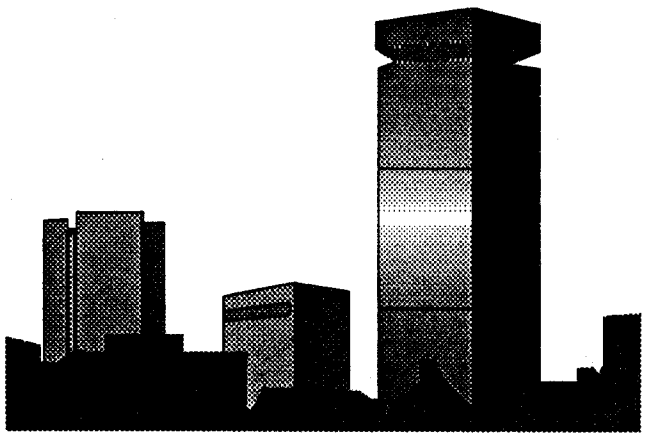
San Diego Gas & Electric
Marketing Programs & Planning
8306 Century Park Court
San Diego, CA 92123

1994 Nonresidential New Construction Program

First Year Load Impact Evaluation

February 1996



MPAP-94-P52-935-604
Study ID No. 935

San Diego Gas & Electric
Marketing Programs & Planning

Principal Investigators

Patrick Kirkland
Dean Schiffman
Rob Rubin
Leslie Willoughby

Table of Contents

Executive Summary

This report covers the 1994 program year of the SDG&E Nonresidential New Construction Program. The Program was redesigned in 1993 and named "Savings Through Design." Two options, Performance and Prescriptive, were available in 1994. The Performance Option of the program offers cash incentives to builders who are willing to revise their building plans to exceed Title 24 standards and achieve energy savings of 10 percent or greater in one or more of the following categories: cooling, heating, lighting, fans/motors, pumps, and hot water. The Prescriptive Option of the Program has incentives for measures such as: high-efficiency air conditioning, chillers, heat pumps, motors, glazing. energy efficient fluorescent lamps, electronic ballasts, optical reflectors, lighting controls, and compact fluorescents. The program requires customers to exceed Title 24 requirements by at least 10 percent in order to qualify for incentives. Only one of the 117 participants in this evaluation was covered under the performance option. Almost 70% of the new construction was tenant improvement rather than new buildings.

The methodology of this study uses a two-phase regression analysis to directly estimate net savings by subtracting participant consumption per square foot from that of nonparticipants. Estimated savings are presented in Table 1 below:

TABLE 1
Estimated Savings for 1994 Nonresidential New Construction Program

End Use	kWh per Square Foot			kW per Square Foot		
	Participant	Nonparticipant	Savings	Participant	Nonparticipant	Savings
Lighting	8.23	9.75	1.52	.00174	.00206	.00033
Lighting/HVAC	1.56	2.17	0.61	.00033	.00046	.00013

The regression model tended to overestimate savings per square foot for lighting and underestimate savings for lighting/HVAC combinations. However, the total estimate of 2.13 kWh per square foot savings compares favorably with the *ex ante* engineering estimate of 3.09 kWh per square foot. Although reasonable estimates of total savings were found in the analysis, since both the participant and nonparticipant samples were small, no changes in the *ex ante* estimates are recommended.

In an attempt to verify results of the regression analysis, DOE-2 building simulations were run on the 30 largest users in each group of participants and nonparticipants. It was specifically requested that the simulations not be calibrated to actual billing data so that the accuracy and usefulness of the results could be assessed. The simulations proved to be of little value. In about 40% of the cases, the whole-building energy use from the simulations either overestimated or underestimated actual consumption by at least an order of magnitude. In addition, some of the simulations failed to pick up obvious weather-sensitive loads. For these reasons, results from the simulations were not included in the model.

Measures installed under the program but not included in the Nonresidential New Construction Protocol Table C-8 are classified as "miscellaneous measures" and require a first-year retention study. On-site inspections of the miscellaneous measures revealed that 100% of the measures were installed and operating one year later.

The methodology used in this analysis, taking the difference between the participant group and the nonparticipant sample, yields net impacts directly. Therefore, no net-to-gross ratio is calculated.

Introduction

This report covers the 1994 program year of the SDG&E Nonresidential New Construction Program. The Program was redesigned in 1993 and named "Savings Through Design." Two options, Performance and Prescriptive, were available in 1994. These options are described below.

Savings Through Design – Performance Option

The Performance Option of the Savings Through Design Program is designed to encourage the installation of new construction projects which exceed California's Title 24 Building Energy Efficiency Standards. SDG&E offers free energy efficiency design review services for commercial projects during the planning or design phase. Cash incentives were available to those willing to revise their building plans to exceed Title 24 standards and achieve energy savings of 10 percent or greater in one or more of the following categories: cooling, heating, lighting, fans/motors, pumps, and hot water.

During 1994, five Title 24 design reviews were contracted for estimated savings of .03 gWh and .02 mW. SDG&E continued to improve its communication with the architectural, engineering, and development community through Title 24 seminars, newsletters, case studies, testimonials, and personal contacts. The Energy Design Assistance Program (EDAP) provided support in 1994 by sponsoring two seminars for the architectural and engineering community. Program presentations were made to such organizations as American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), American Institute of Architects (AIA), Illumination Engineering Society (IES), and Building Owners Management Association (BOMA).

The Performance Option experienced a drop in participation in 1994 due to the expansion of Prescriptive Option activity and the movement to tenant improvement projects. Under the Prescriptive approach, incentives are provided without the use of the more complex and costly Performance compliance methodology.

Savings Through Design – Prescriptive Option

The Prescriptive Lighting Efficiency Option of the Savings Through Design Program is designed to encourage the installation of energy efficient fluorescent lamps, electronic ballasts, optical reflectors, lighting controls, and compact fluorescents. Account Executives and Energy Service Representatives promote this program by targeting commercial customers and commercial design firms.

In 1993, the expansion of the Savings Through Design prescriptive option to include mechanical and glazing measures resulted in many additional contracts. This portion of the program was available to customers using this approach for Title 24 compliance. The program requires customers to exceed Title 24 requirements by at least 10 percent in order to qualify for incentives. This option has incentives for measures such as: high-efficiency air conditioning, chillers, heat pumps, motors, and glazing. Should customers participate under this Prescriptive Option, they would not qualify to also participate under the Performance Option for the same measures.

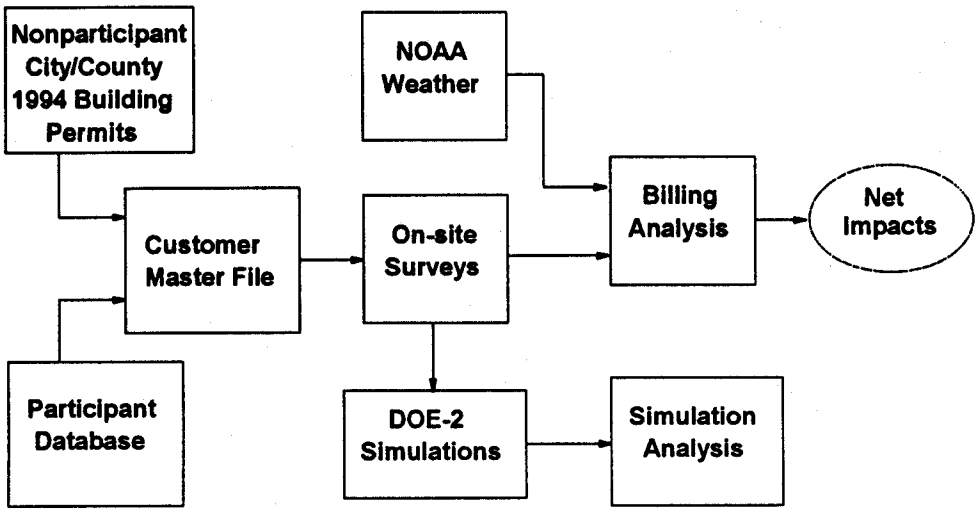
Monetary incentives were also available to customers on a custom basis for measures installed which did not fall under the Prescriptive lighting, mechanical, or glazing options. Customers can qualify for custom incentives for measures as long as they exceed Title 24 requirements by 10 percent or more and are cost-effective for both the customer and SDG&E. For measures that are non-Title 24, they must exceed the base case by 10% or more to qualify for an incentive. These are determined on a case by case basis.

Data Collection

Data for the impact analysis were obtained from the following major sources:

- Customer name, address, and installation date from the program tracking database;
- Nonparticipant building activity from 1994 San Diego City/County building permits;
- Consumption history from the Customer Master File;
- Data on floor stock, square footage, hours of operation, and occupancy from on-site audits;
- DOE-2 building simulations;
- Hourly weather data for three climate zones from NOAA files; and
- Retention information on "miscellaneous measures."

The following diagram describes the flow of data into the final new impact results:



Participant Database

A census of 117 Savings Through Design Program participants were extracted from the 1994 Nonresidential New Construction database. Only one of these was a performance option. All others were prescriptive. Almost 70% of the construction was tenant improvement, the remainder being new buildings. The 117 participants represented 751 installations of more than 50,000 individual measures. An attempt was made to include all participants in the analysis.

Participants are broken down by end use as follows:

Lighting Only	79
HVAC Only	4
Combination Lighting/HVAC	25
Miscellaneous	5
Combination Other Than Lighting/HVAC	4
Total	117

A breakdown of participants by 3-digit SIC code is provided in Appendix A.

Only one gas measure was installed in the 1994 program: a dessicant dehumidification system. This measure was not included in the analysis.

Nonparticipant Database

A list of 1,068 commercial new construction sites was obtained from 1994 San Diego city/county building permits. The sites were required to have completed construction in 1994. Of these, 870 had unique site addresses which were matched by address against SDG&E's 1994 Customer Master File. Only 392 premise IDs representing 441 individual accounts could be matched with confidence. This became the pool from which a nonparticipant comparison group was drawn. The group of nonparticipants was stratified by building type and size (annual kWh) in order to match them to the participant group, although the small number of customers in each group made this extremely difficult.

On-Site Audits

Detailed on-site audits were conducted on 104 of the 117 participants and a sample of 110 nonparticipants. The pool of nonparticipants was stratified by building type and size and contacted randomly within strata until a sample was achieved which resembled the participant group as closely as possible.

The primary purpose of the audits was to collect information on floor stock, lighted and conditioned square footage, hours of operation, and occupancy. For purposes of running building simulations, data on equipment efficiencies and capacities were also collected A copy of the survey instrument is provided in Appendix B.

A summary of the participant and nonparticipant groups by building type and size is given below. Note that a small building consumes less then 500,000 kWh per year, medium is 500,000 to 1,000,000 kWh, and large is greater than 1,000,000 kWh per year:

TABLE 2
Participant Surveys

Segment	Small	Medium	Large	Total
Assembly	6	6	6	18
College	0	0	0	0
Grocery	1	2	5	8
Hospital	0	0	1	1
Lodging	2	0	0	2
Meeting Hall	4	0	0	4
Misc. (pumps)	0	4	1	5
Non-Food Retail	0	0	0	0
Warehouse	0	0	1	1
Office	19	7	8	34
Restaurant	2	0	0	2
Retail	11	0	4	15
School	10	2	2	14
Total	55	21	28	104

TABLE 3
Nonparticipant Surveys

Segment	Small	Medium	Large	Total
Assembly	6	1	4	11
College	1	2	0	3
Grocery	8	1	0	9
Hospital	1	0	0	1
Lodging	1	0	0	1
Meeting Hall	5	0	0	5
Misc. (pumps)	5	0	0	5
Non-Food Retail	14	1	0	15
Warehouse	1	0	0	1
Office	25	9	9	43
Restaurant	3	0	0	3
Retail	0	0	1	1
School	11	1	0	12
Total	81	15	14	110

Billing and Weather Data

Hourly weather data were estimated from daily highs and lows from NOAA data files and converted to heating and cooling degreehours (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 household. For each new construction site, consumption data and weather data covered the period beginning with the month following the end of construction through December 1995. Each premise was required to have at least nine months of data.

DOE-2 Building Simulations

A sample of 30 DOE-2 building simulations were run on each of the participant and nonparticipant groups. Simulations were run under "as-built" conditions and Title 24 base case efficiencies using 1981 weather as a typical meteorological year (TMY). The largest energy users among the participants and nonparticipants were selected to have building simulations. It was specifically requested by SDG&E that the simulations not be calibrated to actual billing data so that the accuracy and usefulness of the results could be assessed.

Retention Data

First year retention data were collected on 100% of measures that fell into the "miscellaneous measures" category in order to verify *ex ante* engineering estimates of savings. These included 52 measures installed at nine sites. Data were collected by on-site inspection of the sites involved.

The Econometric Framework

This analysis follows the methodology specified in Table C-8, Item 3, Option (a) of the Protocols.

The Regression Model

The model begins with a simple weather normalization regression, estimated for each customer (indexed by i):

Equation 1 (The Basic Regression Equation)

$$kWh_{it} = \alpha_i + \beta_i(cdh_{it}) + \varepsilon_{it}$$

On the left-hand side of Equation 1 is energy consumption for the month (indexed by t), corrected for the length of the billing cycle. The variable on the right-hand side is cooling degreehours (with a base of 65 degrees Fahrenheit), representing the bulk of the consumption associated with the HVAC measures. This leads directly to Phase 1 of a two-phase estimation effort.

Phase 1 of the Estimation Procedure

Due to variation in weather over time, Equation 1 can be estimated at the customer level (using ordinary least-squares), for both participants and nonparticipants. From this we can construct normalized cooling consumption, based on a long-term value for cooling degreehours:

Equation 2 (Normalized Cooling Consumption at the Customer Level)

$$C_i = \beta_i\left(\overline{cdh}\right)$$

For those participants associated with HVAC measures, we can obtain estimated normalized annual cooling consumption, per square foot:

Equation 3 (Normalized Annual Cooling per Square Foot)

$$\overline{C} = 12 \times \frac{\sum_i \beta_i\left(\overline{cdh}\right)}{\sum_i SQFT_i}$$

This same result is available for nonparticipants, which leads to weather-normalized estimated net impact for cooling:

Equation 4 (The Weather-Normalized Estimated Net Impact for Cooling)

$$\Delta\overline{C} = \overline{C}^{nonpart} - \overline{C}^{part}$$

Phase 2 of the Estimation Procedure (Lighting)

Phase 2 of the estimation procedure estimates lighting consumption differentials between participants and nonparticipants, based on some simplifying assumptions and the estimated intercept coefficient α_i from Equation 1. Note first that the intercept coefficient α_i ("static" consumption) is composed of lighting consumption L_i, and nonlighting consumption M_i,

$$\alpha_i = L_i + M_i$$

Or, realizing that in the context of Equation 1 α_i is estimated, we can write,

Equation 5 (Estimated Static Consumption)

$$\alpha_i = L_i + M_i + \eta_i,$$

including the random error term η_i. Assume at this point that lighting consumption is roughly proportional to square footage:

Equation 6 (Energy Consumption for Lighting)

$$L_i = \beta_L\left(SQFT_i\right)$$

In addition, if nonlighting consumption is proportional to square footage (with the factor of proportionality varying with building type),

$$M_i = \beta_{M,i}(SQFT_i)$$

Making the appropriate substitutions into Equation 5, the following regression model becomes available:

Equation 7 (The Final Regression Model)

$$\alpha_i = \beta_L\left\{\left[1+\left(\frac{\beta_{M,i}}{\beta_L}\right)\right]S_i\right\}+\eta_i = \beta_L\left\{\left[1+\left(\frac{M_i}{L_i}\right)\right]S_i\right\}+\eta_i$$

If the single regressor $\left\{\left[1+(M_i/L_i)\right]S_i\right\}$ is constructed by building type, the estimated regression equation yields energy consumption per square foot (by virtue of Equation 6) directly from the equation, in the form of the regression coefficient β_L. Estimated annual consumption for lighting (per square foot) is then,

$$\beta_L^{annual} = 12 \times \beta_L$$

The differential between nonparticipants and participants is,

Equation 8 (The Estimated Energy Net Impact for Lighting)

$$\Delta\beta_L^{annual} = \beta_L^{annual,nonpart} - \beta_L^{annual,part}$$

Strengths and Weakness of the Regression Model

Clearly the regression model just described is simpler than the majority of models that are usually applied in this context. This may be a weakness of the model, or it may be its strength. More complicated models, such as a *conditional demand model*, rarely go beyond the textbook techniques of checking R-squared statistics, t-statistics, and signs on coefficients. To our knowledge, these regressions are rarely checked for reasonableness at the customer level. The estimated error terms are rarely, if ever, formally analyzed at the customer level, and regression coefficients are—to our knowledge—never rigorously tested for their heterogeneity across customers.

When regressions are estimated at the customer level—as is the case for Equation 1—it follows that the regression will, at least, fit fairly well at the customer level, and, based on one of the properties of ordinary least squares, the error terms will sum to zero at the customer level (mimicking what we expect from the real error terms at the customer level). Moreover, for this same reason, Equation 1 will generally yield solid estimates of the intercept term α_i, leading to a reasonably good foundation for the Phase 2 effort above.

Weaknesses of the model may include the simplifying assumptions concerning lighting and nonlighting consumption and their relationship to square footage. These assumptions are clearly designed to keep the analysis simple (although the results given below seem reasonable). At the very least, this allowed SDG&E to immediately test a regression model, the results of which could be readily understood, and either accepted as reasonable or rejected; no attempt would be made to "make the model work" by adding layer upon layer of modeling "enhancements." To SDG&E, it was questionable, based on our analysis of simulation results and more

complicated regression models, whether more "sophisticated" approaches were likely to yield more credible results. As a result, the company took a far simpler approach, especially in the light of the small number of participants..

Results

Early in the analysis, it was evident that the regression model failed for customers with square footage above 250,000. This was due to a lack of correlation between consumption and square footage for the sample of customers at that level, an assumption critical to the model. For this reason, four participants and four nonparticipants were dropped from the analysis as outliers. Occupancy rates were not considered an issue since the average occupancy for participants was 86% and the average for nonparticipants was 85%.

Pertinent summary statistics for participants and nonparticipants used in the analysis are presented in Table 4 below. Due to the small sample under the "HVAC alone" (4), the "HVAC" and "Lighting/HVAC" categories were combined in the analysis. Complete statistics, including confidence intervals and the various designated units of measurement from the M&E Protocols, are provided in M&E Table 6 of this report.

TABLE 4
Summary Statistics for 1994 Nonresidential New Construction

End Use	Participants				Nonparticipants			
	Count	Average kWh	Average Sqft	kWh per Sqft	Count	Average kWh	Average Sqft	kWh per Sqft
Lighting	81	382,980	46,557	8.23	100	207,228	21,249	9.75
Lighting/HVAC	26	58,892	44,161	1.56	104	84,696	39,014	2.17

Energy Savings Estimates

Savings estimates are calculated by subtracting consumption per square foot of affected space for participants from that of nonparticipants. For lighting, the annual savings were 1.52 kWh per square foot. Savings for HVAC and lighting/HVAC combined were 0.61 kWh per square foot. This compares with *ex ante* estimates of 0.97 kWh per square foot for lighting and 2.12 kWh per square foot for lighting/HVAC combinations. The corresponding realization rates are 157% and 29%, respectively.

Capacity Savings Estimates

Lighting demand savings were 0.68 Watts per square foot. Combination lighting/HVAC savings are derived from kWh savings by using a commercial system peak load factor of 0.54. This factor was derived from metered commercial end-use data from SDG&E's 1994 Load Studies Report. This factor yields a demand savings of 0.00032 kW per square foot for lighting and 0.00013 kW per square foot for the lighting/HVAC combination. The *ex ante* estimates for demand savings were 0.0002347 kW per square foot for lighting and 0.00033766 kW per square foot for lighting/HVAC combinations. Realization rates are 138% and 38%, respectively.

Summary of Savings

The following table summarizes the savings associated with participants in the 1994 Nonresidential New Construction Program:

TABLE 5
Estimated Savings for 1994 Nonresidential New Construction Program

End Use	kWh per Square Foot			kW per Square Foot		
	Participant	Nonparticipant	Savings	Participant	Nonparticipant	Savings
Lighting	8.23	9.75	1.52	.00174	.00206	.00032
Lighting/HVAC	1.56	2.17	0.61	.00033	.00046	.00013

Miscellaneous Measures

On-site inspections of 52 "miscellaneous measures" (the majority of which were motors) were conducted at nine sites for purposes of determining first-year retention rates. One hundred percent of the measures were found to be installed and operating.

Building Simulations

In an attempt to verify results of the regression analysis, DOE-2 building simulations were run on the 30 largest energy users in each group of participants and nonparticipants. SDG&E purposely requested that these simulations not be calibrated to actual billing consumption so that the accuracy and usefulness of the simulation data could be assessed.

The simulations proved to be of little value. In about 40% of the cases, the whole-building energy use from the simulations either overestimated or underestimated actual consumption by at least an order of magnitude. In addition, some of the simulations failed to pick up obvious weather-sensitive loads. This is true despite having put a great deal of effort into assuring that the meters used to extract billing data exactly matched the meters serving the areas of the sites surveyed.

Results of the simulations showed that participants failed to comply to Title 24 standards by 4 percent and nonparticipants failed to comply by 15 percent. However, considering the questionable accuracy of the simulation outputs, these results were ignored.

Net-to-Gross Ratios

The methodology used in this analysis, taking the difference between the participant group and the nonparticipant sample, yields net impacts directly. Therefore, no net-to-gross ratio is calculated

Summary and Conclusions

The results of the analysis are somewhat surprising in that lighting savings per square foot tend to be overestimated and savings for lighting/HVAC combinations tend to be underestimated, when compared to the *ex ante* engineering estimates. This may be a problem that is inherent in the two-phase regression model, either because of collinearity problems or because the model does not attribute enough of the static load to HVAC. The latter problem could happen if the ventilation portion of the HVAC is not particularly weather sensitive.

The total savings estimate for lighting and lighting/HVACcombined is 2.14 kWh per square foot, which compares favorably with the *ex ante* estimate of 3.09 kWh per square foot. The lower estimated value from this analysis may be due to the overrepresentation of schools in both the participant and nonparticipant samples. Schools tend to have a lower energy usage per square foot than that of the general commercial population.

Although reasonable estimates of total savings were found in the analysis, since both the participant and nonparticipant samples were small, SDG&E finds no compelling reason to change the *ex ante* estimates of savings for the Program.

Suggested Changes to the Protocols

Having just completed this impact evaluation, SDG&E makes the following recommendataions with regards to changes in the M&E Protocols:

- The M&E Protocols require the completion of first, fourth, and ninth year retention studies for miscellaneous measures. It is reasonable to believe that since construction under the Nonresidential New Construction Program is recent, no significant renovations have been done that would cause measures to be removed in the first year. SDG&E is suggesting a change to the Protocols that would permanently eliminate the first year retention study.
- Because of time requirements and the data-intensive nature of on-site audits required to do building simulations, and because the accuracy and usefulness of the simulations is in doubt, SDG&E suggests an option under Protocol Table C-8, Item 3 that allows regression modeling without requiring simulations.

M&E PROTOCOLS TABLE 6

RESULTS USED TO SUPPORT PY94 SECOND EARNINGS CLAIM

FOR

NONRESIDENTIAL NEW CONSTRUCTION PROGRAM FIRST YEAR LOAD IMPACT EVALUATION

FEBRUARY 1996

STUDY ID NO. 935

SAN DIEGO GAS & ELECTRIC
M&E PROTOCOLS TABLE 6 - RESULTS USED TO SUPPORT PY94 SECOND EARNINGS CLAIM FOR THE NONRESIDENTIAL NEW CONSTRUCTION PROGRAM
FIRST YEAR LOAD IMPACT EVALUATION, FEBRUARY 1996, STUDY ID NO. 935

Designated Unit of Measurement: LOAD IMPACTS PER SQUARE FOOT OF LIGHTED FLOOR AREA
END USE: INDOOR LIGHTING ONLY

				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	81.0	43.8	65.9	96.0	36.7	50.9	69.2	92.7	38.3	49.3
	Impact Yr kWh	382,980	207,228	311,847	454,113	173,631	240,825	327,544	438,416	181,044	233,412
	Impact Yr kW/designated unit	0.00174	0.00206	0.00141	0.00207	0.00173	0.00239	0.00148	0.00200	0.00181	0.00232
	Impact Yr kWh/designated unit	8.2	9.8	6.7	9.8	8.2	11.3	7.0	9.4	8.5	11.0
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	N/A	-37.15	N/A	N/A	-53.8	-20.5	N/A	N/A	-50.1	-24.2
	A. ii. Load Impacts - kWh	N/A	-175,752	N/A	N/A	-254,420	-97,084	N/A	N/A	-237,061	-114,443
	B. i. Load Impacts/designated unit - kW	N/A	0.00032	N/A	N/A	-0.00014	0.00079	N/A	N/A	-0.00004	0.00069
	B. ii. Load Impacts/designated unit - kWh	N/A	1.52632	N/A	N/A	-0.67243	3.72507	N/A	N/A	-0.18724	3.23988
	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D.A. ii. Load Impacts - kWh, realization rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D.B. i. Load Impacts/designated unit - kW, real rate	N/A	138%	N/A	N/A	-0.6	336%	N/A	N/A	-0.2	292%
	D.B. ii. Load Impacts/designated unit - kWh, real rate	N/A	157%	N/A	N/A	-0.7	384%	N/A	N/A	-0.2	334%
3. Net-to-Gross Ratios		**RATIO**		**RATIO**	**RATIO**			**RATIO**	**RATIO**		
	A. i. Average Load Impacts - kW	N/A		N/A	N/A			N/A	N/A		
	A. ii. Average Load Impacts - kWh	N/A		N/A	N/A			N/A	N/A		
	B. i. Avg Load Impacts/designated unit of measurement - kW	N/A		N/A	N/A			N/A	N/A		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	N/A		N/A	N/A			N/A	N/A		
	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	N/A	N/A	N/A	N/A	N/A
	B. Post-install average value SQUARE FOOTAGE	46,557	21,249	45,771	47,343	20,774	21,724	45,944	47,170	20,879	21,619
6. Measure Count Data		**NUMBER**									
	A. Number of measures installed by participants in Part Group	See Next									
	B. Number of measures installed by all program participants in the 12 months of the program year	Few Pages									
	C. Number of measures installed by Comp Group	N/A									
7. Market Segment Data		**SIC**	**PERCENT**								
	Distribution by 3 digit SIC - Commercial/Industrial	See									
		Appendix A									

NOTE: Net-to-gross ratios are not calculated since there is no gross estimate as described in the report

SAN DIEGO GAS & ELECTRIC

M&E PROTOCOLS TABLE 6 - RESULTS USED TO SUPPORT PY94 SECOND EARNINGS CLAIM FOR THE NONRESIDENTIAL NEW CONSTRUCTION PROGRAM

FIRST YEAR LOAD IMPACT EVALUATION, FEBRUARY 1996, STUDY ID NO. 935

Designated Unit of Measurement: LOAD IMPACTS PER SQUARE FOOT OF CONDITIONED SPACE

END USE: LIGHTING & HVAC APPLIANCES - 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	14.6	17.9	11.9	17.3	16.5	19.3	12.5	16.7	16.8	19.0
	Impact Yr kWh	68,888	84,695	56,123	81,654	78,029	91,361	58,940	78,837	79,500	89,890
	Impact Yr kW/designated unit	0.00033	0.00046	0.00027	0.00039	0.00042	0.00049	0.00028	0.00038	0.00043	0.00049
	Impact Yr kWh/designated unit	1.6	2.2	1.3	1.8	2.0	2.3	1.3	1.8	2.0	2.3
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	N/A	3.34	N/A	N/A	0.3	6.4	N/A	N/A	1.0	5.7
	A. ii. Load Impacts - kWh	N/A	15,806	N/A	N/A	1,405	30,208	N/A	N/A	4,583	27,030
	B. i. Load Impacts/designated unit - kW	N/A	0.00013	N/A	N/A	0.00006	0.00020	N/A	N/A	0.00007	0.00018
	B. ii. Load Impacts/designated unit - kWh	N/A	0.61094	N/A	N/A	0.27545	0.94644	N/A	N/A	0.34948	0.87240
	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D.A. ii. Load Impacts - kWh, realization rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D.B. i. Load Impacts/designated unit - kW, real rate	N/A	38%	N/A	N/A	17%	59%	N/A	N/A	22%	55%
	D.B. ii. Load Impacts/designated unit - kWh, real rate	N/A	29%	N/A	N/A	13%	45%	N/A	N/A	16%	41%
3. Net-to-Gross Ratios		RATIO		RATIO	RATIO			RATIO	RATIO		
	A. i. Average Load Impacts - kW	N/A		N/A	N/A			N/A	N/A		
	A. ii. Average Load Impacts - kWh	N/A		N/A	N/A			N/A	N/A		
	B. i. Avg Load Impacts/designated unit of measurement - kW	N/A		N/A	N/A			N/A	N/A		
	B. ii. Avg Load Impacts/designated unit of measurement - kWh	N/A		N/A	N/A			N/A	N/A		
	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	N/A	N/A	N/A	N/A	N/A
	B. Post-install average value SQUARE FOOTAGE	44,161	39,014	41,006	47,316	37,261	40,767	41,702	46,620	37,648	40,380
6. Measure Count Data		NUMBER									
	A. Number of measures installed by participants in Part Group	See Next									
	B. Number of measures installed by all program participants in the 12 months of the program year	Few Pages									
	C. Number of measures installed by Comp Group	N/A									
7. Market Segment Data		SIC	PERCENT								
	Distribution by 3 digit SIC - Commercial/Industrial	See									
		Appendix A									

NOTE: Net-to-gross ratios are not calculated since there is no gross estimate as described in the report

TABLE 6, Item 6(A)

Nonresidential New Construction Sample: 104

Measure Count Data:

HVAC:

Quantity	*Measure Descriptions*
2	economizer on 2-3ton rooftop a/c uni
1	economizer on 2ton A/C
30	economizer on 30 A/C units (5 ton)
4	A/C: DX Hi Eff12-20SEER=8.9min
3	A/C: DX High Eff Packaged Rooftop
68	A/C: DX High Efficiency Unit
24	A/C: High Efficiency Packaged Rooft
5	A/C: Packaged Rooftop Unit
1	A/C: Packaged Rooftop Unit-HVAC
2	A/C: Packaged Rooftop Units
33	Air Source Heat Pumps Various Mod
1	Chiller: Centrifugal High Eff
2	Chiller: OTHER
1	Economizer on 1 rooftop A/C units (
24	Economizers
15	Economizers on 15 Packaged Heat
2	Heat Pump: WaterSource
3	Heat Pump: WaterSrc <=24 MBH
32	Heat Pump: WaterSrc 24-65 MBH
7	Heating Units
7	Packaged rooftop HVAC
1	Processed Load-Mech Subcooling&
2	TEFC Motor 15HP - 50HP
2	TEFC Motor 3HP - 10HP
1	VFD on pump
2	VFD's on two pumps
2	VFD's on 2 20 HP Cooling Tower Fa
12	VFD's on 40HP Sup Fans & 20HP R
12	VSD/ASD for Motors
2	VSD/ASD on two processing pumps
1	1 VAV systems for HVAC With 16 V
17	17 VAV boxes on HVAC

LIGHTING:

Quantity	*Measure Descriptions*
1	Dimming Daylight for 246 400W HP
3	Dimming Daylight Controls
1	Dimming Daylight- Sales Area
1	Dimming Daylight-Work Area
792	Occupancy Sensors
659	1CFQ13H
22	1CFQ26H
139	1CFQ28H
19	1CF9H
1430	1FO32/.5B4T8-2L
50	1FO32/.5B4T8-2L/1R4-D1
78	1FO32/1B4-EE
284	1FO32/1B4T8-2L
114	1F40/.5B4-EL/0R4-D2
9	1F40/1B4-EL
12	1F40/1B4-EL/0R4-D2
36	1F96/.5B8-EL/1R8-D1
251	1F96/1B8-EL
6	1F96/1B8-EL/1R8-D1
5	1XCF5K
222	1XSF20
992	2CFQ13H
214	2CFQ26H
109	2CFQ28H
40	2CF18H
5	2CF5H
6	2CF5H/1B2-T5CF
26	2CF9H
13	2FO17/1B2-17T8
19	2FO17/1B2-17T8/1R2-CNC
61	2FO17/1B2-17T8/1R2-D2
140	2FO32/.5B4T8-2L
136	2FO32/.5B4T8-2L/1R2-CNC
3200	2FO32/.5B4T8-4L
32	2FO32/1B2-31T8
3227	2FO32/1B4T8-2L
47	2FO32/1B4T8-2L/0R4-CNC
12	2FO32/1B4T8-2L/1R2-CNC
1370	2FO32/1B4T8-2L/1R4-CNC
2329	2FO32/1B4T8-2L/1R4-D2
4	2FO32/2B4T8-2L
1311	2FO96/1B8-EL
216	2F34/0B4-EL
72	2F34/1B4-EL

LIGHTING (cont.):

Quantity	*Measure Descriptions*
79	2F34/1B4-EL/1R4-CNC
71	2F40/1B2-40T12
753	2F40/1B4-EL
12	2F40/1B4-EL/0R4-D2
30	2F40/1B4-EL/0R8-D2
8	2F40/1B8-EL
2813	2F96/1B8-EL
1383	2UO31/1B2-31T8
2	2UO31/1B4-EL
16	2U40/1B2-40T12
143	3CFQ26H
20	3CFQ28H
4	3CF9H
201	3FO17/1B2-17T8
11	3FO17/1B4T8-3L
2071	3FO32/1.5B4T8-2L
258	3FO32/1.5B4T8-2L/1R4-CNC
22	3FO32/1.5B4T8-2L/1R4-D2
26	3FO32/1B4T8-2L
1330	3FO32/1B4T8-3L
641	3FO32/1B4T8-3L/1R4-CNC
609	3FO32/2B4T8-2L
431	3F34/0B4-EL
18	3F34/1.5B4-EL
24	3F34/1B4T8-3L
108	3F40/1.5B4-EL
123	3F40/1B4-EL
6	3F40/2B4-EL
1	3U40/1B2-40T12
29	4CFQ28H
1374	4FO32/1B4T8-4L
68	4FO32/1B4T8-4L/0R4-D2
278	4FO32/1B4T8-4L/1R8-CNC
183	4FO32/1B4T8-4L/2R4-CNC
34	4FO32/1B4T8-4L/2R4-D2
602	4FO32/2B4T8-2L
23	4FO32/2B4T8-2L/1R4-D2
94	4F34/1B4T8-4L
127	4F34/2B4-EL
745	4F40/2B4-EL
5	4F40/2B4-EL/0R4-D2
1	5CF9H
122	6FO32/2B4T8-3L
30	6FO32/3B4T8-2L
79	8FO32/2B4T8-4L

MISC:

Quantity	*Measure Descriptions*
1	Dessicant Dehumidification System w/ Conventional
1	High Eff. Alternatives to Refrig Syst
1	Inlet guide vanes
1	Inlet Guide Vanes
1	Motor 1HP - 2HP
2	Motor 15HP - 50HP
11	Motor 3HP - 10HP
1	Motor 60HP - 200HP
5	3 Grieve & 2 Brinks Gas Curing Ovens

TABLE 6, Item 6(B)

Nonresidential New Construction Population: 117

Measure Count Data:

HVAC:

Quantity	*Measure Descriptions*
2	economizer on 2-3ton rooftop a/c unit
1	economizer on 2ton A/C
30	economizer on 30 A/C units (5 ton)
4	A/C: DX Hi Eff12-20SEER=8.9min
3	A/C: DX High Eff Packaged Rooftop
69	A/C: DX High Efficiency Unit
24	A/C: High Efficiency Packaged Rooft
5	A/C: Packaged Rooftop Unit
1	A/C: Packaged Rooftop Unit-HVAC
2	A/C: Packaged Rooftop Units
33	Air Source Heat Pumps Various Mod
2	Chiller: Centrifugal
1	Chiller: Centrifugal High Eff
2	Chiller: OTHER
1	Economizer on 1 rooftop A/C units (
24	Economizers
15	Economizers on 15 Packaged Heat
1	Energy Efficient HVAC Process
2	Heat Pump: WaterSource
6	Heat Pump: WaterSrc <=24 MBH
49	Heat Pump: WaterSrc 24-65 MBH
7	Heating Units
1	Install VFD on 10hp AH-5 return fan
1	Install VFD on 10hp AH-8 return fan
1	Install VFD on 25hp AH-8 supply fan
1	Install VFD on 60hp AH-5 supply fan
1	Oversized Cooling Tower
7	Packaged rooftop HVAC
3	Pony Motors on 4 Cooling Towers
1	VFD on pump
1	VFD on Condenser Water Pump
2	VFD on CHW Pump
2	VFD's for 2 15HP Cooling Tower Fa
9	VFD's on air handlers
2	VFD's on two pumps
2	VFD's on 2 20 HP Cooling Tower Fa
2	VFD's on 2ea 20 HP Heating Hot W
3	VFD's on 3 Secondary Chilled Wtr P
12	VFD's on 40HP Sup Fans & 20HP R
3	VFD'S on 3 ea 20 HP Chilled Water
33	VFDs on 33 AHUs
12	VSD/ASD for Motors
2	VSD/ASD on two processing pumps
12	VSD/ASD Control for 6 VAV system
1	VSD/ASD: COOLING TOWER FAN
2	Water Cooled Screw Chillers
1	1 VAV systems for HVAC With 16 V
17	17 VAV boxes on HVAC

LIGHTING:

Quantity	*Measure Descriptions*
2	Dimming Daylight
1	Dimming Daylight for 246 400W HP
3	Dimming Daylight Controls
1	Dimming Daylight- Sales Area
1	Dimming Daylight-Work Area
717	1CFQ13H
22	1CFQ26H
139	1CFQ28H
17	1CF18H
19	1CF9H
2345	1FO32/.5B4T8-2L
50	1FO32/.5B4T8-2L/1R4-D1
89	1FO32/1B4-EE
661	1FO32/1B4T8-2L
1	1F34/1B4-EL
114	1F40/.5B4-EL/0R4-D2
9	1F40/1B4-EL
12	1F40/1B4-EL/0R4-D2
36	1F96/.5B8-EL/1R8-D1
251	1F96/1B8-EL
6	1F96/1B8-EL/1R8-D1
153	1HP1000
93	1XCF5K
24	1XLED1
535	1XSF20
1486	2CFQ13H
330	2CFQ26H
164	2CFQ28H
54	2CF18H
5	2CF5H
6	2CF5H/1B2-T5CF
249	2CF9H
89	2FO17/1B2-17T8
19	2FO17/1B2-17T8/1R2-CNC
61	2FO17/1B2-17T8/1R2-D2
140	2FO32/.5B4T8-2L
136	2FO32/.5B4T8-2L/1R2-CNC
3803	2FO32/.5B4T8-4L
32	2FO32/1B2-31T8
6103	2FO32/1B4T8-2L
47	2FO32/1B4T8-2L/0R4-CNC
12	2FO32/1B4T8-2L/1R2-CNC
3239	2FO32/1B4T8-2L/1R4-CNC
6332	2FO32/1B4T8-2L/1R4-D2
4	2FO32/2B4T8-2L
1311	2FO96/1B8-EL
216	2F34/0B4-EL
84	2F34/1B4-EL
57	2F34/1B4-EL/0R4-D2
79	2F34/1B4-EL/1R4-CNC
71	2F40/1B2-40T12

LIGHTING (cont.):

Quantity	*Measure Descriptions*
753	2F40/1B4-EL
12	2F40/1B4-EL/0R4-D2
30	2F40/1B4-EL/0R8-D2
8	2F40/1B8-EL
3090	2F96/1B8-EL
1689	2UO31/1B2-31T8
2	2UO31/1B2-31T8/1R2-D2
2	2UO31/1B4-EL
16	2U40/1B2-40T12
143	3CFQ26H
20	3CFQ28H
4	3CF9H
576	3FO17/1B2-17T8
593	3FO17/1B2-17T8/1R2-D1
11	3FO17/1B4T8-3L
2947	3FO32/1.5B4T8-2L
258	3FO32/1.5B4T8-2L/1R4-CNC
22	3FO32/1.5B4T8-2L/1R4-D2
549	3FO32/1.5070175438598B4T8-2L
26	3FO32/1B4T8-2L
2666	3FO32/1B4T8-3L
641	3FO32/1B4T8-3L/1R4-CNC
785	3FO32/2B4T8-2L
431	3F34/0B4-EL
18	3F34/1.5B4-EL
24	3F34/1B4T8-3L
108	3F40/1.5B4-EL
123	3F40/1B4-EL
6	3F40/2B4-EL
16	3UO31/1.5B2-31T8
4	3UO31/1B2-31T8
1	3U40/1B2-40T12
29	4CFQ28H
53	4FO17/1B2-17T8
2106	4FO32/1B4T8-4L
68	4FO32/1B4T8-4L/0R4-D2
278	4FO32/1B4T8-4L/1R8-CNC
183	4FO32/1B4T8-4L/2R4-CNC
34	4FO32/1B4T8-4L/2R4-D2
611	4FO32/2B4T8-2L
23	4FO32/2B4T8-2L/1R4-D2
94	4F34/1B4T8-4L
174	4F34/2B4-EL
745	4F40/2B4-EL
5	4F40/2B4-EL/0R4-D2
1	5CF9H
503	6FO32/2B4T8-3L
30	6FO32/3B4T8-2L
79	8FO32/2B4T8-4L
2	9CF9H

MISC:

Quantity	*Measure Descriptions*
1	Dessicant Dehumidification System w/ Conventional
1	High Eff. Alternatives to Refrig Syst
1	Inlet guide vanes
1	Inlet Guide Vanes
1	Motor 1HP - 2HP
15	Motor 15HP - 50HP
32	Motor 3HP - 10HP
1	Motor 60HP - 200HP
1370	Occupancy Sensors
1	Processed Load-Mech Subcooling&Gas Def.
2	TEFC Motor 15HP - 50HP
2	TEFC Motor 3HP - 10HP
5	3 Grieve & 2 Brinks Gas Curing Ovens

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING DOCUMENTATION

FOR

NONRESIDENTIAL NEW CONSTRUCTION PROGRAM
FIRST YEAR LOAD IMPACT EVALUATION

FEBRUARY 1996

STUDY ID NO. 935

M&E PROTOCOLS TABLE 7
DATA QUALITY AND PROCESSING DOCUMENTATION
For Nonresidential New Construction Program
First Year Load Impact Evaluation
February 1996
Study ID No. 935

A. OVERVIEW INFORMATION

1. **Study Title and Study ID:** 1994 Nonresidential New Construction Program: First Year Load Impact Evaluation, February 1996, MPAP-94-P52-935-604, Study ID No. 935

2. **Program, Program Year(s), and Program Description (design):** Nonresidential New Construction Program for the 1994 program year. The program offers two options: Performance and Prescriptive. The Performance Option of the program offers cash incentives to builders who are willing to revise their building plans to exceed Title 24 standards and achieve energy savings of 10 percent or greater in one or more of the following categories: cooling, heating, lighting, fans/motors, pumps, and hot water. The Prescriptive Option of the Program has incentives for measures such as: high-efficiency air conditioning, chillers, heat pumps, motors, glazing. energy efficient fluorescent lamps, electronic ballasts, optical reflectors, lighting controls, and compact fluorescents. The program requires customers to exceed Title 24 requirements by at least 10 percent in order to qualify for incentives

3. **End Uses and/or Measures Covered:** Lighting only, electric and/or gas space cooling, combination of lighting and HVAC.

4. **Methods and models used:** See the section of the report entitled "The Econometric Framework" for a complete description of the final model specifications.

5. **Participant and comparison group definition:** *For the load impact analysis:* the participants in the 1994 Nonresidential New Construction Program are defined as having signed an agreement under the "Savings Through Design" Program after July 1993, and completed construction in calendar year 1994. There were 117 participants meeting the criteria. The comparison group sample was developed from San Diego city/county building permits with construction completion dates in 1994. The comparison group was stratified by building type and size (annual kWh) for matching with the participant group. It was possible to match 392 nonparticipants with the Customer Master File. *For the building simulations:* the thirty largest energy users in each group of participants and nonparticipants were chosen to have DOE-2 building simulations.

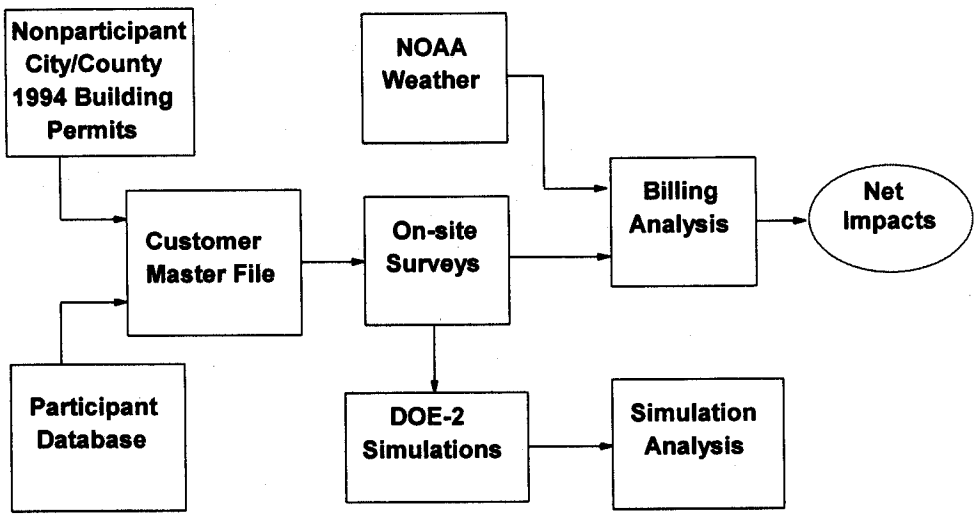
6. **Analysis sample size:**

SAMPLE FOR 1994 NONRESIDENTIAL NEW CONSTRUCTION				
End Use	# of Customers	# of Installations	# of Measures	Avg. # of Months of Data
PARTICIPANTS				
Lighting	74	362	21,577	17.3
HVAC	4	26	48	17.0
Combination Lighting/HVAC	19	150	9,201	15.0
Miscellaneous	4	16	18	20.0
Other Combination	3	9	2,224	17.3
NONPARTICIPANTS	110	N/A	N/A	20.9

B. DATABASE

1. Flow Charts:

DATA FLOW DIAGRAM



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

   - Customer name, address, and installation date from the program tracking database;
   - Nonparticipant building activity from 1994 San Diego City/County building permits;
   - Consumption history from the Customer Master File;
   - Data on floor stock, square footage, hours of operation, and occupancy from on-site audits;
   - DOE-2 building simulations;
   - Hourly weather data for three climate zones from NOAA files; and
   - Retention information on "miscellaneous measures."

3. **Data Attrition:**

   a. Participant Sample - Load Impact Analysis

   For the load impact analysis, on-site surveys were conducted for 104 of the 117 participants, representing an 89% response rate.

   b. Nonparticipant Sample - Load Impact Analysis

   A list of 1,068 commercial new construction sites was obtained from 1994 San Diego city/county building permits. The sites were required to have completed construction in 1994. Of these, 870 had unique site addresses which were matched by address against SDG&E's 1994 Customer Master File. Only 392 premise IDs representing 441 individual accounts could be matched with confidence. This became the pool from which a nonparticipant comparison group was drawn. A final sample of 110 nonparticipants were surveyed from the pool.

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 insure accurate merging. Surveys and billing data were merged by premise ID number. Weather data were merged by billing cycle and climate zone.

5. **For impact analyses**, only square footage, hours of operation, and occupancy rates were used from the on-site surveys. Data on floor stock and equipment capacities and efficiencies were collected for all sites, but used only in the building simulations. The complete surveys for all sites will be added to SDG&E's database of commercial end use surveys (CEUS). Survey data are in PC format on diskettes.

C. SAMPLING

1. **Sampling procedures and protocols:** As prescribed in the Protocols Table 5, an attempt was made to include a census of the 117 Program participants in the analysis. The pool of 392 nonparticipants was stratified by building type and size (annual kWh) to match to the participant group. Premise ID's for nonparticipants were selected randomly within strata until a total sample of approximately the same size as the participant group was achieved.

2. **Survey Information:** A copy of the on-site survey is attached at the end of the report as Appendix B. Response rates for the participants was 104 out of 117, or 89%. 110 nonparticipants were surveyed out of a pool of 392. Not all 392 customers were contacted, so there is no response rate available. No reasons for refusal are available, nor was there any effort to account for non-response bias.

3. **Statistical Descriptions:** the descriptive statistic are annual consumption and square footage. See Table 6 for confidence intervals.

Summary Statistics for 1994 Nonresidential New Construction								
End Use	Participants				Nonparticipants			
	Count	Average kWh	Average Sq ft	kWh per Sq ft	Count	Average kWh	Average Sq ft	kWh per Sq ft
Lighting	81	382,980	46,557	8.23	100	207,228	21,249	9.75
Lighting/HVAC	26	58,892	44,161	1.56	104	84,696	39,014	2.17

D. DATA SCREENING AND ANALYSIS

1. Participants and nonparticipants with square footage greater than 250,000 were considered to be outliers. The regression model failed at this level due to a lack of correlation between consumption and square footage. This affected four participants and four nonparticipants. Missing data points were ignored in all calculations. Weather adjustments are described in the Econometric Framework section of the report.

2. No adjustments were made to control for the effect of "background" variables.

3. No screening was done on the participant group. For nonparticipants, a list of 1,068 commercial new construction sites was obtained from 1994 San Diego city/county building permits. The sites were required to have completed construction in 1994. Of these, 870 had unique site addresses which were matched by address against SDG&E's 1994 Customer Master File. Only 392 premise IDs representing 441 individual accounts could be matched with confidence.

4. **Regression statistics:** See Table 6 for regression results.

5. **Specification:** See the section of the report entitled the Econometric Framework.

6. **Error in measuring variables:** An attempt was made to assure that meter(s) serving the area for which a survey was conducted matched the meters for which billing data was extracted. Billing data were screened for completeness.

7. **Autocorrelation:** Not considered to be a serious problem.

8. **Heteroskedasticity:** Not considered to be a serious problem.

9. **Collinearity:** Not considered to be a serious problem.

10. **Influential data points:** Customers with square footage above 250,000 were considered to be outliers due to a lack of correlation between square footage and energy use.

11. **Missing Data:** Missing data points were ignored in all calculations.

12. **Precision:** The standard errors for the estimates were calculated from the variances of the samples of participants and nonparticipants on the variable(s) in question, unless noted on Table 6.

E. DATA INTERPRETATION AND APPLICATION

1. **Calculation of net impacts:** This study calculates the net load impacts for lighting, cooling, and combinations of lighting and HVAC by subtracting the consumption per square foot for program participants from that of the comparison group. The methodology of this study estimates the net effects directly without estimating the gross impacts. A net-to-gross ratio was not calculated.

2. This methodology is presented as an option in the Protocols in Table C-8, item 3, option (a). SDG&E has used a two-phase regression model for determining consumption per square foot for both participants and nonparticipants. Phase 1 deals with weather-sensitive loads. Phase 2 uses results from Phase 1 to determine the remaining non-weather-sensitive loads.

   The regression model tended to overestimate savings per square foot for lighting and underestimate savings for lighting/HVAC combinations. However, the total estimate of 2.13 kWh per square foot savings compares favorably with the *ex ante* engineering estimate of 3.09 kWh per square foot. Although reasonable estimates of total savings were found in the analysis, since both the participant and nonparticipant samples were small, no changes in the *ex ante* estimates are recommended.