Final Report Study No. 720

Measure Retention Study of the 1996 Commercial EEI Program

Submitted to
Southern California Gas Company

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by

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Executive Summary

Background and Study Method

The California Demand Side Management Advisory Committee (CADMAC) measurement and evaluation (M&E) Protocols require Retention Studies at specific retention years depending on the program. The purpose of the Retention Study is to collect data to determine the retention and effective useful life (EUL) for the primary measures in the program. This involves measuring the proportion of measures still in place, and operational. The retention information along with considerations of time since program participation provides the basis for development of the *ex post* EUL. The *ex post* EUL is then statistically compared with *the ex ante* EUL.

This study is the Measure Retention Study for the 1996 Commercial Energy Efficiency Incentives (EEI) Program operated by Southern California Gas Company (SoCalGas). This report includes the tables required by the M&E Protocols.

An examination of SoCalGas' Commercial EEI program database presented clear information with regard to what measures were to be examined in accordance with protocol requirements. Cooking measures alone constituted 75% of expected therm savings. This means that the only measure to be examined in the retention study are the cooking measures.

A stratified sampling plan was utilized to ensure the sample obtained the highest precision based upon expected energy savings while also ensuring representation of the smaller saving sites. The initial sampling was then winnowed to those sites that were part of the first year load impact study, as required by the Protocols for the SoCalGas retention studies. A total of 200 sites were visited to determine the retention of the cooking measures indicated in the program database.

The primary retention measurement is the proportion of measures that are in place and operational. This is derived from survey information by analyzing weighted proportions of the site visit data. The Effective Useful Life (EUL) analysis came from calculating the expected median from an exponential model and a linear model, given the average length of time since installation and the average retention rate.

Findings

The savings weighted retention is 78.7 percent (adjusting for the stratified random sampling). Participants participated throughout 1996. Retention measurement occurred in late January 2001. This means that 78.7% of the cooking measures were retained after 4.5 years.

The *ex post* EUL was estimated by both an exponential and linear model with both providing reasonable results and the same overall conclusion. Both of these EUL estimates and their confidence intervals are presented in Table ES.1.

Table ES.1[1] EUL Estimates

	Linear Model	Exponential Model
Median value	10.6 years	13.0 years
Confidence interval* (lower)	8.9 years through	10.5 years through
Confidence interval* (higher)	13.3 years	16.8 years

* Calculated at 80% confidence level.

The *ex ante* EUL for cooking measures for Southern California Gas Company's Commercial EEI Program is 12 years. Twelve (12) years falls within the confidence interval for both the exponential and linear models for the Effective Useful Life (EUL). **This provides clear evidence that the *ex ante* EUL is an accurate measure of the EUL of the Commercial EEI Program's cooking measures as of the 4th year retention study.**

[1] This table is the same as Table 3.1 and is further described in Section 3.

1.0 Introduction

1.1 Project Background

Standardized protocols for demand-side management (DSM) evaluation were developed in California through the cooperative efforts of utility DSM evaluation experts, interested parties, regulatory staff, and outside consultants working through the California Demand Side Management Advisory Committee (CADMAC). These measurement and evaluation (M&E) protocols are the standardized expectations for DSM evaluation which serve as the basis for the measurement of *ex post* energy savings caused by energy efficiency programs, whose measurement determines the shareholder incentives to be received by the utility due to the utility's performance in obtaining these savings.

The M&E Protocols' require Retention Studies at a specified number of years after the program year depending on the program. This document presents the fourth (4^{th}) year retention study of Southern California Gas Company's (SoCalGas) Commercial Energy Efficiency Incentives (EEI) Program of 1996 as stipulated in Table 8B of the M&E Protocols.[1] The Retention Study must collect data to determine the proportion of measures that are in place and operational. This is derived from survey information by analyzing frequencies and means of the site visit data by measure. This involves measuring the proportion of measures still in place, operational, and effective. The retention information, along with considerations of time since program participation, provide the basis for development of the *ex post* EUL. The *ex post* EUL is then statistically compared with the *ex ante* EUL at an 80% confidence level.[2]

[1] *Protocols, and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs*, 1999 Version, page 26.

[2] Ibid, Table 6, page 17.

1.2 Report Overview

Section 1 has provided an overview of the project. Section 2 presents the methodology of the study, to include the program information that determined the selection of the cooking measures as the measures to be examined in this study. The last section, Section 3, presents the study findings including information on the sample, the measure retention estimate,
and the effective useful life examination (EUL). The last subsection of Section 3 also presents a summary of the documentation protocols as required in Table 7, and the reporting protocols as required in Table 6 of the revised M&E Protocols. Two appendices follow the body of the report. Appendix A contains a copy of the site visit instrument. Appendix B presents the datasets and documentation for the study (in accordance with the M&E Protocols).

2.0 Methodology

2.1 Measurement Issues

Criteria for Measure(s) Included in Retention Study

The M&E Protocols provide explicit direction as to the criteria to be used for determining what measures are to be examined in the required retention studies. This is as follows:

> *"The utility should select the top ten measures, excluding measures that have been identified as miscellaneous (per Table C-9), ranked by net resource value or the number of measures that constitutes the first 50% of the estimated resource value, whichever number of measures is less."*[3]

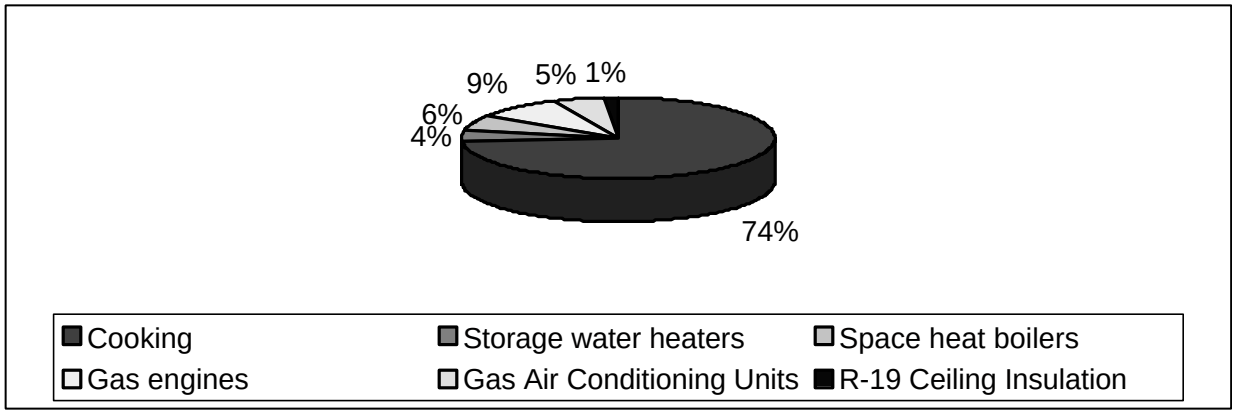
An examination of SoCalGas' Commercial EEI program database presents clear information with regard to these protocol requirements for the measures(s) to be studied. Cooking measures alone constitute 75% of expected therm savings, as shown in Table 2.1 and Figure 2.1. This means that the cooking measures are the only measures for which this retention study will be conducted.

Table 2.1 Distribution of Measures within SoCalGas' 1996 Commercial EEI Program

	% of therm savings
Cooking	74%
Storage water heaters	4%
Space heat boilers	6%
Gas engines	9%
Gas Air Conditioning Units	5%
R-19 Ceiling Insulation	1%
Total	100%

[3] Ibid, Table 9B, page 27, General comment section.

Figure 2.1 Expected Therm Savings Per Measure



The cooking equipment in SoCalGas' 1996 Commercial EEI Program included the following high efficiency gas cooking equipment:

- ranges,
- fryers,
- ovens,
- pizza ovens,
- griddles,
- Chinese ranges,
- Salamanders,
- steamers,
- rotisseries,
- broilers,
- pressure cookers,
- stockpots,
- donut fryers,
- steam tables, and
- cheesemelters.

Retention Measurement

One of the primary objectives of this study was to answer the questions: "Is the measure still in place?; Is it operational?; and Is it still effective?". This is in accordance with the M&E Protocols' definition of a Measure Retention Study:

> *"An assessment of (a) length of time the measure(s) installed during the program year are maintained in operating condition; and (b) the extent to which there has been a significant reduction in the effectiveness of the measure(s)."*[4]

The methodology selected was based upon these needs, understanding the differences between a measure retention study and a persistence study, and developing a workable methodology for conducting 200 site visits to gather the data to answer this question within a tight time deadline.

This study was designed only as a measure retention study and not a persistence study. Only a few practitioners with significant experience in conducting persistence studies understand the differences between these two types of studies. One of the primary differences after the studies are conducted lies in their acceptable uses. Given that this study is a measure retention study, the results should only be used as a measure retention study (unless further adjustments and examinations are made).

An example of an improper use of a measure retention study would be to use its results along with prior impact evaluation. This improper use of the retention results could yield a double-counting of losses. As an example, suppose a program database indicated that 100 low flow showerheads should have been installed. Then an impact evaluation is conducted one year post-participation. This impact evaluation finds 97 showerheads installed (or implicitly accounts for this loss in a lower realization rate in a billing analysis such as a 97% realization rate).

[4] Ibid. Measure Retention Study definition from page A-9.

Then suppose two years later a retention study is done and finds 90 showerheads in place and operational. If the study were conducted as a measure retention study only, using as its baseline the program database, the retention study would find a loss of 10 showerheads (100-90) or a 90% retention. This could be an accurate measure retention estimate.

However, if the retention study results were applied to the impact evaluation's savings to estimate savings still being achieved, there would be a double-count of the 3% loss. The persistence retention rate would need to be re-estimated as 93% (90/97) in order to be applied to the impact savings estimate. Of the 10 showerheads not in place at the time of the retention study, three are in the program database but were never actually installed and seven were the retention loss in the form of persistence from the impact evaluation.

Another alternative way to look at this issue can be seen in how this retention study is performed and how its information can be used. The M&E Protocols specifically state that for SoCalGas the measurement retention studies will be based upon sub-samples from the first year impact analyses and annual load impact studies.[5] This study was designed to meet this requirement, as discussed below in the section on sampling.

This means that this retention study is directly applicable to the first year impact assessment as it includes savings estimates (effectiveness). However, as retention is still measured from the original database, the double-count possiblity still exists. (The first year impact study for SoCalGas' Commercial EEI Program was based upon a telephone survey and billing analysis. There were no on-site visits, metering or monitoring. First year retention estimates were not explicitly provided nor a database of retained measures after the first year.)

As this study is a measure retention study, and not a persistence study, it did not gather data on usage, as doing so could cause confusion to readers of the report.

[5] M&E Protocols (ibid), pg. 28.

Effective Useful Life Measurement

The second primary objective of this study is to estimate the *ex post* effective useful life (EUL) and compare this to the *ex ante* EUL. The M&E Protocols define effective useful life (EUL) as:

> *"An estimate of the median number of years that the measures installed under the program are still in place and operable."*[6]

This means we need to use the average retention rate at each follow-up point to estimate when half (50%) of the measures are still in place and operable and half are not.

2.2 Survey Instrument

The site visits and survey instruments were kept simple for easy and quick data collection, minimizing potential data errors, and ensuring high quality customer service. The instrument was drafted to allow each instrument to contain the specific customer information on the site and the number and types of cooking measures being examined for the retention study. As part of interacting with customers on-site, participants were also asked their satisfaction level with the cooking measures. The draft instrument was reviewed by the Utility Study Manager and then finalized. A copy of the site survey instrument is provided as Appendix A.

2.3 Sampling

There are a total of 735 sites in SoCalGas' 1996 Commercial EEI Program that received incentives for 1,309 pieces of cooking equipment. This resulted in an anticipated savings of 1,584,165 therms per year.

We conducted site surveys of 200 sites, 27% of the participating sites and collected data on the retention of all program-installed cooking measures at that site. Assessing all cooking measures installed at these 200 sites raises the retention sample size to 361.

[6] Ibid, pg. A-1.

In order to maximize the accuracy of the retention study, these 200 site visits were selected through a stratified random sampling process based upon estimated therm savings. The sampling strata were designed based upon the program site data and expected therm savings from installed cooking measures. The stratum information is provided in Table 2.2.

Table 2.2 Sampling Strata Design from Program Site Data of Cooking Measures

Stratum	Sites	% of Sites	Therm Min.	Therm Max	Avg.	Expected Therms	% of Svgs
1	65	8.8%	5,045	23,131	8,962	582,528	36.8%
2	80	10.9%	3,058	4,969	3,766	301,257	19.0%
3	278	37.8%	1,007	2,998	1,938	538,705	34.0%
4	312	42.4%	59	998	518	161,675	10.2%
Total	735	100.0%			**Total**	1,584,165	100.0%

Stratified random sampling was conducted based upon these strata. These initial sampling datasets from the program data were then compared to the list of sites (by premise identifier) included in the first year impact study. Only those selected sampling sites were kept in the sample that were in the first year impact study.

2.4 Final Sample

Site visits were made by qualified ASW auditors for the selected sampling sites. Given the very short and easy nature of the site survey instrument once on-site, it was decided that the best customer service, quickest, and most cost-effective method was direct site visits (at non-meal times given we would be looking at cooking equipment often in restaurants) without prior scheduling (which would have taken the customer longer with headquarters contact and site scheduling than the actual site visit took). This procedure produces an almost 100% sampling hit rate and, therefore, eliminates potential sampling bias.

We conducted site surveys of 200 sites, 27% of the participating sites and collected data on the retention of all program-installed cooking measures at that site. Assessing all cooking measures installed at these 200 sites raises the retention sample size to 361.

The final site sample distribution by the sampling strata is provided in Table 2.3. This table also provides the stratum weighting for the analysis given the final sampling distribution.

Table 2.3 Sampling Strata Design from Program Site Data of Cooking Measures

Actual Site Visits Stratum	# of Sites	% of Sites	Expected Therms	% of Svgs	% Compare	Stratum Weights
1	24	12.0%	206,110.70	41.5%	0.885364	0.1969256
2	22	11.0%	82,123.70	16.5%	1.149144	0.2555964
3	86	43.0%	174,076.76	35.1%	0.969429	0.2156236
4	68	34.0%	33,945.42	6.8%	1.491995	0.3318543
	200	100.0%	496,256.58	100.0%	4.50	1

2.5 Analysis for Retention Estimates

Cooking equipment is a very straightforward measure for a retention study. The equipment is in general not partially removed. It is either there and operational, there and non-operational, or removed. Therefore, the site survey collected this information for the cooking measures installed. This data was gathered as shown in Figure 2.2, an excerpt from the site survey instrument provided in Appendix A.

Figure 2.2 How Retention Data Was Collected

Measure Type #1		**
	Mfg.	**
	Model	**
	Number	**
Q3	# Still in place	
Q4	# also operational	

** Shaded areas provided by computerized read of sampling database.

2.6 Effective Useful Life Analysis

The purpose of the retention study is to develop an *ex post* Effective Useful Life (EUL) estimate and compare this with the *ex ante* EUL. According to the M&E Protocols, Table 10, this comparison is made at the 80% confidence level.

> *"1) For measures selected for 3rd/4th year retention studies: The estimated ex post measure effective useful life that results from the retention study will be compared to the ex ante (i.e., forecast) effective useful life estimates. Hypothesis testing procedures will be used to determine if the estimated ex post measure effective useful life is statistically significantly different from the ex ante measure effective useful life. If the estimated ex post measure effective useful life is significantly different than the ex ante measure effective useful life, the estimated ex post measure effective useful life will be used to recalculate the Resource Benefits, net. Otherwise, the Resource Benefits, net estimate will continue to use the ex ante measure effective useful life. Hypothesis testing will be conducted at the 20% significance level.*
>
> *An equivalent representation is to construct 80% confidence intervals around the estimated ex post measure effective useful life. If the ex ante measure effective useful life estimate is within the constructed confidence interval, then the Resource Benefits, net calculation will continue to use the ex ante measure effective useful life. If the ex ante measure effective useful life estimate is outside the constructed confidence interval, the estimated ex post measure effective useful life will be used to recalculate the Resource Benefits, net."*[7]

The *ex ante* estimate for SoCalGas' cooking measures in the Commercial EEI Program is 12 years.

This retention study will obtain a weighted average retention percentage for the 1996 program cooking measures. The measured were installed throughout 1996 and the study does not have when the measures were removed. Retention measurement occurred in late January 2001. Therefore, the time since installation is estimated at 4.5 years. This then provides two points for the EUL analysis, 100% retention at program installation and the weighted average retention rate at 4.5 years.

Two data points means that the easiest EUL analysis is using a linear model. A linear model will be used. The loss over the 4.5 years will produce an average annual loss rate. When loss is at 50%, or the median, this is the EUL from a linear model. The 80% confidence interval around this point estimate is also quite straightforward to estimate given the standard error of the retention estimate.

[7] M&E Protocols, Table 10, pg. 31.

A common EUL model used with energy efficiency programs is the exponential model. One of the primary advantages of using an exponential model is that it more closely resembles the S-curve retention profile expected, and provides a simple assessment of the median. This latter advantage makes it straightforward to predict the effective useful life (EUL). With these advantages, an exponential model was also used to predict the EUL for cooking measures.

The exponential survival function is:

$$S(t) = e^{-\lambda t}$$

The mean survival time is then $1/\lambda$.

Defining the EUL as the median creates the following equation:

$$S(t) = e^{-\lambda t} = 0.5$$

Solving for t = EUL, obtains:

$$EUL = -\ln(0.5)/\lambda$$

Observing S in a sample with average measure age t can then be used to solve the survival function for $\lambda = \ln(S)/t$. Substituting into the previous equation provides us with the formula for the predicted EUL as follows:

$$\text{Predicted EUL} = [t \ln(0.5)] / \ln(S)$$ where S=survival proportion

The predicted EUL (*ex post* EUL) is compared to the *ex ante* EUL to derive the EUL realization rates. This is expressed as:

EUL Realization Rate = *Ex Post* EUL/*Ex Ante* EUL

Confidence intervals will then be estimated using the predicted EUL equation and the confidence interval upper and lower limits for S and t (constant in the case of these study as we have only one post-retrofit retention time period).

The dichotomous scale we have retention of cooking measures also allows the possibility of using classical survival analysis techniques. These techniques originated in the medical field where the concern was for mortality or whether someone contracted the studied disease. These outcomes are dichotomous, they either occur or not and can be measured as zero or one events. Classic survival analysis is generally considered the "gold-standard" is measuring survival functions.

Early retention studies in energy efficiency programs have seldom had enough failure data to obtain a solving model (obtaining convergence) or reasonable estimates. Yet, as a "gold-standard", we also performed a classical survival analysis.

3.0 Findings and Results

3.1 Retention Findings

The first step for final sample was removing the customer identifiers and removing unnecessary variables to create the final sample for documentation (retaining customer confidentiality). It is from this point on that all the datasets and analysis efforts (spreadsheets and SAS® programs) have been provided within the documentation and datasets for this project. Appendix B contains all the datasets, documentation, and elements of this analysis as required by the M&E Protocols.

Keeping this analysis as simple and straightforward as possible, much of the analysis is performed with simple Excel® spreadsheets. The overall weighted retention estimate was derived by summing measure retention by stratum. The stratum retention rate is this sum divided by the total number of cooking measures installed in these sample strata. The overall average weighted retention rate is the weighted stratum retention rates, resulting in an overall retention rate for cooking measures in SoCalGas' 1996 Commercial EEI Program is 78.7%.

Similarly, the variance in the retention rate by stratum by calculated to obtain the standard deviation by stratum.. From this, the weighted average standard deviation was derived as 0.375.

3.2 Effective Useful Life (EUL) Analyses

The linear model using the total loss of 21.3% (100% - 78.7%) and divides by the time period, 4.5 years, to obtain an annual loss rate of 4.7%. Half of the measures remain (median as 50% remaining) at 10.6 years (0.5/.047).

The confidence interval calculations are based upon well-accepted formulas that are used to estimate confidence intervals for sampling error. The retention estimates are means and are, therefore, point estimates. As such, the calculation of the confidence level is straight forward based on the formula for confidence intervals for point estimates. This formula is as follows:

$$\text{Mean} - t\,(sd/\sqrt{N}) < \text{Mean} < \text{Mean} + t\,(sd/\sqrt{N})$$

where:

t = score representing desired level of statistical significance

sd = standard deviation

N = sample size

The 80% confidence interval for the retention estimate is, therefore, 74.4% to 83.0%.

The lower confidence interval provides an annual loss rate of 6% and an EUL of 8.9 years. The upper confidence interval on the retention estimate provides an annual loss rate of 4% and an EUL of 13.3 years. That means the 80% confidence interval as applied to the linear model result in a confidence interval range of 8.9 years to 13.3 years. The *ex ante* EUL of 12 years is within this confidence interval.

The exponential model was also used to calculate a predicted EUL as described in Section 2.5. Recall the equation for the predicted ex post EUL is as follows:

$$\text{Predicted EUL} = [t \ln(0.5)]/\ln(S) \quad \text{where S=survival proportion}$$

Placing the retention rate of 78.7% and t=4.5 years yields an EUL estimate of 13.0 years.

Substituting the retention confidence interval of 74.4% and 83.0% provides a confidence interval for the exponential model estimate of 10.5 to 16.8 years. The *ex ante* EUL is also within this confidence interval.

Given only two time periods and simple dichotomous outcomes, a simple dataset was created that represented 361 measures in place in mid-1996 and 284 retained as of the end of January 2001. This dataset was used for Classic Survival Analysis use Lifereg in SAS® with a logistic model with no scale and no intercept. This model achieved convergence but did not provide a reasonable EUL estimate. This estimate was 161 years with a 80% confidence interval of 157 years to 165 years.

In summary, the *ex post* EUL was estimated reasonably by both an exponential and linear model with both providing the same overall conclusion. Both of these EUL estimates and their confidence intervals are presented in Table ES.1.

Table 3.1[8] EUL Estimates

	Linear Model	Exponential Model
Median value	10.6 years	13.0 years
Confidence interval* (lower)	8.9 years through	10.5 years through
Confidence interval* (higher)	13.3 years	16.8 years

* Calculated at 80% confidence level.

The *ex ante* EUL for cooking measures for Southern California Gas Company's Commercial EEI Program is 12 years. Twelve (12) years falls within the confidence interval for both the exponential and linear models for the Effective Useful Life (EUL). **This provides clear evidence that the *ex ante* EUL is an accurate measure of the EUL of the Commercial EEI Program's cooking measures as of the 4th year retention study.**

3.3 Required Protocol Tables

This subsection provides the summary tables as required in the M&E Protocols.

Table 3.2 provides the summary documentation for data quality and processing as required in Table 7 of the M&E Protocols.

[8] This table is the same as Table ES.1.

Table 3.2 Data Quality and Processing Documentation Protocol Table 7B

Protocol Table Item #	
	Overview Information
1a. Study Title & ID	Measure Retention Study for SoCalGas Company's 1996 Commercial EEI Program
1b. Program, years, & descrip.	1996 Commercial Energy Efficiency Incentives Program Assistance provided for high efficiency gas measures for commercial customers.
1c. End uses & measures	End Use: Cooking Study measures: Cooking (e.g., ranges, boilers, fryers, melters)
1d. Methods & models	Site survey analysis produced retention counts. Given a stratified sample, weighted average retention calculated. Predicted EUL estimated via linear and exponential models based on weighted retention rate and time period of 4.5 years.
1e. Analysis sample sizes	200 sites for a total retention study of 361 measures.
	Data collection: Mid-January to Early February 2001.
	Database Management
2a. Data sources	Program tracking database provided information for initial stratified sampling pool. Final sampling pool were selected sites with those that within the first year impact study removed from retention study sample.
2b. Data attrition	Unscheduled on-sites had no scheduling attrition.
2c. Data quality checks	All program data pulled along with initial sampling. Each customer in sampling pool was assigned a tracking number that was used throughout surveying, data entry and verification, and initial analysis checks within study. Protocols established for site visits, utility interactions, and data entry.
2d. Collected data not used	None

	Sampling	
3a. Sampling procedures	Stratified random sample by expected site therm savings for cooking measures.	
3b. Survey information	Survey instrument provided in Appendix A.	
3c. Statistical descrip.	Retention findings based on weighted mean of site retention estimate. EUL estimates derived from linear and exponential model. Confidence intervals estimates for both using 80% confidence interval for point retention estimate.	
	Data Screening and Analysis	
4a. Outliers	No outliers identified or treated.	
4b. Background var.	None.	
4c. Screened data	No screening, all data utilized.	
4d. Model statistics	Linear Model Average measure age: 4.5 Loss: 21.3% Annual loss: 4.7% EUL: 10.6 years	Exponential Model Average measure age: 4.5 Proportion surviving: 78.7% EUL: 13.0 years
4e. Specification	Predicted EUL = At 50% remaining linear loss. For exponential: $[t \ln(0.5)]/\ln(S)$ where S=survival proportion	
4e1 Heterogeneity	All cooking measures with no heterogeneity considered.	
4e2 Omitted Factors	No omissions.	
4f Error	Simple survey with no scheduling attrition. There were 201 site visits. One site had no access and retention information could not be obtained.	
4g Influential data points	No outliers identified.	
4h Missing data	None.	
4i Precision	Confidence levels computed on retention rates and applied to retention point estimate through linear and exponential formulas.	

Table 3.3 provides a reporting summary of the study results as required in Table 6 of the M&E Protocols.

Table 3.3 Data Quality and Processing Documentation
Protocol Table 6

Protocol Table Item #	
	Overview Information
1. Studied measure & end-use	Cooking
2. *Ex ante* EUL	12 years.
3. *Ex post* EUL	Linear model: 10.6 years Exponential model: 13.0 years
4. *Ex Post* to be used	12 years
5. EUL Standard Error	0.375
6. 80% Confidence Interval	Linear Model: 8.9 years to 13.3 years Exponential Model: 10.5 years to 16.8 years
7. p-Value	20%
8. Realization Rate	1.0
9. Like measures	None

3.4 Other Findings

Most customers (87%) were satisfied or very satisfied with their energy efficiency cooking equipment from the program. Less than three percent (3%) were dissatisfied or very dissatisfied.

Another interesting fact gathered from the retention study was that business turnover amongst these commercial customers (mostly restaurants with some schools and other facilities) was 12.5% over the 4.5-year period. There was a high correlation between a change in business and removal of the measures. At the same time, this correlation was slightly less than 0.5, meaning a significant proportion of business turnovers were often to other restaurants that continued to use the energy efficient cooking equipment.

Appendix A: Site Survey Instrument

Introduction
Southern California Gas Company
1996 Commercial Retention Study

Original Customer

Hello, my name is _____. I work for ASW Engineering and we have been hired by Southern California Gas Company to do a very quick survey at this site. Our records show that your firm purchased some energy efficient cooking equipment with the help of SoCalGas back in 1996. We are performing a study to see how much of this equipment has since failed or been removed. This is just a study and there is no penalty or consequences if the equipment is no longer here. It should take me less than five minutes to see the equipment and turn on to test that they work.

CONDUCT SURVEY

Thank you very much for your assistance.

New Customer

Hello, my name is _____. I work for ASW Engineering and we have been hired by Southern California Gas Company to do a very quick survey at this site. Our records show that a firm that was located here in 1996 purchased some energy efficient cooking equipment with the help of SoCalGas. This equipment may have remained in the facility as your firm moved in. We are performing a study to see how much of this equipment has since failed or been removed. We would like to see if this cooking equipment is still on this site. This is just a study and there is no penalty or consequences to any customer if the equipment is no longer here. It should take me less than five minutes to look through your cooking equipment to find these pieces and turn them on to test that they work.

CONDUCT SURVEY

Thank you very much for your assistance.

Site Survey Data Collection Instrument

Site Visit Survey for the Retention Study
of the Commercial EEI Program -- SoCalGas

Site Tracking#		Surveyor Initials	Survey Date

Company Name	
Prev. Contact Name	
Prev. Contact Position	
Prev. Contact Phone	
Customer Name	
Street Address	
City	
Zip	
# of Types	

		Yes	No
Q1	Is customer name different at this address?		
	Q2 (IF YES) _____ New customer name		

Measure Type #1			**Measure Type #2**		
	Mfg.			Mfg.	
	Model			Model	
	Number			Number	
Q3	# Still in place		Q7	# Still in place	
Q4	# also operational		Q8	# also operational	
Q5	If some have been removed or replaced: Why?		Q9	If some have been removed or replaced: Why?	

Q6	How satisfied are you with this equipment?					Q10	How satisfied are you with this equipment?				
	Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied		Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied

Site Tracking # 0 Page 2

Measure Type #3						**Measure Type #4**				
	Mfg.						Mfg.			
	Model						Model			
	Number						Number			
Q11	# Still in place					Q15	# Still in place			
Q12	# also operational					Q16	# also operational			
Q13	If some have been removed or replaced: Why?					Q17	If some have been removed or replaced: Why?			
Q14	How satisfied are you with this equipment?					Q18	How satisfied are you with this equipment?			
	Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied		Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied
Measure Type #5						**Measure Type #6**				
	Mfg.						Mfg.			
	Model						Model			
	Number						Number			**#N/A**
Q19	# Still in place					Q23	# Still in place			
Q20	# also operational					Q24	# also operational			
Q21	If some have been removed or replaced: Why?					Q25	If some have been removed or replaced: Why?			
Q22	How satisfied are you with this equipment?					Q26	How satisfied are you with this equipment?			
	Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied		Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied
Measure Type #7						**Measure Type #8**				
	Mfg.						Mfg.			
	Model						Model			
	Number						Number			
Q27	# Still in place					Q31	# Still in place			
Q28	# also operational					Q32	# also operational			
Q29	If some have been removed or replaced: Why?					Q33	If some have been removed or replaced: Why?			
Q30	How satisfied are you with this equipment?					Q34	How satisfied are you with this equipment?			
	Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied		Very satisfied	Somewhat Satisfied	Neither satisfied nor dissatisfied	Somewhat Dissatisfied	Very dissatisfied

Appendix B: Datasets and Documentation

This study was specifically designed to be as simple and straight forward as possible. As the analysis progressed, the steps and programs were continually refined in order to accomplish this goal. The result was the development of small set of concise data analysis steps, almost all of which were simply performed within easy to read Excel spreadsheets®. The use of these steps, and copies of the programs are provided in this Appendix. The Excel© spreadsheets, and SAS© programs are provided on diskette at the end of this Appendix. Following the description contained below, the work should be easily replicable.

Flow of Datasets and Analysis Programs

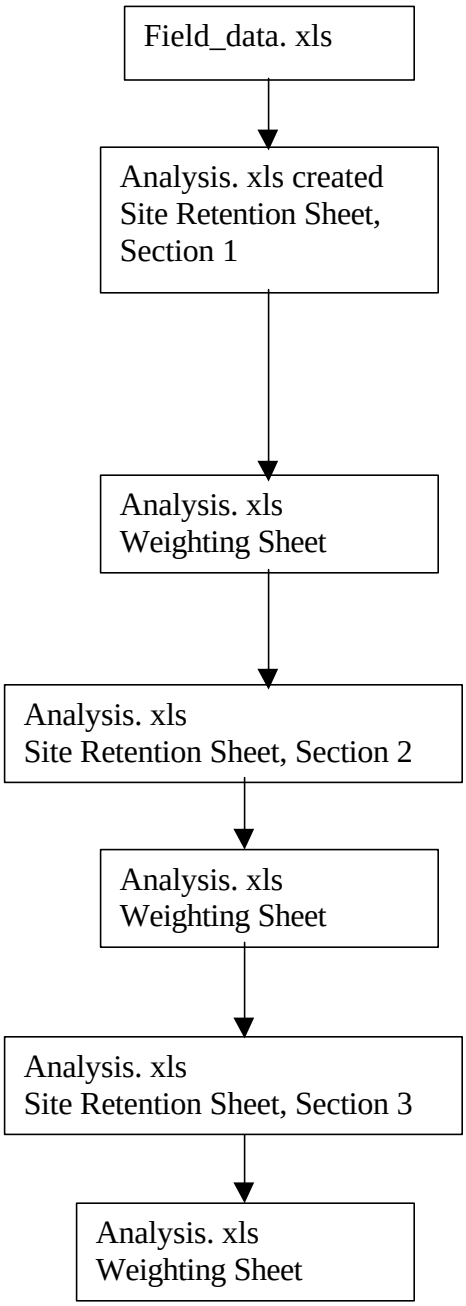
A step-by-step schematic of the use of datasets and analysis programs is presented in Figure B.1. This diagram also indicates the complete flow of the material provided and the type of material (dataset and type, program and type). This diagram can be used with the datasets and programs provided on diskette to replicate all of the results discussed in this report.

Set-Up Reminders for Replication

The Excel© programs and SAS© are the exact ones used for this study. A few minor changes will need to be made to replicate the work.

Excel® spreadsheets use sheet reference links and would need to be checked if the spreadsheet name is changed. SAS© programs contain LIBNAME statements and FILENAME statements in the beginning of the programs to tell the program where to find datasets and where to place datasets. These will need to be changed to reflect the folder set-up being used in the replication.

Figure B.1



Final sample with necessary data and no customer identifying data.

Field data copied into Analysis.xls as start of site retention sheet.
Complete Section 1 of Site Retention Sheet by formulas that 1. Count measures installed per site, measures remaining per site, and site retention rate.

2. Identify for column sum the number of business changes.
3. Use "if" statement to count stratum and identify therm savings per stratum.

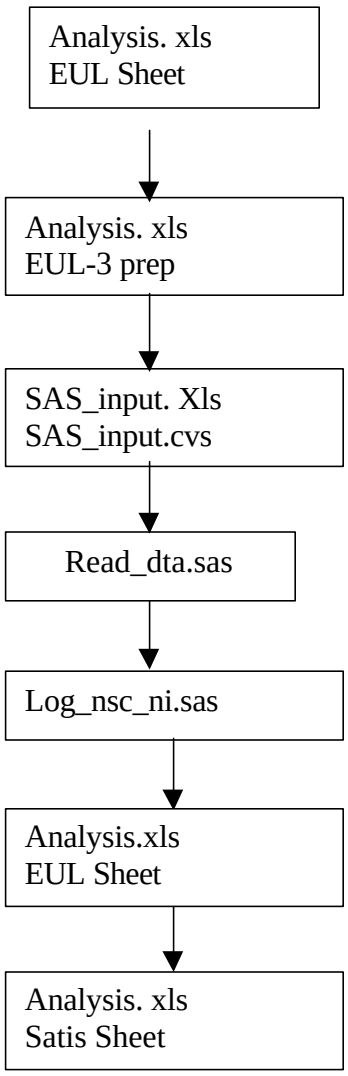
Created with sampling stratum.
Actual site counts and expected therms by stratum from Site Retention Sheet totals of Section 1.
Stratum weights calculated from comparison of sample to overall with weights totaling 1.0.

Calculate stratum retention rates by site.
Sum total for stratum retention sums.

Stratum sums divided by sum of measures installed by stratum provides stratum retention weights.
Apply weighted to sum to average weighted retention rate.

Calculate variance, obtain by stratum by using a "SumIf" column total.

Weight variances by stratum.
Square root variances by stratum for standard deviations by stratum.
Sum for weighted standard deviation.



EUL sheet using information from Weighting Sheet and EUL formulas to calculate EUL estimates and confidence intervals (at 80%) for Linear Model and Exponential Model.

Data created that replicates number of measures installed in mid-year 1996 and retained or failure (0/1 dichomotous variable) in retention study. Made in format to save just this sheet for SAS® input.

Save EUL-3 prep as separate worksheet.
Delete row of column headings.
Save as comma-delimited file.

SAS program that read comma-delimited file.
Creates log file (Read_dta.log) of results and permanent SAS dataset: Dta4Anal.ssd.

Uses permanent SAS dataset to do Lifereg survival analysis with logistic model with noscale and no intercept.

Type in SAS results. Calculate EUL and confidence interval EULs looking for 4.5 years matching 78.7% retention.

Use "SumIf" on Site Retention Sheet for satisfaction responses by category of response (1, 2, etc.).
Use counts to calculate percent Very Satisfied, Satisfied, etc.