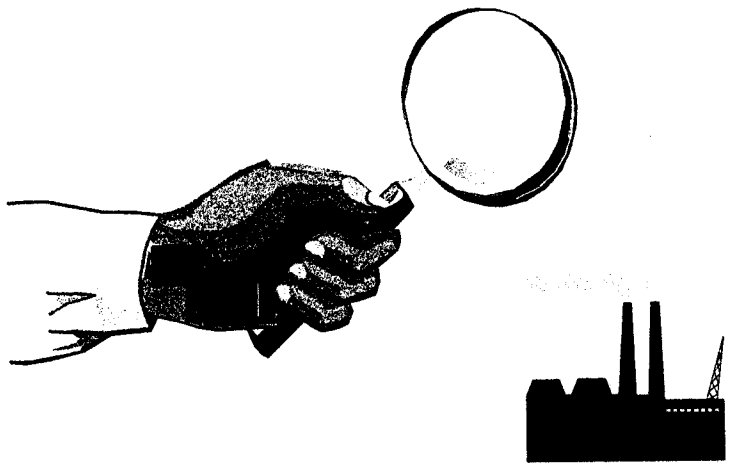
San Diego Gas & Electric
Marketing Programs & Planning
8306 Century Park Court
San Diego, California 92123

1994 Industrial Energy Management Services Program

First Year Load Impact Evaluation

February 1997



MPAP-94-P42-941-706

Study ID No. 941

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Executive Summary

The Commercial/Industrial (C/I) Energy Management Services (EMS) Programs are designed to provide specific energy saving recommendations to meet individual customer needs. These audit programs are considered to be lead generators for SDG&E's Commercial/Industrial Energy Efficiency Incentive (EEI) Programs. Since so many EMS participants become C/I EEI participants, a retroactive waiver was requested and approved on March 15, 1995. This waiver delayed the evaluation of the PY94 Commercial/Industrial Energy Management Services Programs from March 1, 1996, to March 1, 1997 (see Appendix A).

This first year load impact evaluation estimates the gross energy savings for participants and nonparticipants by use of a regression model. The model estimates the gross energy savings at the customer premise level. Table C-11 of the M&E Protocols requires that the gross energy savings be reported for all end uses combined, and the lighting, motors, and miscellaneous end uses separately. Table 1 shows the annual energy and demand savings for the 1994 Industrial EMS Audit Program participants by end use. (Positive values are savings while negative values are increases in consumption.)

TABLE 1
Average Annual Savings for 1994 Industrial EMS Audit Participants

End Use	Annual kWh Savings	Annual kW Savings
Motors	0	0
Lighting	-25,443	-4.62
Miscellaneous	-12,532	-2.28
TOTAL	-37,975	-6.90

The estimated average annual net impacts and net-to-gross results for energy and demand are provided in Table 2:

TABLE 2
Average Annual Net Impacts and Net-to-Gross

	kWh	kW
Net Load Impacts	-37,344	-6.78
Net-to-Gross Ratio	98.3%	98.2%

Introduction

Program Overview

The Commercial/Industrial Energy Management Services Programs are designed to provide specific energy saving recommendations to meet individual customer's needs. SDG&E has two different audit programs: Large Commercial/Industrial Audits and Medium/Small Commercial/Industrial Audits. The Large Commercial/ Industrial Audit Program focuses on energy saving measures that the customer is most interested in. Account executives and energy service representatives work closely with these customers to encourage the implementation of the recommended energy saving measures. The Medium/Small Commercial/Industrial Audit Programs detail specific recommendations for future energy efficient equipment installation. No incentives are offered under these programs; however, audit recommendations which may be eligible for incentives are recommended to the Commercial/Industrial Energy Efficiency Incentives (C/I EEI) Programs. Approximately 33% of the Industrial EMS audit participants became Industrial EEI program participants during 1994 and the first nine months of 1995.

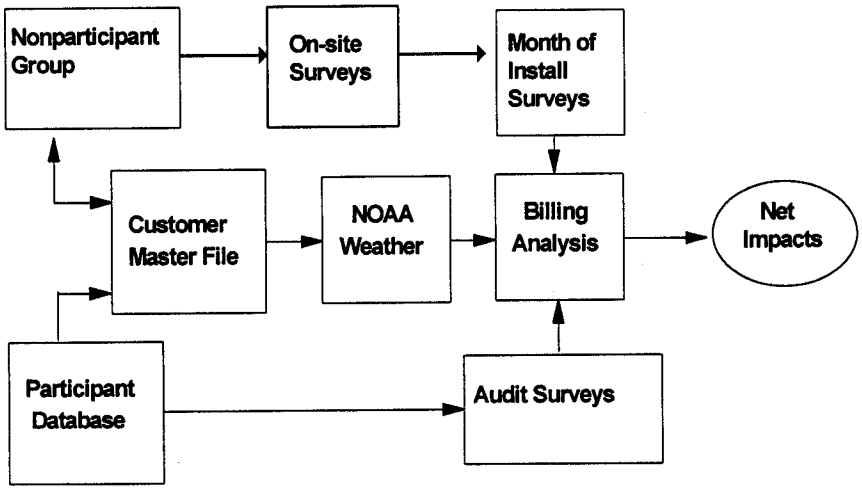
Sampling & Data Collection

Data Collection

The data came from the following sources:

- Participant group customer name, address, and audit dates came from the program tracking database.
- Nonparticipant group was selected from the Customer Master File. This is the nonparticipant group used in the CEEI PY94 first year load impact evaluation (Study ID No. 923).
- Data on floor stock, square footage, hours of operation, and occupancy from on-site audits for the nonparticipants.
- Electric consumption history from the Customer Master File.
- Hourly weather data for three climate zones from NOAA files.
- Participant Survey to identify month and year of installation for efficiency measures and/or behaviors that may have been done as a result of SDG&E's audit.
- Nonparticipant group was phone surveyed to obtain the month of installation if the on-site audit indicated that there was some type of efficiency work done in 1994.

The following diagram shows the relationship between data elements:



The data were merged together to form the dataset for the regression analysis leading to the estimated energy savings per participant.

Participant Database

A total of 48 participants were identified in the 1994 Industrial Energy Management Services (IEMS) Program database. A participant is defined as having had SDG&E perform an audit in 1994. Of the 48 participants, 16 then went on to participate in one of SDG&E's IEEI programs during 1994 or during the first 9 months of 1995, leaving 32 IEMS participants for analysis (refer to the Retroactive Waiver in Appendix A). The M&E Protocols require 12 months of pre-installation and 9 months of post-installation consumption data. This data requirement further reduced the analytical sample size to 15 participants.

The database of 15 participants was phone surveyed for the month and year of installation for efficiency measures and/or behaviors that may have been done as a result of SDG&E's audit. The goal of the survey was to provide the best possible audit/install date to be used as the implementation date for use in estimating the load impacts. Nine participants responded to the survey for a response rate of 60%. Of the nine completed surveys, four participants indicated that they had done some type of energy efficiency measures or behaviors on their own. See Appendix B for a copy of the participant survey instrument. Table 3 summarizes the attrition process for the participants.

TABLE 3 Participant Attrition Summary	
1994 Energy Management Services participants	48
Remaining participants who did not participate in other SDG&E EEI programs.	32
Participants meeting minimum consumption data requirements (12 months pre and 9 months post of the implementation date)	15

Nonparticipant Database

M&E Protocol Table C-11 allows for a nonparticipant sample for the net-to-gross calculation for the Industrial EMS Program. Of the 15 industrial participants, only 4 claimed to have implemented energy efficient measures or behaviors on their own. The program tracking database does not contain the necessary information to calculate the net-to-gross ratios based on payback as described in Table C-11. Therefore, the nonparticipant group used for this analysis is the same one used in the CEEI PY94 first year load impact evaluation (Study ID No. 923). This nonparticipant sample was developed from SDG&E's Customer Master File by obtaining a list of commercial customers and the associated unique Premise ID numbers (generally a unique customer address). This nonparticipant group was determined to not have participated in **any** of SDG&E's 1994 DSM nonresidential programs.

Volt VIEWtech conducted detailed on-site surveys for 450 nonparticipants. The primary purpose of the audits was to collect information on floor stock, lighted and conditioned square footage, hours of operation, occupancy, and information on any energy efficiency installations the customer may have done. Refer to Appendix D of the CEEI PY94 first year load impact evaluation (Study ID No. 923) for a copy of the survey instrument.

Of the 450 nonparticipants, 63 were identified as doing some type of efficiency related measures/behaviors during 1994. These 63 customers were phone surveyed and asked the month that the efficiency/behavioral measure was implemented. Of the 63 nonparticipants surveyed, 35 answered the survey for a response rate of 56%. The remaining 28 could not be contacted, would not answer the survey, or were no longer in business. Of the 35 that answered the survey, 33 were determined to have sufficient pre- and post-consumption data and went into the regression analysis. Of the 387 nonparticipants with no installations of efficiency related measures, 374 were matched to billing records.

The total number of nonparticipants used in the analysis are 407 (374 no installations of efficiency related measures plus the 33 with install dates). See Appendix C for a copy of the nonparticipant 1994 efficiency improvements measures survey instrument. Table 4 summarizes the attrition process for the nonparticipants.

TABLE 4 Nonparticipant Attrition Summary		
1994 commercial nonparticipant database	450	
	No Install	**Install**
Nonparticipants that installed efficiency related measures		63
Nonparticipants that did not install	387	
Nonparticipants that installed with completed surveys		35
Nonparticipants meeting minimum data requirements	374	33
Nonparticipants used in the analysis	407	

Billing and Weather Data

Hourly weather data were estimated from daily highs and lows from NOAA data files and converted to heating and cooling degree hours with a base of 65 degrees Fahrenheit. These were matched to consumption data from the Customer Master File by billing cycle and climate zone for each participant and nonparticipant. The range of data for each customer in the participant and nonparticipant group could cover the period of January 1993 through June 1996.

The Regression Model

The General Model

The statistical method used is ordinary least- squares regression analysis, applied at the customer level, for participants and nonparticipants. Regressions were constructed for each customer (indexed by i), using monthly data (indexed by t). The following is the specification of the customer regression equation:

$$kWh_{it} = \beta_{0i} + \beta_{1i}(trend_{it}) + \beta_{2i}(cdh_{it}) + \beta_{3i}(d_{it}) + \varepsilon_{it}$$

Normalized monthly electric consumption is on the left hand side of the equation. $\beta_{0i} + \beta_{1i}(trend_{it})$ is the non-weather related trended element of electricity consumption such as lighting and miscellaneous loads. This captures the effects of changes in production, employment, downsizing, and overall changes in the economy. The next term $\beta_{2i}(cdh_{it})$ is the weather related consumption based on normalized cooling degree-hours. The following coefficient β_{3i} is the monthly estimated savings associated with the implementation of the audit recommendations.

The indicator variable (d_{it}) takes on the value of 0 or 1 depending on the date of implementation. The least squares regression model also contains the usual random disturbance term ε_{it}.

Demand Savings Estimate

The gross demand savings estimate is derived from the electric metering data for 1995 submitted to the CEC on September 27, 1996.[1] The CEC analysis contains hourly load estimates of CEC defined population sectors. The annual coincident with system peak estimates for the Industrial Building and Other Industrial sectors were combined to calculate a coincident with system peak load factor (Coin_LF). The Coin_LF is defined as the ratio of average demand to the demand at time of system peak:

$$\text{Coin\_LF} = \frac{\left(\frac{\text{TotalAnnualkWh}}{8{,}760}\right)}{\text{SystemPeakDemand}} = \frac{\left(\frac{1{,}399{,}688{,}621}{8{,}760}\right)}{254{,}391} = 0.62810$$

The coincident with system peak load factor for these two industrial classes combined is 0.628. This load factor was applied to the gross energy savings estimates reported in this study and in M&E Protocols Table 6.

Net Impact and Net-to-Gross

The net impact is calculated as the difference between gross savings per average participant and gross savings per average nonparticipant:

Net Impact: $\Delta\bar{\beta}_3 = \bar{\beta}_{3\text{part}} - \bar{\beta}_{3\text{ nonpart}}$

The estimate of the net-to-gross ratio is the net impact divided by the average participant gross savings:

Net-to-Gross ratio: $\eta_d = \frac{\Delta\bar{\beta}_3}{\bar{\beta}_{3\text{part}}}$

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1 Docket 94-DCP-1 CEC Data Collection and Analysis Plan, 1995-1997. In accordance with this plan, the CEC data request is submitted annually. The datasets include commercial annual sector peak load estimates.

Results

Savings Estimates

The coefficient from the regression model for the savings variable provides the estimate of the gross monthly load impact in kWh at the customer level. Negative savings indicate that consumption is increasing while positive savings show that consumption is decreasing. The results show that the participant and nonparticipant savings estimates are not statistically significant. The final results utilized 14 participants and 407 nonparticipants. Table 5 shows the results and relevant statistics.

TABLE 5
Industrial EMS Results (All End Uses Combined)

	Participants	Nonparticipants
Average Monthly savings in kWh	-3,164.55	-52.56
T Statistic	-1.24	-.35
S.E.	2,549.51	150.93
Count	14	407

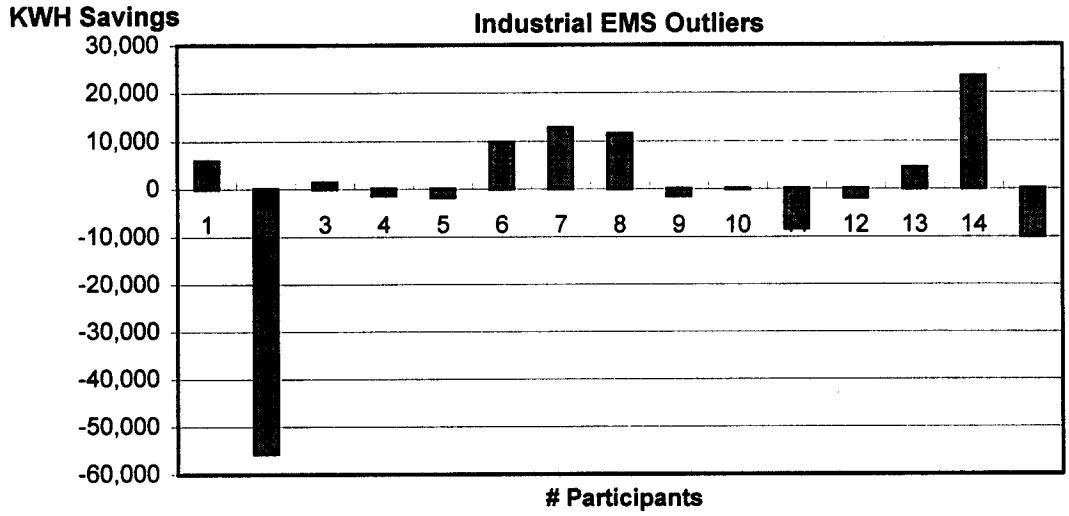
The average demand savings estimate for participants at time of system peak is -6.90. The demand savings estimate was calculated by applying the coincident with system peak load factor of 0.628 to the annual average hourly kWh of -4.33. The nonparticipant demand estimate was calculated in the same manner using the same coincident with system peak load factor.

$$\text{Estimated participant average demand savings} = \frac{-4.33}{0.628} = -6.90$$

This is the peak demand savings estimate reported in M&E Protocols Table 6.

Outliers

One outlier was identified in the participant analysis. This was revealed by inspecting the magnitude of the estimated monthly savings compared to the rest of the 14 participants. This outlier was removed from the analysis due to its extreme impact on the average estimated savings. If the outlier were kept in the analysis, the average savings changed from -3,165(n=14) kWh per month to 758(n=15). By removing the outlier, the average standard error changed from 3,596 to 2,550 and the t statistic improved from .21 to -1.24. The nonparticipant regression model had no outliers. The following plot of 15 participants shows the magnitude of the outlier:



End Use Savings Estimates

To disaggregate savings by end uses, weights were developed and applied to the entire savings estimate and allocated across end uses. The preferred weighting method would have been to allocate the *ex ante* estimates of the savings by end use. Unfortunately, this data is not available. The audit program database identifies information regarding the number of ***proposed*** measures and behaviors only. Although this method is not the optimal way to determine end use savings, information about actual measure installations and behavioral changes was not available for the majority of the participants. The weights were determined by calculating the frequency distribution for these ***proposed*** number of measures and behavioral changes by the major end uses: lighting, motors, and miscellaneous. Frequencies and weights calculated for the participants end uses are shown in Table 6.

TABLE 6
End Use Number of Measures and Weights

End Use	No. of Measures	Weight
Motors	0	0.00
Lighting	12	0.67
Other	6	0.33
TOTAL	18	1.00

Table 7 shows the annual energy and demand savings for the 1994 Industrial EMS Program participants by end use.

TABLE 7
Average Annual Savings for 1994 Industrial EMS Audit Participants

End Use	Annual kWh Savings	Annual kW Savings
Motors	0	0
Lighting	-25,443	-4.62
Miscellaneous	-12,532	-2.28
TOTAL	-37,975	-6.90

Net Load Impacts and Net-to-Gross Results

The estimated average annual net impacts and net-to-gross results for energy and demand are reported in Table 8:

TABLE 8
Average Annual Net Impacts and Net-to-gross

	kWh	kW
Net Load Impacts	-37,344	-6.78
Net-to-Gross Ratio	98.3%	98.2%

M&E PROTOCOLS TABLE 6

RESULTS USED TO SUPPORT PY95 SECOND EARNINGS CLAIM

FOR

1994 INDUSTRIAL ENERGY MANAGEMENT SERVICES PROGRAM FIRST YEAR LOAD IMPACT EVALUATION

FEBRUARY 1997

STUDY ID NO. 941

SAN DIEGO GAS & ELECTRIC

M&E PROTOCOLS TABLE 6 - RESULTS USED TO SUPPORT PY94 SECOND EARNINGS CLAIM FOR THE INDUSTRIAL ENERGY MANAGEMENT SERVICES PROGRAM

FIRST YEAR LOAD IMPACT EVALUATION, FEBRUARY 1997, STUDY ID NO. 941

Designated Unit of Measurement: ALL PRACTICES AND MEASURES COMBINED

END USE: ALL END USES COMBINED

				5. A. 90% CONFIDENCE LEVEL				5. B. 80% CONFIDENCE LEVEL			
				LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND	LOWER BOUND	UPPER BOUND
1. Average Participant Group and Average Comaprison Group		PART GRP	COMP GRP	PART GRP	PART GRP	COMP GRP	COMP GRP	PART GRP	PART GRP	COMP GRP	COMP GRP
A. Pre-install usage:	Pre-install kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Pre-install kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Base kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Base kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Base kW/ designated unit of measurement	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Base kWh/ designated unit of measurement	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B. Impact year usage:	Impact Yr kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Impact Yr kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Impact Yr kW/designated unit	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Impact Yr kWh/designated unit	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. Average Net and Gross End Use Load Impacts		AVG GROSS	AVG NET	AVG GROSS	AVG GROSS	AVG NET	AVG NET	AVG GROSS	AVG GROSS	AVG NET	AVG NET
	A. i. Load Impacts - kW *	-6.90	-6.78	-7.16	-6.65	-7.04	-6.52	-7.10	-6.70	-6.98	-6.58
	A. ii. Load Impacts - kWh	-37,975	-37,344	-88,302	12,353	-87,671	12,983	-77,196	1,247	-76,565	1,878
	B. i. Load Impacts/designated unit - kW	-6.90	-6.78	-7.16	-6.65	-7.04	-6.52	-7.10	-6.70	-6.98	-6.58
	B. ii. Load Impacts/designated unit - kWh	-37,975	-37,344	-88,302	12,353	-87,671	12,983	-77,196	1,247	-76,565	1,878
	C. i. a. % change in usage - Part Grp - kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	C. i. b. % change in usage - Part Grp - kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	C. ii. a. % change in usage - Comp Grp - kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	C. ii. b. % change in usage - Comp Grp - kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D. Realization Rate:	D.A. i. Load Impacts - kW, realization rate	-31.8%	-31.2%	-73.9%	10.3%	-73.3%	10.9%	-64.6%	1.0%	-64.0%	1.6%
	D.A. ii. Load Impacts - kWh, realization rate	-22.1%	-21.8%	-51.5%	7.2%	-51.1%	7.6%	-45.0%	0.7%	-44.7%	1.1%
	D.B. i. Load Impacts/designated unit - kW, real rate	-31.8%	-31.2%	-73.9%	10.3%	-73.3%	10.9%	-64.6%	1.0%	-64.0%	1.6%
	D.B. ii. Load Impacts/designated unit - kWh, real rate	-22.1%	-21.8%	-51.5%	7.2%	-51.1%	7.6%	-45.0%	0.7%	-44.7%	1.1%
3. Net-to-Gross Ratios		RATIO		RATIO	RATIO			RATIO	RATIO		
	A. i. Average Load Impacts - kW	98.2%		90.1%	106.4%			91.9%	104.6%		
	A. ii. Average Load Impacts - kWh	98.3%		90.2%	106.5%			92.0%	104.7%		
	B. i. Avg Load Impacts/designated unit of measurement - kW	98.2%		90.1%	106.4%			91.9%	104.6%		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	98.3%		90.2%	106.5%			92.0%	104.7%		
	C. i. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - kW	N/A		N/A	N/A			N/A	N/A		
	C. ii. Avg Load Impacts based on % chg in usage in Impact year relative to Base usage in Impact year - kWh	N/A		N/A	N/A			N/A	N/A		
4. Designated Unit Intermediate Data		PART GRP	COMP GRP	PART GRP	PART GRP	COMP GRP	COMP GRP	PART GRP	PART GRP	COMP GRP	COMP GRP
	A. Pre-install average value	N/A	N/A	N/A	N/A	N/A	DIR	N/A	N/A	N/A	N/A
	B. Post-install average value	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6. Measure Count Data		NUMBER									
	A. Number of measures installed by participants in Part Group	N/A									
	B. Number of measures installed by all program participants in the 12 months of the program year	N/A									
	C. Number of measures installed by Comp Group	N/A									
7. Market Segment Data		SIC	PERCENT	SIC	PERCENT						
	Distribution by 3 digit SIC	367	33.33%	364	6.67%						
		308	20.00%	372	6.67%						
		283	6.67%	381	6.67%						
		344	6.67%	394	6.67%						
		362	6.67%								

* kW load impacts for the participant and non-participants were estimated using load factors derived from CEC data for the industrial classes.

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING DOCUMENTATION

FOR

1994 INDUSTRIAL ENERGY MANAGEMENT SERVICES PROGRAM

FIRST YEAR LOAD IMPACT EVALUATION

FEBRUARY 1997

STUDY ID NO. 941

M&E PROTOCOLS TABLE 7
DATA QUALITY AND PROCESSING DOCUMENTATION
For Industrial Energy Management Services Program
First Year Load Impact Evaluation
February 1997
Study ID No. 941

A. OVERVIEW INFORMATION

1. **Study Title and Study ID:** 1994 Industrial Energy Management Services Program: First Year Load Impact Evaluation, February 1997, MPAP-94-P42-941-706, Study ID No. 941.

2. **Program, and Program Description (Design):** The Industrial Energy Management Services Program is designed to provide specific energy saving recommendations to meet the individual customer's needs. This study covers the 1994 program year.[1] SDG&E has two different audit programs: Large Commercial/ Industrial Audits and Medium/Small Commercial/Industrial Audits. No incentives are offered under these programs, however, audit recommendations may be eligible for incentives under C/I EEI Programs.

3. **End Uses and/or Measures Covered:** All end uses combined disaggregated by lighting, motors, and miscellaneous.

4. **Methods and Models Used:** The statistical method used is *ordinary least-squares regression analysis*, applied at the customer level, for participants and nonparticipants. See the modeling section of the report for a complete detailed description of the model specification.

5. **Participant and Comparison Group Definition:** For the load impact analysis, the participants in the 1994 Industrial Energy Management Services Program are defined as having had an audit during the program year and **did not** participate in SDG&E's IEEI 1994 program year or the first 9 months of the 1995 program year (see Appendix A).

   The nonparticipant group used for this analysis is the same one used in the CEEI PY94 first year load impact evaluation (Study ID No. 923). This nonparticipant sample was developed from SDG&E's Customer Master File by obtaining a list of commercial customers and their associated unique Premise ID numbers (generally a unique customer address). This nonparticipant group was determined to not have participated in any of the 1994 DSM nonresidential programs. For the purpose of selecting the C/I EEI nonparticipant sample, the CEEI participants were grouped by annual kWh and the 10 building types defined by the

[1] On March 15, 1995, SDG&E was granted a Retroactive Waiver to postpone the first year load impact analysis for PY94 Nonresidential Energy Management Services from March 1, 1996, to March 1, 1997.

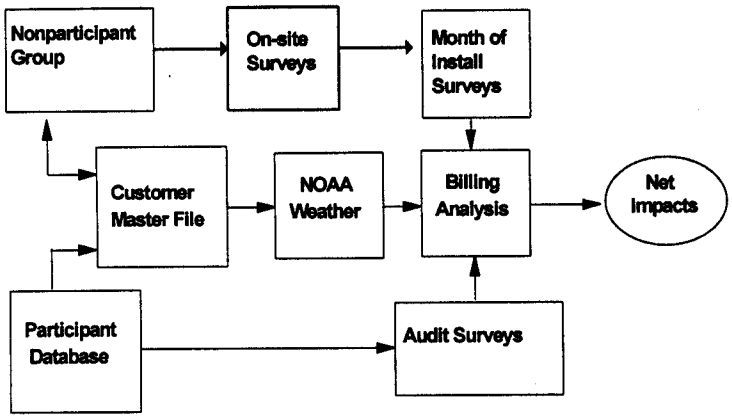
CEC. The nonparticipant group was then stratified by the same building types and consumption levels in order to match them to the 1994 CEEI program participant group. This nonparticipant sample is used for the 1994 Industrial EMS impact evaluation. On-site surveys conducted for the nonparticipant sample collected information on floor stock, lighted and conditioned square footage, hours of operation, occupancy, and information on any energy efficiency installations the customer may have done. A copy of the survey instrument and the building type breakdown of the sample is provided in Appendix D of SDG&E's 1994 CEEI impact evaluation.

6. **Analysis sample size:** Average number of nonparticipant billing months for the analysis is 25.3. Participant sample size going into the analysis is as follows:

End Use	No. of Participants	No. of Measures	Average No. of Billing Months
Lighting	7	12	25.9
Motors	0	0	n/a
Other	8	7	26.0
Total	15	19	

B. DATABASE MANAGEMENT

1. Flow Charts:



2. **Data sources:** the data came from the following sources:

- Participant group customer name, address, and audit dates from the program tracking database.
- Nonparticipant group was selected form the Customer Master File. This is the nonparticipant group used in the PY94 first year load impact evaluation (Study ID No. 923).

- Electric consumption history from the Customer Master File.
- Hourly weather data for three climate zones from NOAA files.
- Participant Survey to identify month and year of installation for efficiency measures and/or behaviors that may have been done as a result of SDG&E's audit.
- Nonparticipant group was re-surveyed to obtain the month of installation if they had done some type of efficiency work in 1994.

The data were merged together to form the dataset for the regression analysis leading to the estimated energy savings per participant. The savings are further disaggregated by lighting, motors, and miscellaneous end uses.

3. Data Attrition:

a. Participant Sample - Load Impact Analysis

For the load impact analysis, the 48 participants in the 1994 Industrial Energy Management Services Program are defined as having had SDG&E perform an audit in 1994. This group was lowered to 32 after eliminating participants that installed energy efficiency measures through one of SDG&E's programs during 1994 or the first 9 months of 1995 (see Appendix A). M&E Protocols require 12 months of pre-installation and 9 months of post-installation consumption data. This requirement further reduced the analytical sample size to 15 participants. This database was sent to CIC Research to be surveyed for the month and year of installation for efficiency measures and/or behaviors that may have been done as a result of SDG&E's audit The goal of the survey was to provide the best possible implementation date. The audit date was used for the implementation date in absence of an installation date obtained from the survey. After eliminating one outlier (discussed later in section D.1) the sample size is at 14 participants.

Participant Attrition Summary

Number of Participants for Load Impact Analysis	
1994 Energy Management Services participants	48
Participants left after removing DSM installations occurring in 1994 and the first 9 months of 1995.	32
Participants meeting minimum consumption data requirements (12 months pre and 9 months post of the implementation date)	15
Participants less outliers	14

b. Nonparticipant Sample - Load Impact Analysis

For this study 63 of the 450 nonparticipants were identified as doing some type of efficiency related measures/behaviors during 1994 leaving 387 nonpartici-

pants with no implementation date. CIC Research was contracted to perform a phone survey which essentially resurveyed these customers asking for the month that the efficiency/behavioral measure was installed. Of the 63 nonparticipants surveyed 35 answered the survey. The remaining 28 could not be contacted, would not answer the survey, or were no longer in business. Of the 35 surveyed non-participants, 33 were determined to have sufficient pre and post consumption data and were used in the analysis. Of the 387 nonparticipants with no installations of efficiency related measures 374 were matched to billing records. The total number of nonparticipants used in the analysis are 407 (374 no installations of efficiency related measures plus the 33 with install dates).

Nonparticipant Attrition Summary

1994 commercial nonparticipant database	**450**	
	No Install	**Install**
Nonparticipants with efficiency related measures		63
Nonparticipants that did not install	387	
Nonparticipants that installed with completed surveys		35
Nonparticipants meeting minimum data requirements	374	33
Nonparticipants used in the analysis	**407**	

4. **Data Quality Checks:** The data sets for the regression analysis were merged in SAS by the appropriate key variables. Counts of the data sets before and after the merges were verified to ensure accurate merging.

5. **All data collected** for this analysis was utilized.

C. SAMPLING

1. **Sampling procedures and protocols:** A census of participants was attempted. See the section of the report entitled Participant Sample - Load Impact Analysis on page 2 and section B.3.a. of this Table 7 for a detailed description. For the nonparticipant sample please see page 2 and section B.3.b. of this Table 7 for a detailed discussion.

2. **Survey information:** Copies of the participant and nonparticipant surveys are attached at the end of the report. Response rates for the participants was approximately 60%. The nonparticipant survey response rate was 56%.

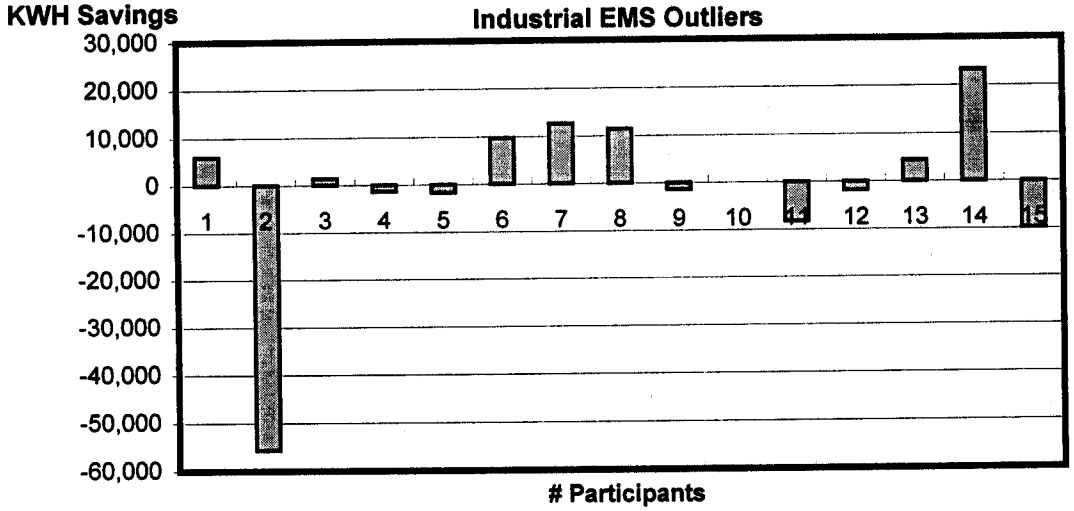
3. Statistical Descriptions:

Industrial EMS Results (All End Uses Combined)

	Participants	Nonparticipants
Average Monthly savings in kWh	-3,164.55	-52.56
T Statistic	-1.24	-.35
S.E.	2,549.51	150.93
Count	14	407

D. DATA SCREENING AND ANALYSIS

1. Outliers: One outlier was identified in the participant analysis. This was revealed by inspecting the magnitude of the estimated monthly savings compared to the rest of the 14 participants. This outlier was removed from the analysis due to it's extreme impact on the average estimated savings. If the outlier were kept in the analysis, the average savings changed from -3,165 (n=14) kWh per month to 758 (n=15). By removing the outlier, the average standard error changed from 3,596 to 2,550 and the t statistic improved from .21 to -1.24. The nonparticipant regression model had no outliers. The following plot of 15 participants show the magnitude of the outlier:



Missing Data Points: None.

Weather Adjustments: The cooling degree-hour regressors are based on estimates of hourly temperature (which are, in turn, based on daily high and low temperatures). The base for the cooling degree-hour is 65 degrees Fahrenheit. These were matched to consumption data from the Customer Master File by billing cycle and climate zone for each participant. The range for each customer

in the participant and nonparticipant group, consumption data and weather data could cover up to the period of January 1993 through June 1996.

2. **Background Variables:** A trend variable was included in the model to control for the effect of non-weather related variables such as effects of changes in production, employment, downsizing, and overall changes in the economy.

3. **Data Screening:** See the section of the report entitled Participant Sample - Load Impact Analysis on pages 2-3 and parts B.3.a., B.3.b., and D.1. above for data screening for inclusion in the final analysis dataset.

4. **Regression statistics:** See C.3.

5. **Specification:**

a. Both the participant and nonparticipant models are estimated entirely at the customer level. The sources of variation are the variation in weather over time and the implementation date which is the date provided by the survey or the audit date.

b. The time dependent regressors are a weather (cdh) variable, a trend variable and an indicator variable for the savings estimate.

c. Not addressed.

d. No factors or associated measures were eliminated from the regression model.

e. The model estimates the gross monthly load impact in kWh at the customer level by using an implementation date indicator. The difference between pre-audit consumption and the post-audit consumption is calculated directly form the regression equation, yielding gross impacts. Net impacts are defined as the difference in the gross impacts between participants and the comparison group.

6. **Error in Measuring Variables:** Data was checked for accuracy and completeness throughout the analysis process.

7. **Autocorrelation:** Not addressed.

8. **Heteroskedasticity:** Not addressed.

9. **Collinearity:** Not addressed.

10. **Influential Data Points:** See part D.1.

11. **Missing Data:** There were no missing data points in the analysis phase. See part D.1.

12. **Precision:** The standard errors for the estimates were calculated from the variances of the samples of participants on the monthly estimated savings coefficient.

E. DATA INTERPRETATION AND APPLICATION

1. **Calculation of Net Impacts:** Average participant group load impacts, minus average comparison group load impacts, plus or minus the effects of uncontrolled differences between the participant and comparison groups times number of participants.

2. **Process, Choices Made, and Rationale:** The process used in the calculation of net impacts is that specified in Table 5 of the M&E Protocols.