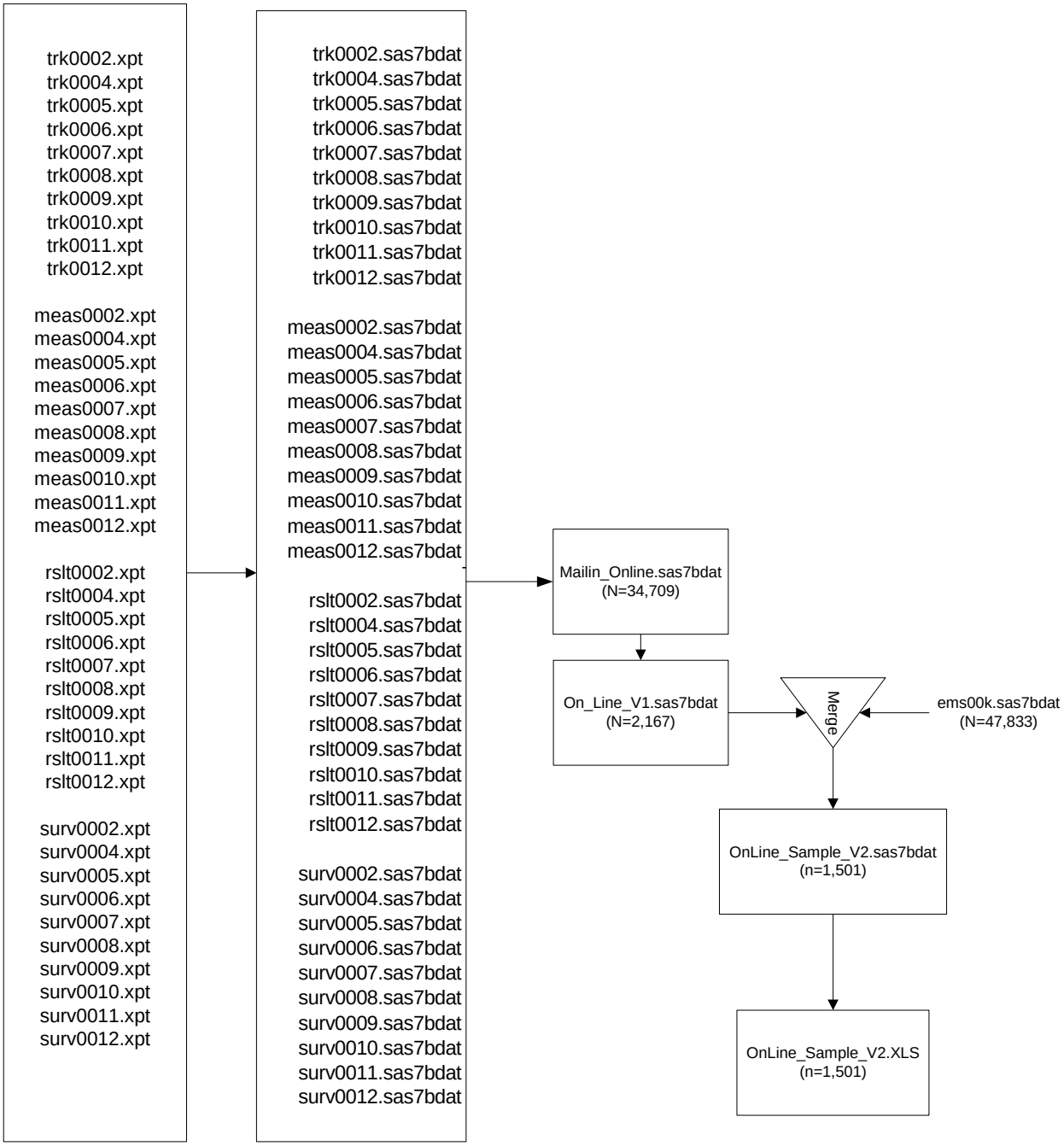


Figure H-5. Data Flow for Time-Of-Sale Audit Sample

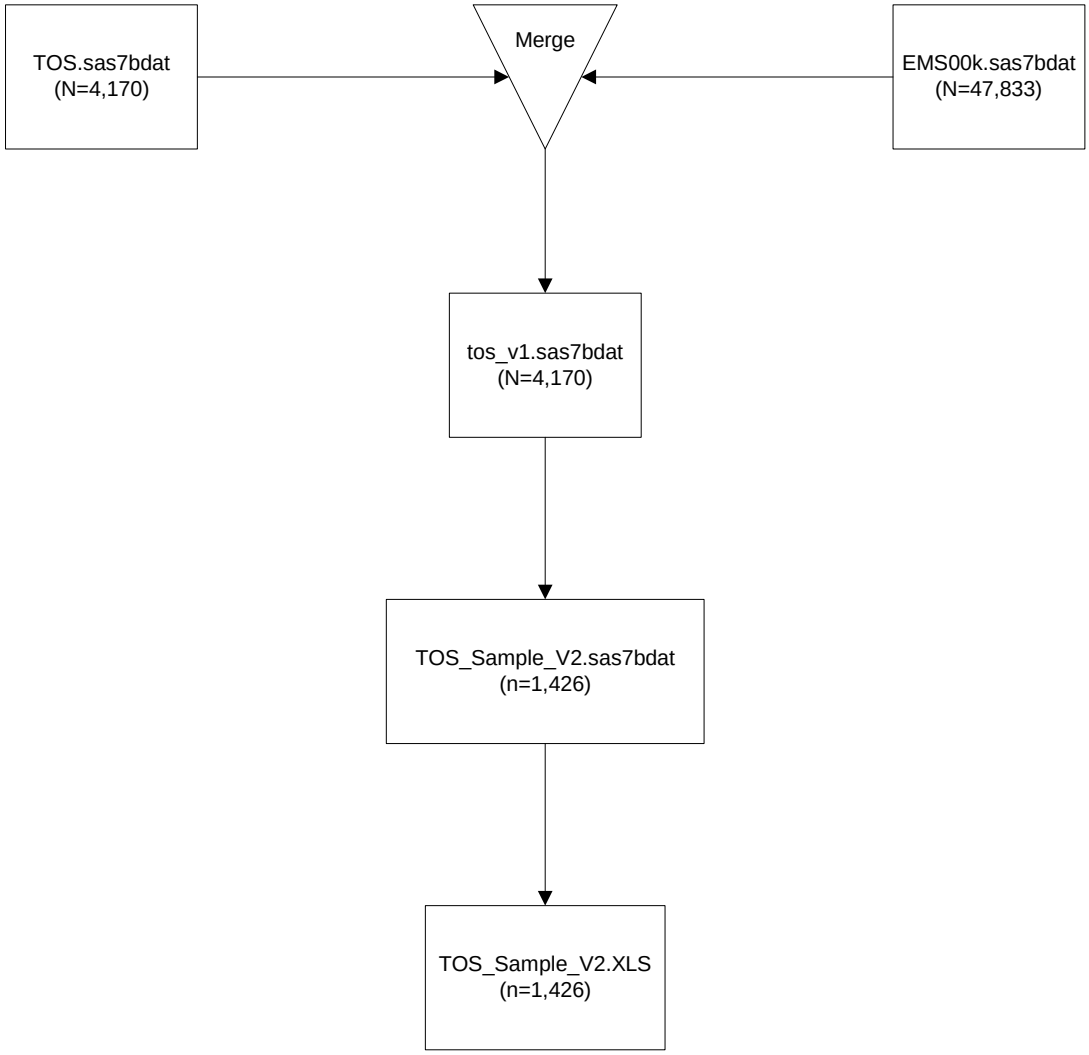
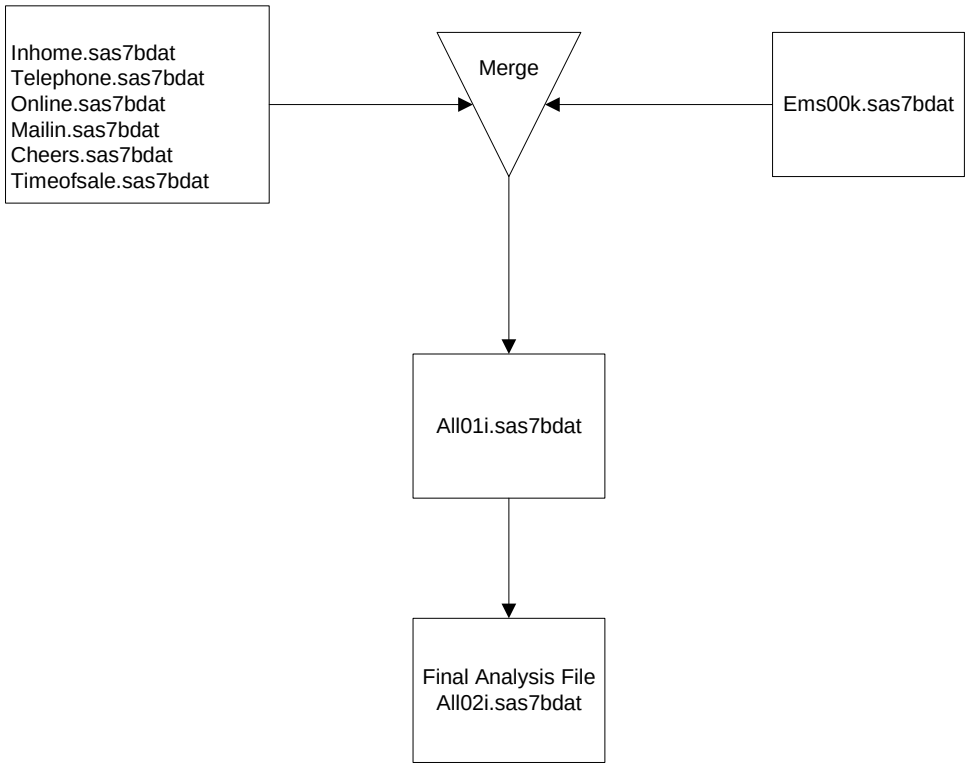


Figure H-6. Data Flow for Final Analysis File

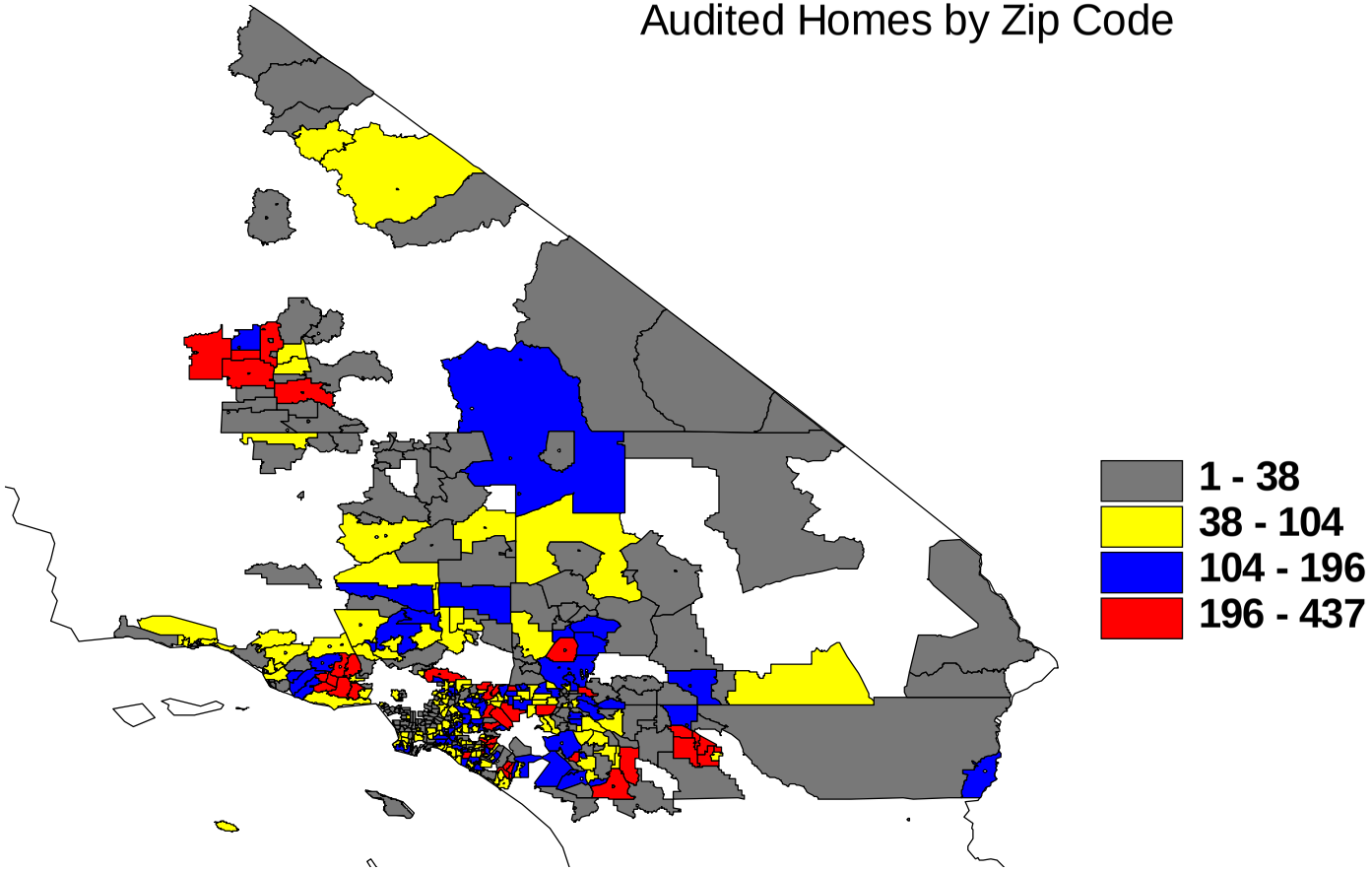


Appendix I

Customer Participation Maps

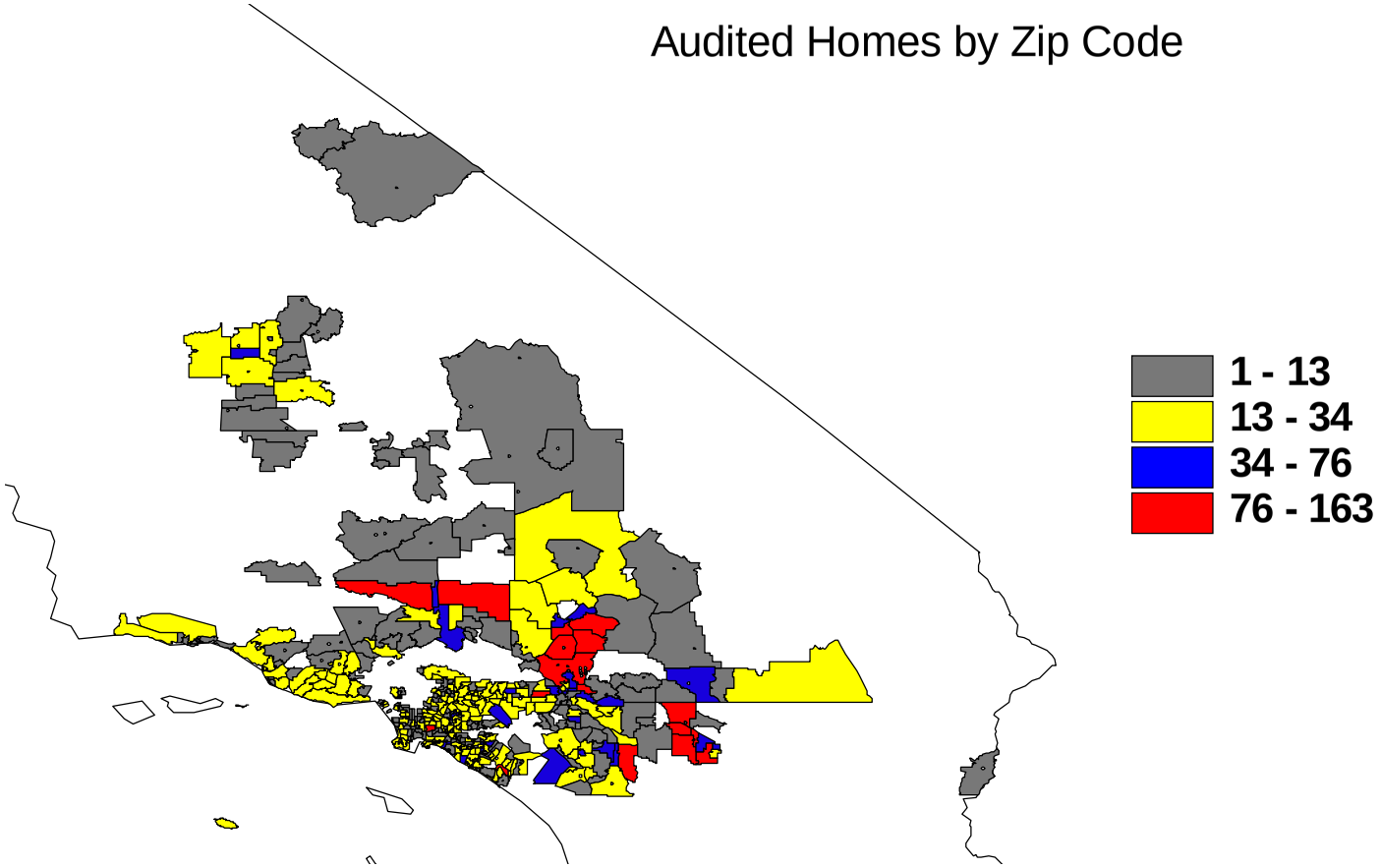
Residential Mail-In Audits

Audited Homes by Zip Code



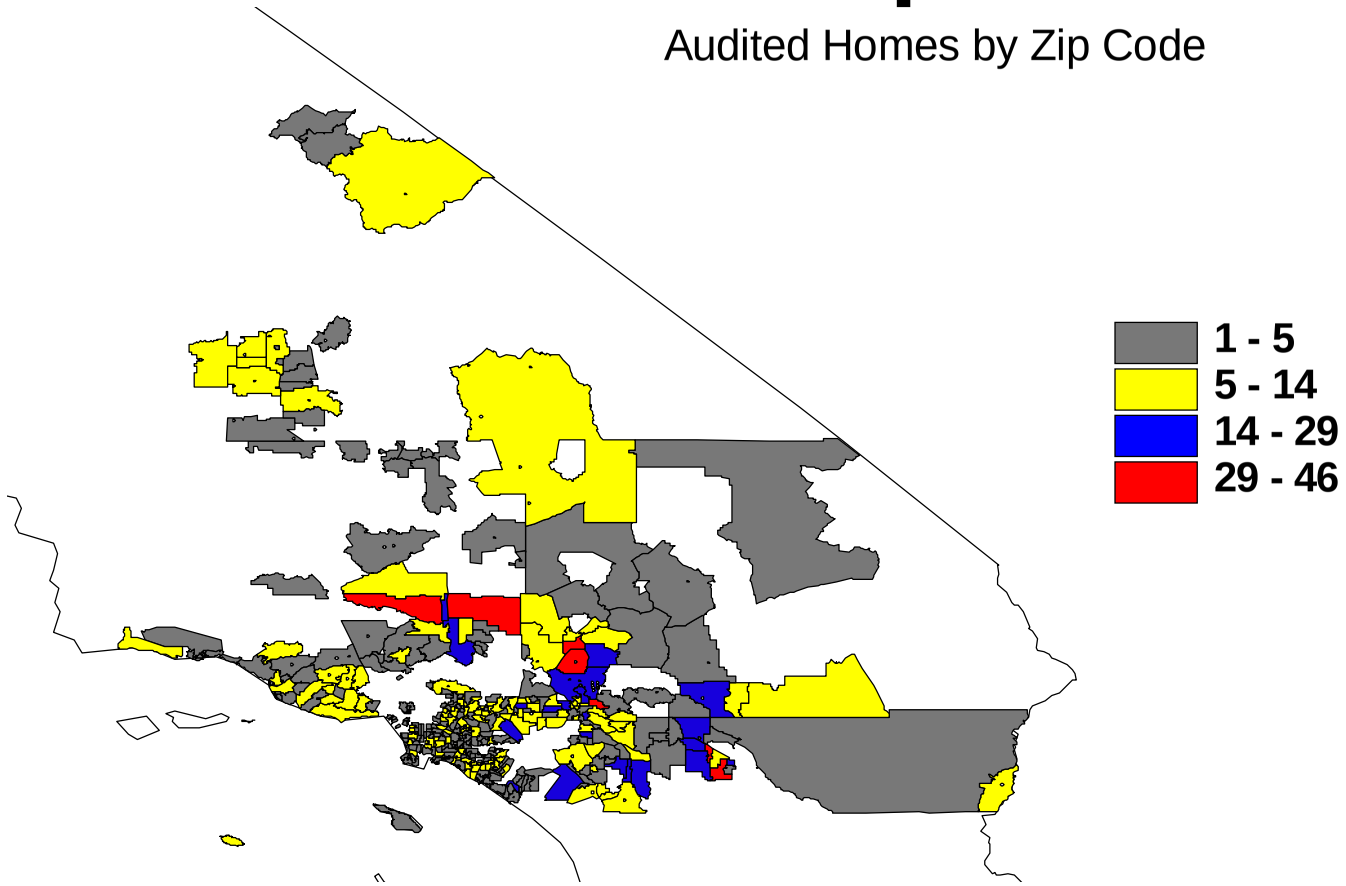
Residential In-Home Audits

Audited Homes by Zip Code



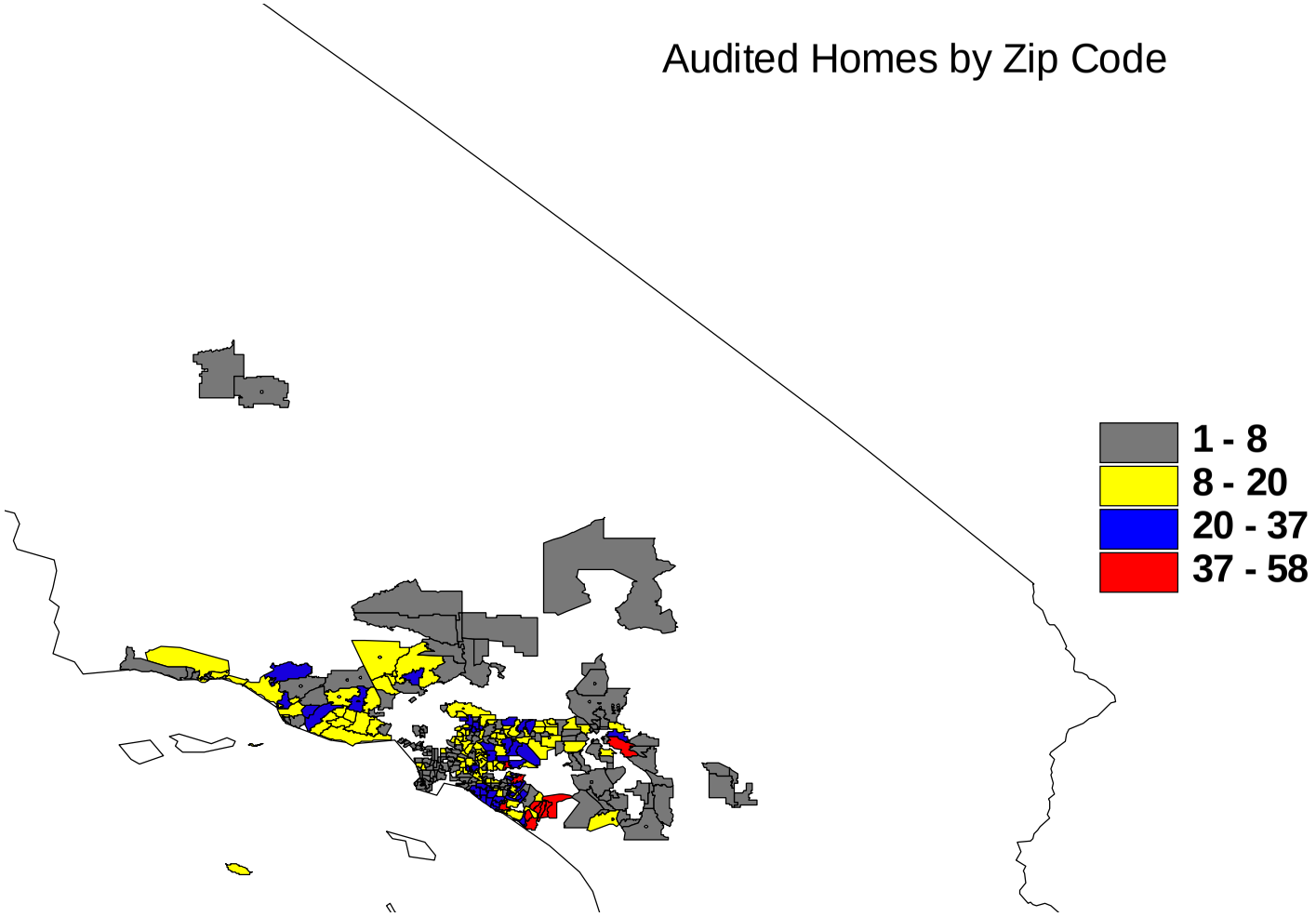
Residential Telephone Audits

Audited Homes by Zip Code



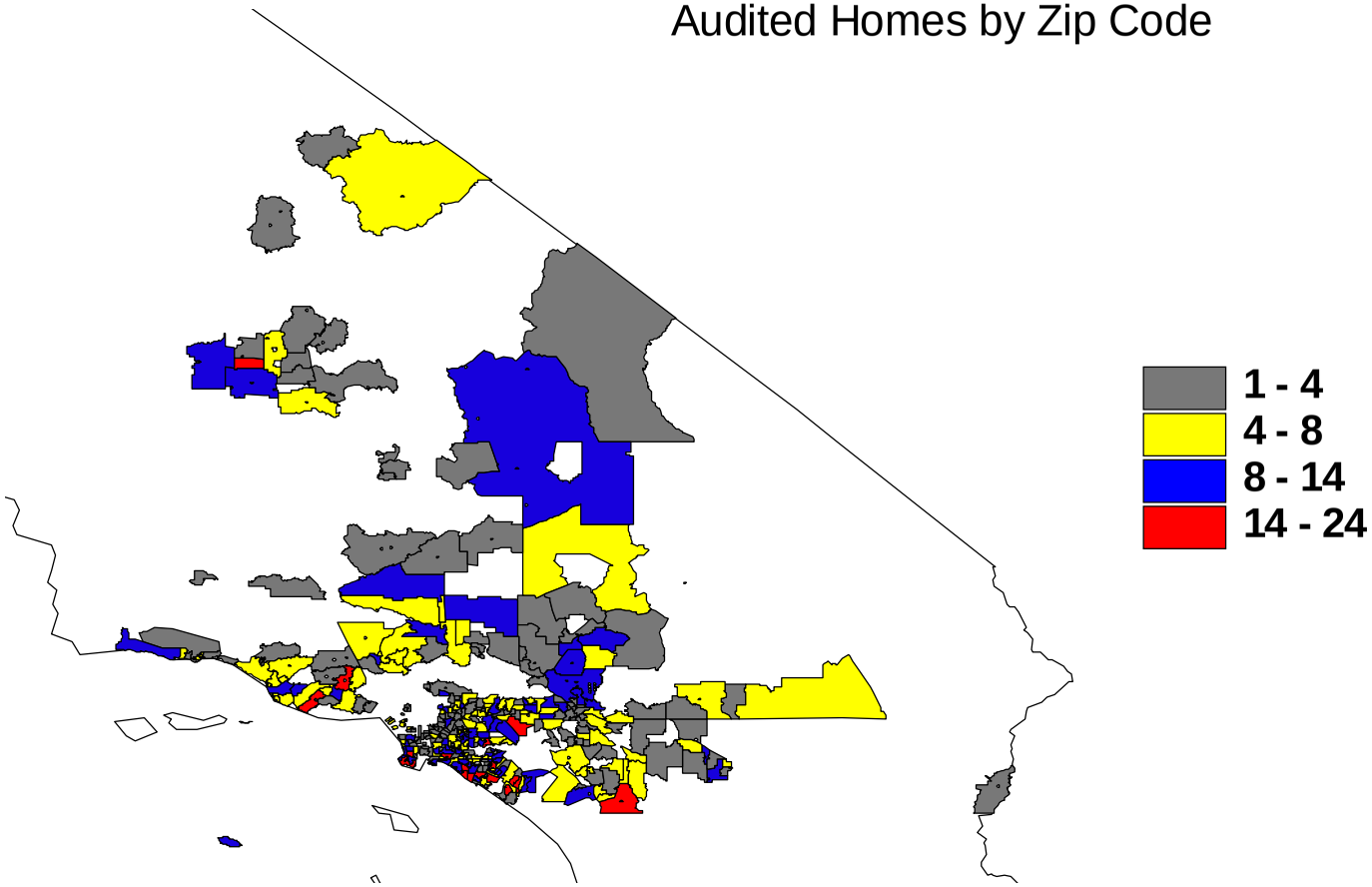
Residential TOS Audits

Audited Homes by Zip Code



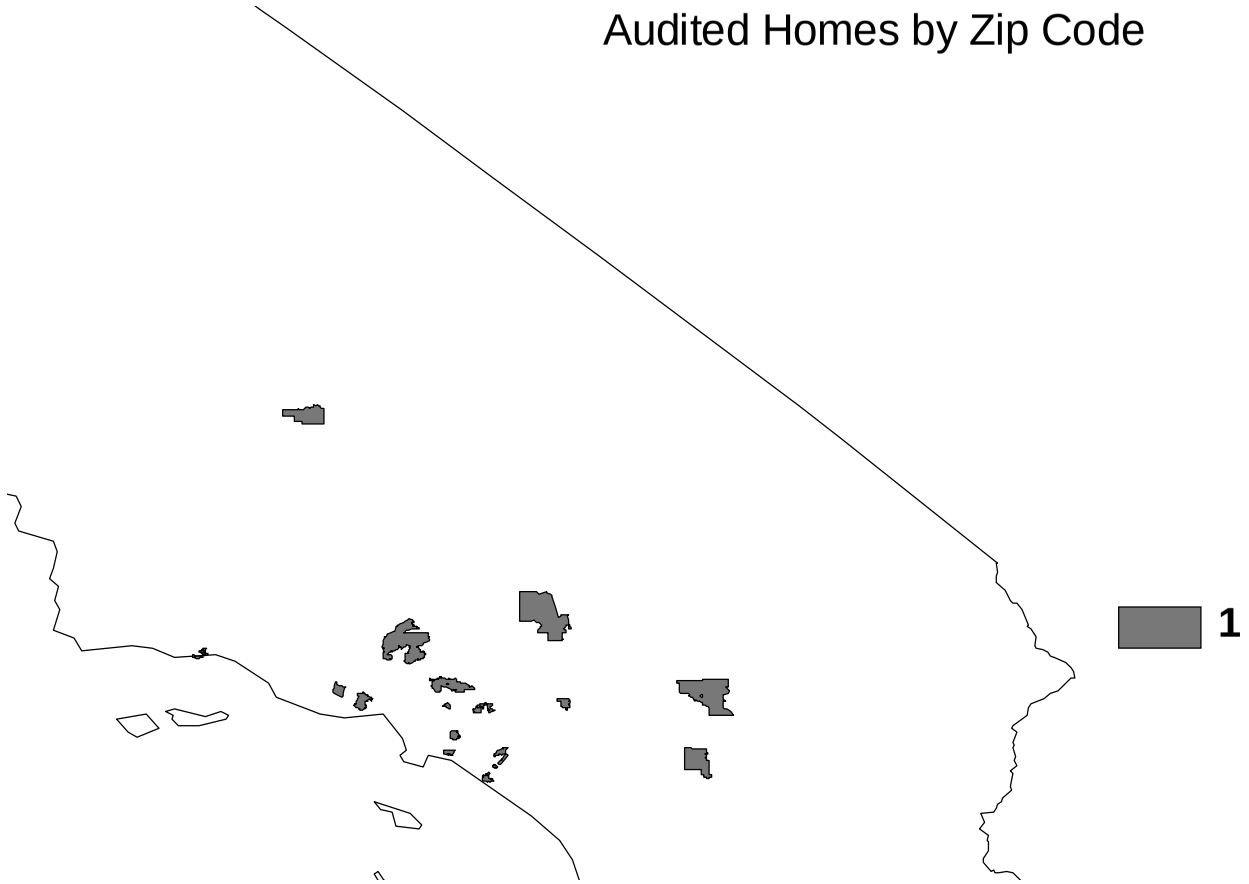
Residential On-Line Audits

Audited Homes by Zip Code



Residential Cheers Audits

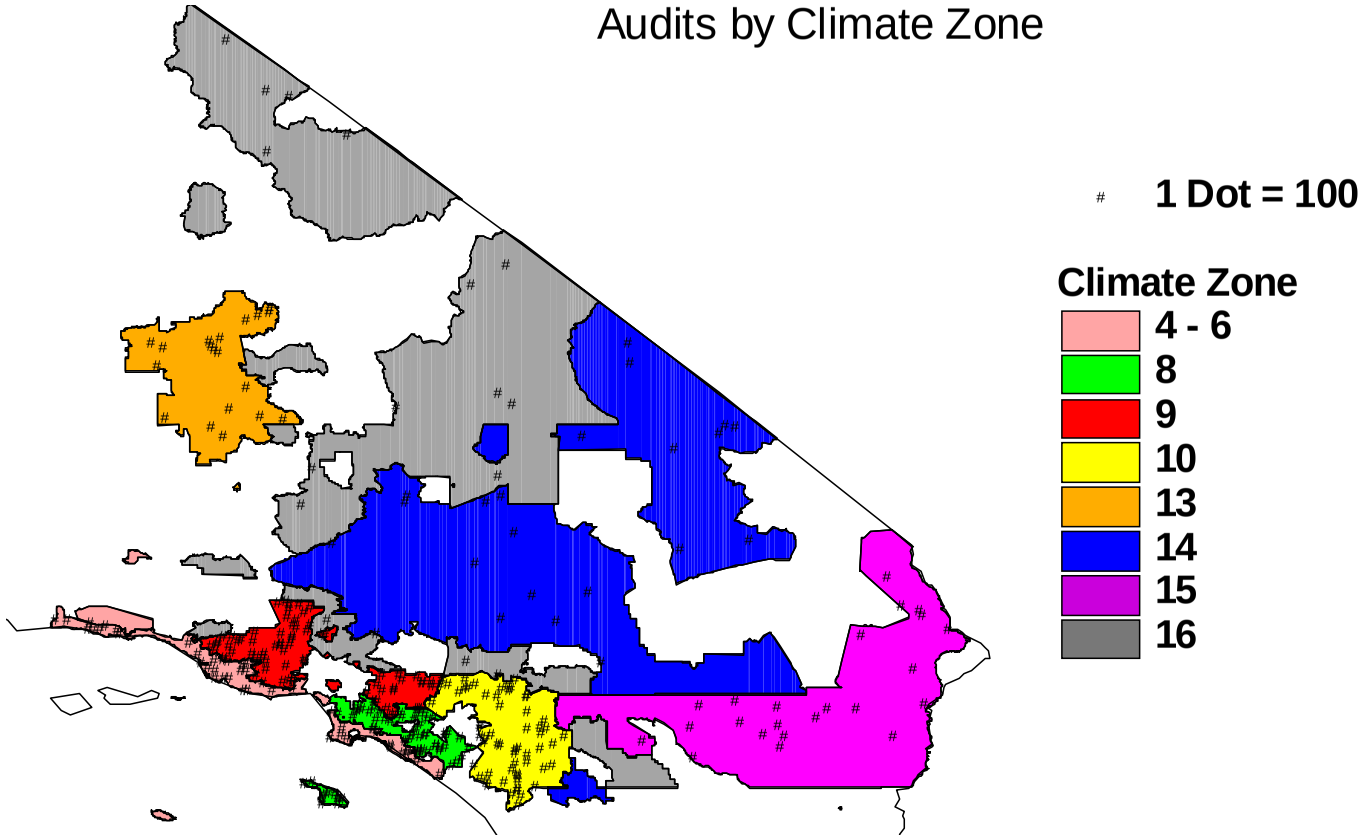
Audited Homes by Zip Code



1

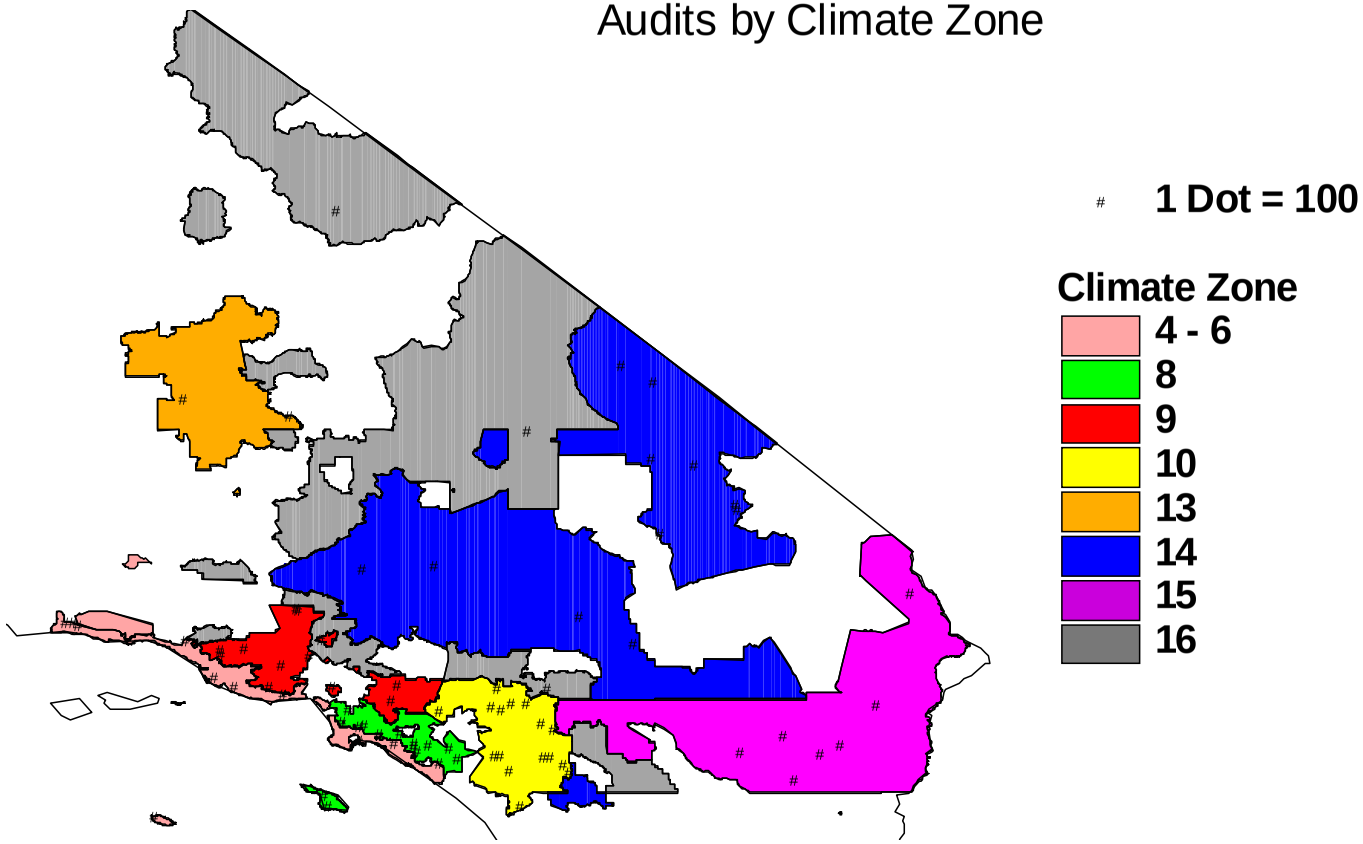
Residential Mail-In Audits

Audits by Climate Zone



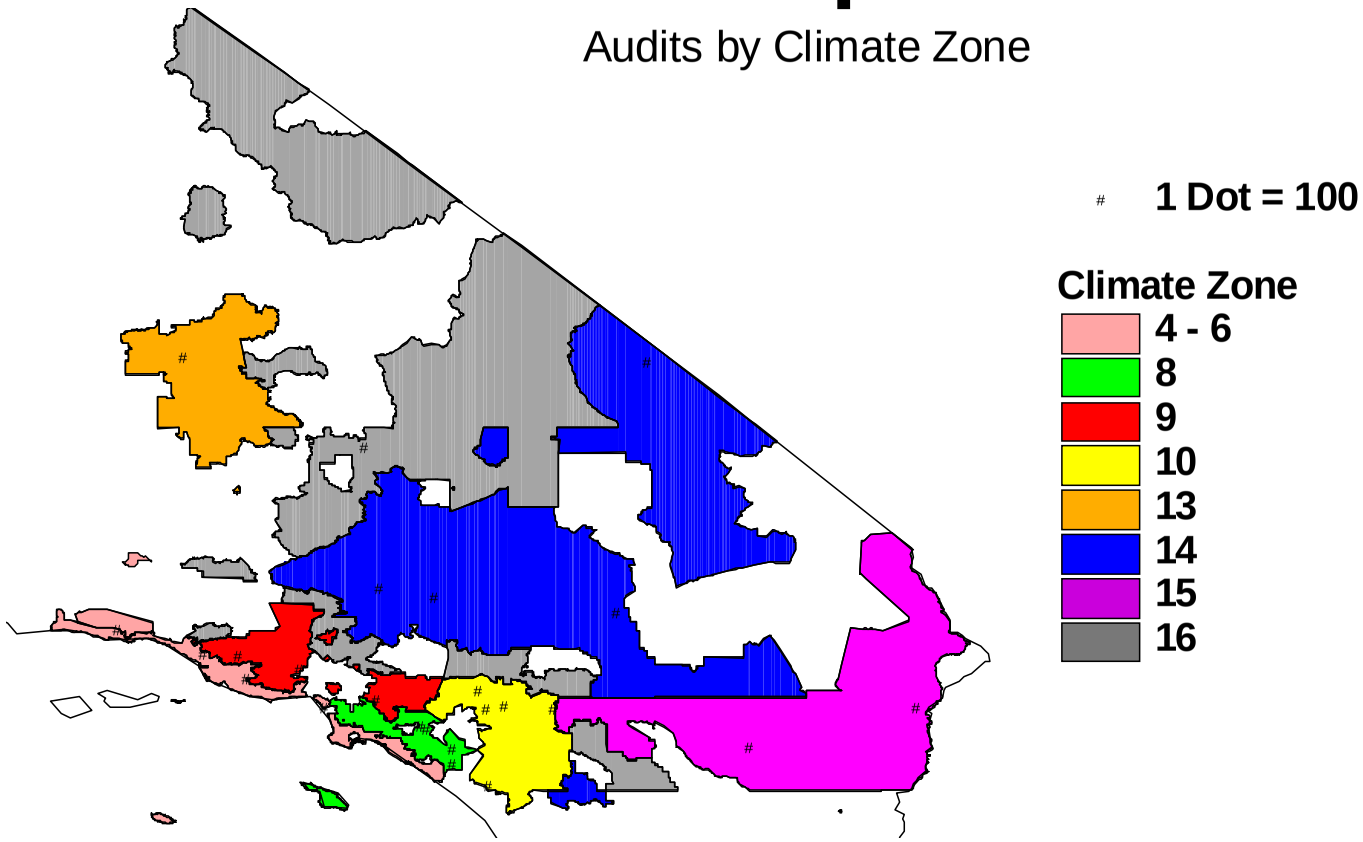
Residential In-Home Audits

Audits by Climate Zone



Residential Telephone Audits

Audits by Climate Zone



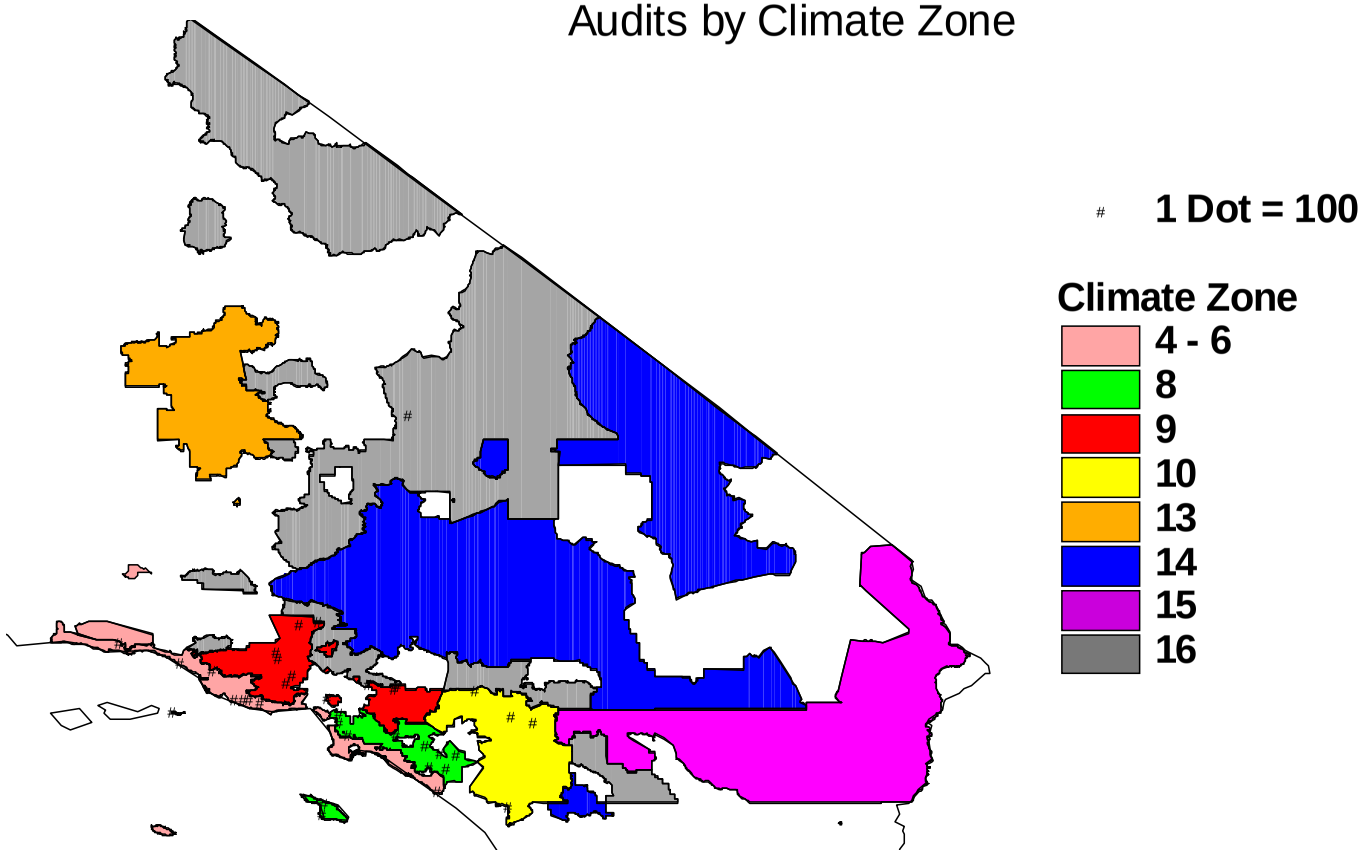
1 Dot = 100

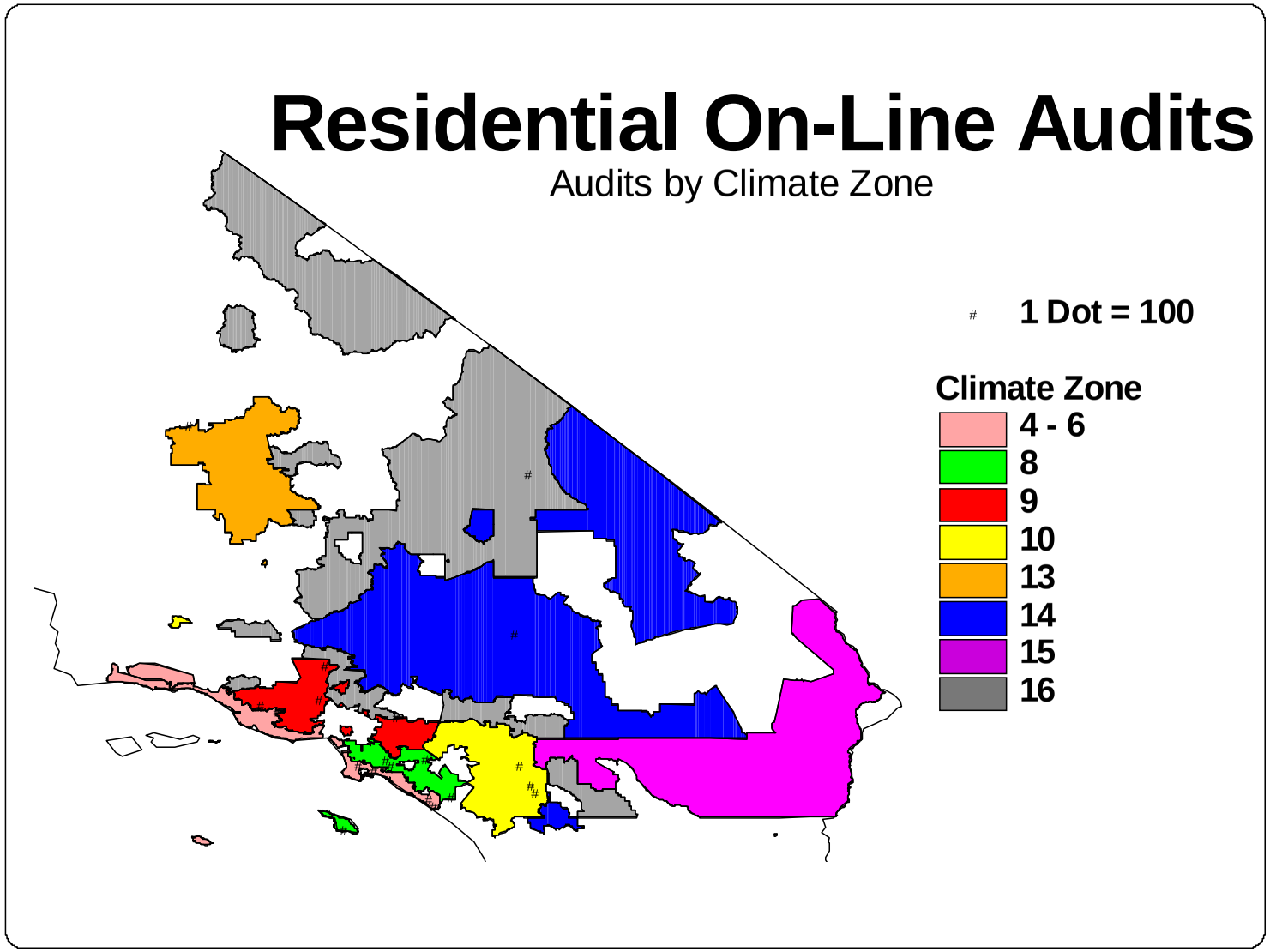
Climate Zone

- 4 - 6
- 8
- 9
- 10
- 13
- 14
- 15
- 16

Residential TOS Audits

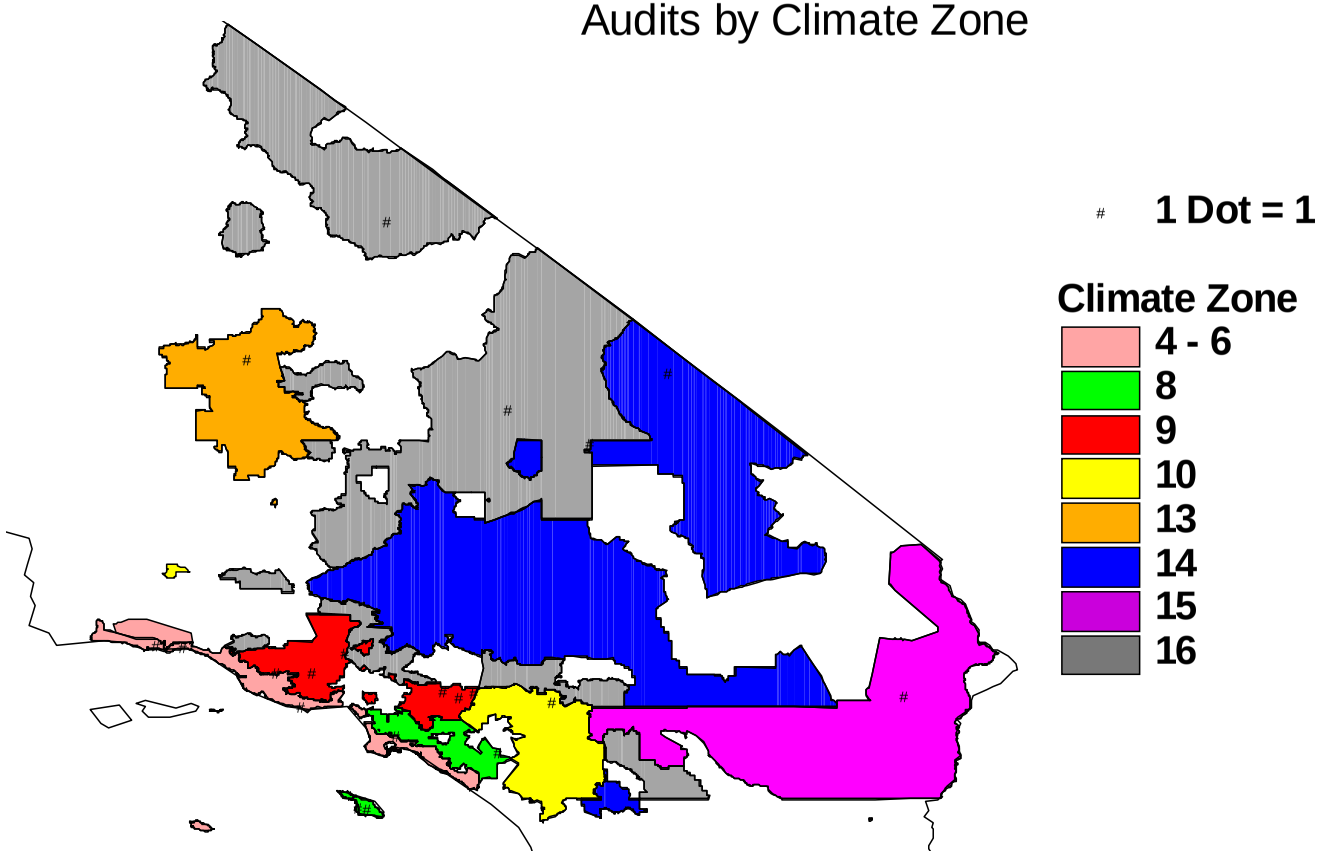
Audits by Climate Zone




Residential On-Line Audits
Audits by Climate Zone
1 Dot = 100
Climate Zone
4 - 6
8
9
10
13
14
15
16

Residential Cheers Audits

Audits by Climate Zone



Appendix J

Estimates of Energy Savings for CHEERS

Estimates of Energy Savings for Seven Homes with CHEERS Ratings

Prepared for
Ridge & Associates
June 7, 2002

By

Robert A. Scott
Rasent Solutions

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Abstract

This report presents an estimate of energy performance for seven residential buildings located in the electric service area of Southern California Edison Company, each of which had a home energy rating performed by a CHEERS-certified Rater. It also compares the pre-existing condition for each home with an improved condition following the installation of a known set of measures recommended by the energy rating. The predicted results are calibrated to actual electric-use data for each of the subject cases. Predicted gas usage is reported without any adjustment.

A number of factors must be considered when reviewing this presentation. The most important of these is the fact that a home energy rating evaluates the performance of selected energy systems compared to a baseline reference for its energy efficiency to obtain the rating score. Consequently the predicted energy use is based on standardized behaviors for operation. Also, the features evaluated in the rating are limited to heating, cooling, domestic hot water and hardwired lighting. Additional use is predicted a priori for certain other hardwired appliances, pools and spas. Additional 'plug-in' loads are not included in the predicted energy.

The analysis makes a number of systematic adjustments to the simulated energy results to moderate the magnitude of the predicted change in the older homes.

There are twelve months electric use billing data for each of the seven cases as well as a listing of energy improvement measures that were previously verified as having been installed.[1] Using the rating data obtained from CHEERS, each of the cases is simulated in the original configuration (BASECASE) and in the improved configuration (ENHANCED). The energy simulations are made using CNE, a computer program which calculates the heating and cooling loads and energy in buildings and is a component of the CHEERS Ratetool 2.0 rating software[2].

The simulation results of the BASECASE configuration are calibrated with the billing data and the results of the ENHANCED configuration are examined for the relative change in energy performance to the BASECASE. The annual energy use from the billing data is adjusted to account for the impact of the energy improvements.

An objective of this presentation is to demonstrate one approach to reconciling the predicted versus actual energy use within this very limited sample. Beyond this, the detailed data extracted from the rating simulation models contained herein, could be used in a more complete evaluation that includes a complete set of data from post-improvement measured use and a detailed behavior profile for each.

As it is highly unlikely that a definitive conclusion can be made as to the actual effectiveness of the purported improvements or the accuracy of the predictive model given the available data, this report does not do so.

---

[1] Data provided by Ridge and Associates (cheers_sample_Scott(v1).xls and cheers_impl.xls). The billing data that was provided for this study included information for eight homes. One is eliminated because the period of the available data for this case is post-improvement as opposed the other cases, which are from before the rating improvements.

[2] CNE is a public domain computer program developed over the past 15 years by Berkeley Solar Group. CHEERS has used this simulation engine as part of its proprietary energy rating software since 1994.

Case Descriptions

The cases selected for review are seven in the Edison territory with ratings performed in 2001. These are located in CEC Climate Zones 6, 8 and 9 [3]. All but one is more than 30 years old, all use natural gas for main space heating and service hot water and one has a heated pool and spa.

Table 1 – Case Descriptions

Case	Visit Date	Street Address	City	Year Built	Floor Area (sft)	Climate Zone
73241	4/2/2001	702 Miramonte	Santa Barbara	1955	1,559	6
73279	3/27/2001	5327 Calera Avenue	Covina	1954	1,380	9
73281	4/2/2001	882 East Comstock	Glendora	1956	1,957	9
73296	4/12/2001	6736 El Salvador	Long Beach	1952	1,577	6
73316	4/30/2001	22724 Brandywine dr.	Calabasas	1965	2,693	8
73335	5/29/2001	11053 Liggett Street	Norwalk	1949	1,458	8
73342	6/12/2001	2946 Penman Street	Tustin	1998	3,352	8

Configuration details for the cases in the analysis are found in attached spreadsheet (Study DataV2.xls)

Simulating the BASECASE and ENHANCED Configurations

The evaluation is based on re-building the energy analysis from the point of the Rater's input to the CHEERS rating software program rather than the post-processing reporting database. Using the rater data files obtained from CHEERS, we are able to extract the BDL input for CNE for both the BASECASE (0) and ENHANCED (1) configurations[4]. Each case is simulated and results compiled according to purchased energy as shown in the table below. The units are given in kWh and therms. The percentages given are based on the total apportioned by end-use for the fuel type. The electric end-use Fan is kWh attributed to the air handler for gas fueled heating systems and is calculated at the rate of 0.000005 kilowatt-hours per Btu of heat delivered by the equipment.[5]

Table 2 - BASECASE and ENHANCED simulation results by end-use and fuel type

Run	Case	Fuel	Cool	%	Heat	%	Fan	%	DHW	%	Light	%	POLS	%	App	%	Total
0	73241	Elec	0	0%		0%	156	9%		0%	1534	91%		0%		0%	1690
0	73241	Gas		0%	631	66%		0%	239	25%		0%		0%	93	10%	963
1	73241	Elec	0	0%		0%	93	12%		0%	675	88%		0%		0%	768
1	73241	Gas		0%	283	46%		0%	239	39%		0%		0%	93	15%	615
0	73279	Elec	1782	53%		0%	97	3%		0%	1480	44%		0%		0%	3359
0	73279	Gas		0%	341	51%		0%	268	40%		0%		0%	58	9%	667
1	73279	Elec	1551	73%		0%	91	4%		0%	469	22%		0%		0%	2111
1	73279	Gas		0%	320	52%		0%	243	39%		0%		0%	58	9%	621

[3] Long Beach has both climate zones 6 and 8. Here the rater selected climate zone 8 for the original rating. The billing data and a CEC zip code reference places this location in 6. This case was re-simulated with the correct climate zone

[4] These ASCII files are contained in the accompanying archive (CNE_InputF.zip).

[5] This is a long-held CEC assumption contained in the California Residential ACM Approval Manual.

0	73281	Elec	1763	38%		0%	153	3%		0%	2738	59%		0%		0%	4654
0	73281	Gas		0%	666	66%		0%	271	27%		0%		0%	68	7%	1005
1	73281	Elec	1299	31%		0%	132	3%		0%	2738	66%		0%		0%	4168
1	73281	Gas		0%	287	51%		0%	202	36%		0%		0%	68	12%	557
0	73296	Elec	1633	38%		0%	258	6%		0%	2414	56%		0%		0%	4305
0	73296	Gas		0%	1305	81%		0%	240	15%		0%		0%	61	4%	1606
1	73296	Elec	560	29%		0%	150	8%		0%	1191	63%		0%		0%	1901
1	73296	Gas		0%	572	68%		0%	206	25%		0%		0%	61	7%	839
0	73316	Elec	2706	24%		0%	175	2%		0%	7463	67%	816	7%		0%	11160
0	73316	Gas		0%	684	55%		0%	308	25%		0%	180	14%	82	7%	1254
1	73316	Elec	2266	24%		0%	175	2%		0%	6262	66%	816	9%		0%	9519
1	73316	Gas		0%	355	39%		0%	288	32%		0%	180	20%	82	9%	905
0	73335	Elec	1845	55%		0%	148	4%		0%	1334	40%		0%		0%	3326
0	73335	Gas		0%	571	65%		0%	245	28%		0%		0%	59	7%	875
1	73335	Elec	1556	54%		0%	148	5%		0%	1187	41%		0%		0%	2890
1	73335	Gas		0%	233	48%		0%	190	39%		0%		0%	59	12%	482
0	73342	Elec	1647	38%		0%	119	3%		0%	2550	59%		0%		0%	4316
0	73342	Gas		0%	431	50%		0%	297	35%		0%		0%	126	15%	855
1	73342	Elec	1647	60%		0%	119	4%		0%	965	35%		0%		0%	2731
1	73342	Gas		0%	431	52%		0%	270	33%		0%		0%	126	15%	828

Duct Efficiency Calculations

The original CHEERS results are modified using an alternative duct efficiency calculation based on the current CEC approach to determining Seasonal Distribution System Efficiency. [6] The CHEERS duct model is an early version of this method and requires some adjustment in assumptions, the most significant being that for all cases the duct surface area is calculated using the factors for 'greater than 12 feet of duct outside conditioned space'. Duct insulation is upgraded in the enhanced case only when less than R-4.2. The duct leakage used in the model is 22% of system airflow for the BASECASE simulation and 6% after repair for the ENHANCED case. Five of the seven cases indicated duct system repair. The calculated duct efficiencies for both the BASECASE and ENHANCED cases are shown in Table 3. Detailed calculations are contained in the duct efficiency worksheets in the accompanying spreadsheet.

Table 3 - Seasonal heating and cooling air distribution system efficiencies

Case	73241	73279	73281	73296	73316	73335	Zn1 73342	Zn2 73342
Basecase-Dist Eff-Heat	0.62	0.67	0.67	0.61	0.73	0.69	0.69	0.69
Basecase-Dist Eff-Cool	0.74	0.66	0.66	0.68	0.67	0.70	0.70	0.70
Enhanced-Dist Eff-Heat	0.82	0.67	0.83	0.81	0.86	0.84	0.69	069
Enhanced-Dist Eff-Cool	0.85	0.66	0.83	0.83	0.80	0.83	0.70	070

[6] Based on the AB 970 Low-rise Residential Alternative Calculation Method Approval Manual, Appendix F calculations, Adopted January 3, 2001.

Calibration Methodology

The model is calibrated using the assumption that all billing data is from prior to installing the improvements. Upon examining the dates of the ratings this appears to be true. The billing data is normalized to 12 monthly periods.[7] The calibration procedure uses the simulated results to apportion the rated end-uses and the disaggregated billing data to determine the space conditioning from the base energy.

Procedure

1. Apportion the BASECASE results kWh for each of the electric end-uses that apply to the specific case. The end-uses that CHEERS estimates energy for are:
   - Cooling
   - Heating
   - HVAC fan
   - Domestic hot water
   - Lighting
   - Pool / spa
   - Miscellaneous appliances
2. Disaggregate the billing data to determine the base energy use.
   - Normalize data to 12 monthly periods
   - Calculate daily kWh use (monthly kWh / Billing Days) to determine daily base kWh. Select second lowest daily value as daily base kWh.
   - Calculate monthly base kWh (daily base kWh X Billing Days) but not more than total billing kWh.
3. Allocate non-base energy use to the heating or cooling season using the Degree-Day values in Table 3. If the monthly fraction (of either HDD or CDD) of the annual total is more than twice that of the other, then the over-base amount is allocated accordingly.[8]

Table 4 - Cooling and Heating Degree-days used to determine season [9]

		Cooling Degree-days												
Case	Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
73241	SANTA BARBARA	0	0	0	9	11	39	81	112	99	38	8	0	397
73279	BURBANK VALLEY PMP PLT	0	7	15	53	86	194	329	341	265	122	12	0	1424
73281	BURBANK VALLEY PMP PLT	0	7	15	53	86	194	329	341	265	122	12	0	1424
73296	LONG BEACH WSO AP	0	5	13	35	63	144	255	295	237	120	34	0	1201
73316	TUSTIN IRVINE RANCH	0	7	7	30	48	119	212	240	203	97	10	0	973
73335	TUSTIN IRVINE RANCH	0	7	7	30	48	119	212	240	203	97	10	0	973
73342	TUSTIN IRVINE RANCH	0	7	7	30	48	119	212	240	203	97	10	0	973
		Heating Degree-days												

[7] Two cases each have two truncated billing periods within one same month and are combined to form 12 rather than the 13 billing periods for those data sets.
[8] Refer to Study_Data.xls – Bill Disagg worksheet for detailed calculations.
[9] California Monthly Heating and Cooling Degree Day Normals: 1961 – 1990. Source: National Weather Service.

Case	Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
73241	SANTA BARBARA	335	266	261	192	147	87	31	16	45	66	194	326	1966
73279	BURBANK VALLEY PMP PLT	329	234	229	155	67	35	0	0	13	35	177	335	1609
73281	BURBANK VALLEY PMP PLT	329	234	229	155	67	35	0	0	13	35	177	335	1609
73296	LONG BEACH WSO AP	285	221	214	134	69	39	0	0	15	24	145	284	1430
73316	TUSTIN IRVINE RANCH	329	256	255	174	97	47	8	0	23	63	190	342	1784
73335	TUSTIN IRVINE RANCH	329	256	255	174	97	47	8	0	23	63	190	342	1784
73342	TUSTIN IRVINE RANCH	329	256	255	174	97	47	8	0	23	63	190	342	1784

4. Adjust predicted light energy, which with the billing data is included mainly in the disaggregated base usage. The CHEERS Rating tool assumes 1080 hour per year for all lighting. In order to align the predicted use so that it falls within a reasonable range, the calibrated lighting energy is calculated as the average of three values. These are:

   - The predicted kWh from the CHEERS rating
   - 28% of the total annual billed energy use (kWh) [10]
   - 2076 kWh per year average residential lighting use in California. [11]

   The resulting values seem a reasonable proxy for estimating lighting energy, especially in the cases where there are large amounts of hardwired lighting.

5. Calculate the estimated energy use for each of the rated end-uses after the energy improvements by adjusting the predicted energy use of the ENHANCED case, as follows:

   Calibrated Enhanced Enduse^F =

   Simulated Enhanced Enduse^F X (Calibrated Baseline Enduse^F ÷ Simulated Baseline Enduse^F)

   Where Enduse^F is the specific rated end use.

Table 5 – Simulated versus Calibrated Results (kWh)

BASECASE	Simulated						Calibrated					
Case	Cool	Fan	Light	Pool	Other	TOTAL	Cool	Fan	Light	Pool	Other	Billed
73241	0	156	1534	0	0	1690	0	291	1455	0	951	2697
73279	1782	97	1480	0	0	3359	1254	68	1716	0	2652	5691
73281	1763	153	2738	0	0	4654	1910	166	2405	0	4091	8572
73296	1633	258	2414	0	0	4305	3158	499	2050	0	218	5925
73316	2706	175	7463	816	0	11160	3133	202	4603	816	6493	15247
73335	1845	148	1334	0	0	3326	5327	426	2063	0	2106	9922
73342	1647	119	2550	0	0	4316	3049	220	2380	0	3334	8983

[10] From the California Energy Commission Lighting Efficiency Technology Report, Volume I, CALIFORNIA BASELINE, Heshong Mahone. September 1999, Page 24.
[11] IBID, Pages 25 – 26.

ENHANCED	Simulated						Calibrated					
Case	Cool	Fan	Light	Pool	Other	TOTAL	Cool	Fan	Light	Pool	Other	BILLED
73241	0	93	675	0	0	768	0	173	640	0	951	1764
73279	1551	91	469	0	0	2111	1091	64	544	0	2652	4351
73281	1299	132	2738	0	0	4168	1408	143	2405	0	4091	8046
73296	560	150	1191	0	0	1901	1082	291	1012	0	218	2602
73316	2266	175	6262	816	0	9519	2623	202	3862	816	6493	13997
73335	1556	148	1187	0	0	2890	4493	426	1836	0	2106	8861
73342	1647	119	965	0	0	2731	3049	220	900	0	3334	7503

Installed Measures

Table 7 shows the measures used in the ENHANCED case simulations. The measures are categorized according to a general type.

Table 6 - List of installed energy improvements

Case	Measure	Type
73241	Replace 1060 Watts of incand lighting with compact fluor: 265 Watt	Lighting Improvement
	Repair and test Heating/Cooling air duct system (Ins:R_4.2)	Duct Repair
	Upgrade Zone1 infiltration to 110.0: repair and test	Infiltration Reduction
	Surface Floor: Upgrade insulation from: None to R-19	Insulation Upgrade
	Surface Wall: Upgrade insulation from: None to R-13	Insulation Upgrade
73279	Replace 1170 Watts of incand lighting with compact fluor: 234 Watt	Lighting Improvement
	Upgrade Zone1 infiltration to 97.4: repair and test	Infiltration Reduction
	Install low-flow devices	Water Heating Improvement
	Surface Wall: Upgrade insulation from: None to R-13	Insulation Upgrade
	Install window exterior shades: Sun Screen-28	Window Treatment
73281	Repair and test Heating/Cooling air duct system (Ins:R_10.0)	Duct Repair
	Upgrade Zone1 infiltration to 138.1: repair and test	Infiltration Reduction
73296	Replace 1415 Watts of incand lighting with compact fluor: 283 Watt	Lighting Improvement
	Repair and test Heating/Cooling air duct system (Ins:R_8.0)	Duct Repair
	Upgrade Zone1 infiltration to 111.3: repair and test	Infiltration Reduction
	Upgrade cooling equip to Air conditioner, SEER 13.0	HVAC Equipment Upgrade
	Upgrade water heater dist system using: Pipe Insulation	Water Heating Improvement

	Surface Ceiling: Upgrade insulation from: None to R-38	Insulation Upgrade
	Surface Floor: Upgrade insulation from: None to R-19	Insulation Upgrade
73316	Replace 1390 Watts of incand lighting with compact fluor: 278 Watt	Lighting Improvement
	Repair and test Heating/Cooling air duct system	Duct Repair
73335	Replace 170 Watts of incand lighting with compact fluor: 34 Watts	Lighting Improvement
	Repair and test Heating/Cooling air duct system	Duct Repair
	Add R-12 wrap to water heater	Water Heating Improvement
	Install low-flow devices	Water Heating Improvement
73342	Replace 1835 Watts of incand lighting with compact fluor: 367 Watt	Lighting Improvement

Energy Savings Report

Without the benefit of measured use data for purchased natural gas, estimating savings attributed to specific measures, with the exception of lighting is impractical. The energy savings estimates shown below are reductions in the purchased energy from the billing data provided for this study and are broken down by rated end-use.

Table 7 - Energy Savings Estimates Simulated versus Calibrated

	Simulated Savings							Calibrated Savings						
Case	Cool	Fan	Light	Pool	Other	TOTAL	%	Cool	Fan	Light	Pool	Other	BILLED	%
73241	0	64	858	0	0	922	55%	0	118	814	0	0	933	35%
73279	231	6	1011	0	0	1248	37%	163	4	1173	0	0	1340	24%
73281	464	22	0	0	0	485	10%	503	23	0	0	0	526	6%
73296	1074	108	1222	0	0	2404	56%	2076	209	1038	0	0	3323	56%
73316	440	0	1201	0	0	1641	15%	509	0	741	0	0	1250	8%
73335	289	0	147	0	0	436	13%	834	0	227	0	0	1061	11%
73342	0	0	1585	0	0	1585	37%	0	0	1480	0	0	1480	16%

Values are annual kWh.

Appendix K

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