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1996 & 1997 Commercial Energy Efficiency Incentives

Fourth Year Retention Evaluation

March 2001

Study ID Nos. 993 & 1017

Table of Contents

1996 & 1997 COMMERCIAL ENERGY EFFICIENCY INCENTIVES PROGRAM:

FOURTH YEAR RETENTION EVALUATION

STUDY ID NOS. 993 & 1017

Program Description

SDG&E's PY96 & PY97 Commercial Energy Efficiency Incentives (CEEI) Program was designed to help customers reduce energy costs and increase energy efficiency at their facilities while providing resource value to society.

The CEEI Program was supported through audits, Energy Service Representatives, and Account Executives. The CEEI Program was targeted to existing customers with retrofit opportunities that provided cost-effective DSM energy savings. SDG&E's main marketing strategy for its retrofit program was financial incentives. Three delivery techniques allowed SDG&E the flexibility needed to encourage the adoption of energy efficiency measures.

The first incentive technique offered customers monetary incentives for the installation of standard mechanical and complex custom energy efficient measures. The target market for this program was primarily large assigned customers. SDG&E Account Executives had established long-term business relationships with these customers, creating a trusting atmosphere that enabled the Account Executive to be involved and influential in assisting the customer with major retrofit applications.

The second delivery mechanism was the Power to Save Program marketed to the vast majority of commercial customers by promoting and encouraging the installation of energy efficient lighting and mechanical technologies. Customer participation began with an energy audit and recommendations for energy efficient equipment implementation based upon the audit. Potential program incentives offered under the CEEI Program were highlighted. Customers were encouraged to participate in the CEEI Program by installing the cost-effective energy measures and receiving incentives for those measures.

The third delivery mechanism was Commercial Rebates. These rebates were delivered through appliance/equipment dealers who gave commercial customers an instant cash incentive at the point of purchase. SDG&E reimbursed the dealer for the rebates upon submittal of the appropriate paperwork.

A customer who participated in SDG&E's CEEI was entered into SDG&E's project tracking system. Information regarding customer name, address, phone number, installed measures, measure costs, energy savings and participation date were kept in this database. The retention sample for this study was drawn from this population.

Sampling and Data Collection

The M&E Protocols require that retention studies evaluate the top 10 measures or 50% of the estimated resource value, whichever number of measures is less, excluding miscellaneous measures. The M&E Protocols require that PY96 and PY97 program years be combined for retention studies to increase sample sizes for retention measures. Three lighting measures, Exit Sign LED - 1 Side with Battery, 2 lamp 4 foot T-8 Electronic Ballast, and 4 foot Optical Reflectors with 2 de-lamps are required study measures in both PY96 and PY97 program years and therefore can be combined for retention analysis.

4,848 commercial and 11 military customers installed the 10 retention measures to be studied for PY96 CEEI. SDG&E's sample design was to conduct an on-site audit of those customers who installed 3 or more of the 10 measures to be studied. Altogether, a sample of 409 customers of the 4,848 commercial participants and all 11 military establishments were selected for on-site visits. Of the 409 commercial participants in PY96 CEEI to be audited, 393 were successfully completed (96.1%). Reasons for refusals include: safety concerns for the auditor (1), protection of trade secrets (2), lack of manpower to escort auditors at restricted sites (2), and pending litigation (non-DSM) involving SDG&E (11; actually one customer with 11 sites that participated in PY96). Audits were successfully completed at all 11 military sites. Due to the large sample sizes shown in M&E Table 7 section 1.e, the affect on the sample design of customer refusals is insignificant.

1,513 customers installed the 10 retention measures to be studied in PY97 (1,507 commercial and 6 military). SDG&E's sample design was to conduct an on-site audit of those customers who installed 2 or more of the 10 measures to be studied. Customers who installed adjustable speed drives (ASDs) on VAV fan Dual Duct, 600 ton and 400 ton Water Cooled Chillers were added to the sample in order to cover all 10 study measures.

15 customers, all municipalities, installed LED Traffic Signals under the CEEI program in PY97. A random sample of 100 intersections across the 15 customers was conducted, resulting in

sample sizes of 910 red traffic balls (a confidence level of 90% with an error term of +/- 5%) and 291 red traffic arrows (90% +/- 10%).

Altogether, a sample of 142 of the 1,507 commercial customers and 3 of the 6 military customers were selected for on-site audits. Of the 142 commercial participants in PY97 CEEI to be audited, 140 were successfully completed (98.6%). The refusal was the customer with an outstanding lawsuit (non-DSM) against SDG&E that participated with 2 sites in PY97. Audits were successfully completed at the 3 military sample sites. M&E Table 7 section 1.e. shows the sample coverage of the CEEI participants.

SDG&E contracted with Xenergy, Inc. to conduct the on-site audits of military sites and SDG&E contracted with VIEWtech, Inc. to conduct the on-site audits of commercial customers in the PY96 & PY97 CEEI program. The objective of the on-site visits was to verify the number of measures that were still in place and operable – the definition of effective useful life (EUL) per the M&E Protocols. Copies of the on-site data collection forms are provided at the end of this study.

Military Sampling

The sampling for the 1997 Commercial EEI Retention Evaluation for lighting measures in the Military Sector was based on the approach used for prior measure retention surveys in this sector. However, due to the installation of a large proportion of lighting measures in family residential dwellings located on a military base during 1996, the projects for 1996 were divided into two groups: residential and nonresidential. These two groups, as had been done in a prior load impact evaluation, were sampled separately. The nonresidential buildings were sampled the same as the 1997 program participants. The family residential dwellings were sampled using residential protocols.

The retention for 1996 nonresidential and all 1997 lighting measures installed in the Military Sector was based on a quota sample. The quota for this study was set at a minimum of 75% of the measures installed at the military facilities. The standard practice for issuing contracts under the program for nonresidential buildings in the Military Sector was to have one contract per building. A sample point in the study was defined as a building with a contract number. This approach for identifying participant building units at military facilities has been used in previously filed first year load impact evaluations at SDG&E.

During PY96, 11 military sites with 572 nonresidential buildings installed 52,660 lighting measures to be studied for retention. To verify that these measures were still in place and operable, 120 buildings at 11 sites representing 39,621 measures were visited (75.2% of the total measures installed).

PY96 Military Nonresidential Quota Sample				
	Military Sites	Contracts/ Buildings	Lighting Measures	Percent Verified
Program	11	572	52,660	NA
Sample	11	120	39,621	75%

For the 1996 residential projects, a single contract usually covered measures installed in hundreds of residential units. In PY96, 4,391 individual dwelling units had 25,779 lighting measures installed at one base. These measures were installed under 23 contracts. The sample for this project was based on the Table 5 of the M&E protocols for residential evaluations. The M&E protocols require a minimum of 200 surveys for residential programs.

PY96 Military Family Residential Sample				
	Military Sites	Contracts	Dwellings	Lighting Measures
Program	1	23	4,391	25,779
Sample	1	N/A	200	1,657

In PY97, six military sites with 120 nonresidential buildings installed 10,840 lighting measures to be studied for retention. To verify that these measures were still in place and operable, 19 buildings at three sites representing 8,121 measures were visited (75% of the total measures installed).

PY97 Military Nonresidential Quota Sample				
	Military Sites	Contracts/ Buildings	Lighting Measures	Percent Verified
Program	6	120	10,840	NA
Sample	3	19	8,121	75%

Measures/"Like" Measures

In order to apply any changes in EUL to measures not studied, the M&E Protocols require that the utility identify any "like" measures within the program. For SDG&E's PY96 and PY97 CEEI Program, the "like" measures are all in the lighting end use. M&E Protocol Table 6 in this report identifies those measures that are determined to be "like" measures (those measures that were not studied but have similar characteristics to measures that were evaluated in this retention study).

Econometric Framework

Retention model for estimating median lifetime

The model for lifetime estimation involves the key concepts of the survivor function, the hazard function, and median lifetime. Once these concepts are established, they will be applied to the data and a maximum-likelihood framework (which brings the concepts and the data together) to produce estimated median lifetime.

The survivor function

For the lifetime of the equipment in question, the survivor function is,

$$S(j) = \text{prob}(\text{lifetime} \geq j)$$

It is the estimated survivor function that allows the formation of an expected median lifetime. Of course, the survivor function must be specified. This is done through a related function: the hazard function.

The hazard function

The hazard function $h(j)$ is the probability of equipment failure (removal, retirement, etc.) in the next unit of time, conditioned on having reached age j. It bears the following relationship to the survivor function.

$$h(j) = -\frac{dS(j)/dj}{S(j)}$$

The hazard function is generally the "intuitive starting point" of any lifetime analysis, since it is structured to reflect the general pattern of equipment failures. The quadratic hazard function

allows for U-shaped and linear hazard curves ($b_2 = 0$, below), as well as an exponential survivor function ($b_1 = b_2 = 0$, below) as special cases:[1]

Equation 1 (The quadratic hazard function)

$$-\frac{dS(j)/dj}{S(j)} = h(j) = b_0 + b_1 j + b_2 j^2$$

Note that the hazard function is actually a differential equation in the survivor curve.

Getting the survivor function from the hazard function

The exact structure of the survivor function can be obtained by solving the hazard function (a differential equation in the survivor function) for $S(j)$, imposing the constraint $S(0) = 1$:

Equation 2 (The survivor function)

$$S(j) = e^{-\left(\beta_1 j + \beta_2 j^2 + \beta_3 j^3\right)} \left(\beta_1 = b_0, \quad \beta_2 = \frac{b_1}{2}, \quad \beta_3 = \frac{b_2}{3}\right)$$

The median lifetime

The median age at failure m is then given by the implicit expression,

Equation 3 (Definition of the median m)

$$S(m) = e^{-\left(\beta_1 m + \beta_2 m^2 + \beta_3 m^3\right)} = \frac{1}{2}$$

We now show the steps necessary to estimate the median lifetime from actual data, by defining the "discrete failure function" and the likelihood function.

The discrete failure function

For uniform periods of time (months), the likelihood of failure at age j (before age j+1) is,

Equation 4 (The discrete failure function)

$$F(j) = S(j) - S(j+1)$$

[1] Lawless, J.F. (1982). *Statistical Models and Methods for Lifetime Data*. New York: Wiley. 252-253.

The data, the likelihood function, and estimation

Consider an equipment sample of size n. Let n_j^F be the number of known failures at age j, and let n^Q be the number of known failures whose age at failure is unknown; then the number of survivors by observation at age J is $n - n^Q - \sum_{j=0}^{J} n_j^F$. Furthermore, let α be the likelihood that the age at failure is unknown, given failure. The log-likelihood function (the log of the likelihood of observing the data) is then,

$$L(\beta,\omega)=\sum_{j=0}^{J} n_j^F \log[(1-\omega)F(j)]+n^Q \log\{\omega[1-S(J+1)]\}+\left(n-n^Q-\sum_{j=0}^{J} n_j^F\right)\log S(J+1).$$

The log-likelihood function can be maximized with respect to its arguments just as a sum-of-squares function can be minimized in a standard regression problem. Standard numerical and grid-search methods can be used to maximize the log-likelihood function. Once estimates are obtained for the vector of coefficients β, the median lifetime can be estimated using Equation 3.

The estimated variance of β, on which the standard errors of its elements are based, is a fairly complex calculation and one which will not be expressly derived here, although the calculation is based on the expectation of the second-derivative matrix for the log-likelihood function:

$$VAR(\beta)=\left(-E\frac{\partial^2 L}{\partial\beta\partial\beta'}\right)^{-1}$$

The estimated median is a nonlinear function of β; as such, its standard error can be estimated dependably for large samples, based on $VAR(\beta)$.

Solving data problems--developing independent and dependent failures

Lifetime estimation using maximum likelihood requires the statistical independence of failures. Sometimes equipment failures are indeed independent, as when failures occur due to age or manufacturing weaknesses. However, in many cases failures are not independent--that is, they are "dependent"--as when, for example, a "cluster" or "bank" of lighting measures are jointly removed during a remodeling.

Independent failures can easily be handled using the maximum likelihood framework described above. Fortunately, dependent failures can also be handled in a similar fashion. A cluster of

dependent failures can be viewed as an independent failure in its own right, one of numerous observed clusters, each of which is subject to the possibility of independent failure. The maximum likelihood framework can simply be applied to the clustered data.

Modeling and estimating with independent and dependent failures

When any one piece of equipment is subject to both independent and dependent failure, the hazard function can be modified accordingly (ignoring the event of both types of failures occurring jointly):

$$h(j) = h_{ind}(j) + h_{dep}(j)$$

Independent failures are bound to be age-dependent, so that,

$$h_{ind}(j) = b_0^{ind} + b_1 j + b_2 j^2$$

Dependent failures are mostly likely age-independent (with respect to the building-remodeling effect, we expect the age of the equipment to be irrelevant), so that,

$$h_{dep}(j) = b_0^{dep}$$

This yields a new survivor function (and, implicitly, a new median life that can be estimated based on the joint use of independent and dependent failure data):

$$S(j) = e^{-\left[\left(\beta_1^{ind} + \beta_1^{dep}\right) j + \beta_2 j^2 + \beta_3 j^3\right]}$$

The variance matrix for the joint estimation problem can be constructed, as can the standard error for the jointly estimated median lifetime, represented by the expression,

$$S(m) = e^{-\left[\left(\beta_1^{ind} + \beta_1^{dep}\right) j + \beta_2 m^2 + \beta_3 m^3\right]} = \frac{1}{2}$$

M&E PROTOCOLS TABLE 6

RESULTS USED TO SUPPORT

PY96 &PY97 THIRD EARNINGS CLAIM

FOR

COMMERCIAL ENERGY EFFICIENCY INCENTIVES PROGRAM

FOURTH YEAR RETENTION EVALUATION

MARCH 2001

STUDY ID NOS. 993 & 1017

TABLE 6 for RETENTION STUDIES
PROGRAM: CEEI
YEAR(S): PY96 & PY97

	1. Enduse	1. Measure	*2. ex-ante* EUL	*2. ex-ante* EUL Source	*3. ex-post* EUL from Study	*4. ex-post* EUL for 3rd & 4th claim	5. Standard Error	6. Upper & lower bounds @ 80% Conf Int		7. P Value	8. Realization Rate	9. "Like" Measures to be Adjusted
PY96	LIGHTING	19-30W CF Fixture (Inside)	10	**	34.4	10.0	66.0	(50.2)	119.0	71.1%	1.00	1
PY96	LIGHTING	Exit Sign LED 1 Side with Battery	20	**	98.4	20.0	437.3	(462.0)	658.8	85.8%	1.00	2
PY96	LIGHTING	Exit Sign Kit (LED)	20	**	116.5	20.0	114.3	(30.0)	263.0	39.9%	1.00	3
PY96	LIGHTING	T-8 El Bal (4ft/2la)	16	**	41.0	16.0	19.6	15.9	66.1	20.2%	1.00	4
PY96	LIGHTING	21-25W CFL	10	**	20.9	10.0	15.3	1.4	40.5	47.4%	1.00	5
PY96	LIGHTING	Opt Refl(4ft/2dlamp)	16	**	154.3	154.3	68.2	66.9	241.7	4.3%	9.64	6
PY96	LIGHTING	11-15W CFL	10	**	20.2	10.0	8.9	8.9	31.6	24.7%	1.00	7
PY96	LIGHTING	CF-13Q Hardwire Fxtr	16	**	87.3	16.0	56.8	14.4	160.1	21.0%	1.00	8
PY96	LIGHTING	Exit Sign Kit (LED) 1 Face Red	20	**	110.6	20.0	726.5	(820.4)	1,041.6	90.1%	1.00	9
PY96	LIGHTING	11-15W Replacement CFL	2	**	8.8	8.8	2.6	5.5	12.1	0.8%	4.42	10
PY97	LIGHTING	Traffic Signals (12 inch Ball)	20	***	NA	20.0	NA	NA	NA	NA	1.00	11
PY97	LIGHTING	Exit Sign LED 1 Side with Battery	20	***	98.4	20.0	437.3	(462.0)	658.8	85.8%	1.00	12
PY97	LIGHTING	Traffic Signals (12 inch Arrow)	20	***	NA	20.0	NA	NA	NA	NA	1.00	13
PY97	LIGHTING	Opt Refl(4ft/2dlamp)	16	***	154.3	154.3	68.2	66.9	241.7	4.3%	9.64	14
PY97	HVAC	VAV Air Handlers w/ASDs	15	****	NA	15.0	NA	NA	NA	NA	1.00	15
PY97	LIGHTING	T-8 El Bal (4ft/2la)	16	***	41.0	16.0	19.6	15.9	66.1	20.2%	1.00	16
PY97	LIGHTING	Opt Refl(4ft/1dlamp)	16	***	72.7	16.0	316.4	(332.8)	478.2	85.8%	1.00	17
PY97	HVAC	ASD on VAV fan Dual Duct	15	****	NA	15.0	NA	NA	NA	NA	1.00	18
PY97	LIGHTING	4FO32/1B4T8-4L	20	***	NA	20.0	NA	NA	NA	NA	1.00	19
PY97	HVAC	1x600 Ton & 1x 400 Ton Water Cooled Chillers	15	****	NA	15.0	NA	NA	NA	NA	1.00	20

# above	9. "Like" Measures to be Adjusted	
2	Exit Sign LED 2 Side with Battery	PY96
2	Exit Sign LED 1 Side wo/Battery	PY96
4	T-8 El Bal (4ft/4la)	PY96
5	16-20W CFL	PY96
6	Opt Refl(4ft/1dlamp)	PY96
7	5-10W CFL	PY96
8	CF-26 or CF-28 Hardwire Fxtr	PY96
10	5-10W Replacement CFL	PY96
12	Exit Sign Replacement (LED)	PY97
12	Exit Sign Kit (LED) 1 Face Red	PY97
12	Exit Sign LED 2 Side with Battery	PY97
16	T-8 El Bal (4ft/4la)	PY97
19	1FO32/1B4T8-2L	PY97

*M&E Protocols Appendix "F"

**Advice Letter filing 957-E-A/986-G-A: Feb 1, 1996

***Advice Letter filing 1001-E/1030-G: Oct 1, 1996

**** Custom Job: Engineering Judgement

Note: NA indicates that no failures were observed

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING

DOCUMENTATION

FOR

COMMERCIAL ENERGY EFFICIENCY INCENTIVES PROGRAM

FOURTH YEAR RETENTION EVALUATION

MARCH 2001

STUDY ID NOS. 993 & 1017

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING DOCUMENTATION

For Commercial Energy Efficiency Incentives Program

Fourth Year Retention Evaluation

March 2001

Study ID Nos 993 & 1017

B. Retention Studies

1. OVERVIEW INFORMATION

a. Study Title and Study ID:

1996 & 1997 Commercial Energy Efficiency Incentives Program – Fourth Year Retention Evaluation, March 1999, Study ID Nos. 993 & 1017.

b. Program, Program Year(s), and Program Description (Design):

Commercial Energy Efficiency Incentives Program for the 1996 and 1997 program years. The Program was designed to help customers reduce energy costs and increase energy efficiency at their facilities while at the same time providing resource value to society.

c. End Uses and Measures Covered:

Lighting and HVAC end uses. The measures are identified in Table 6.

d. Methods and Models Used:

See the section of the report entitled Econometric Framework for a complete description of the final model specifications.

e. Analysis sample size:

Program Year	Measure	# of Customers in Program	# of Installations in Program	# of Measures Installed in Program	# of Measures in Sample Frame	Date of Retention Studies
PY96	19-30W CF Fixture (Inside)	430	60,488	60,488	19,107	Aug-Nov '99
PY96	Exit Sign LED 1 Side with Battery	2,485	33,601	33,601	2,221	Aug-Nov '99
PY96	Exit Sign Kit (LED)	702	21,206	21,206	4,207	Aug-Nov '99
PY96	T-8 El Bal (4ft/2la)	594	178,601	178,601	112,421	Aug-Nov '99
PY96	21-25W CFL	132	26,721	26,721	10,905	Aug-Oct '99
PY96	Opt Refl(4ft/2dlamp)	295	35,641	35,641	26,588	Aug-Nov '99
PY96	11-15W CFL	444	31,886	31,886	16,641	Aug-Nov '99
PY96	CF-13Q Hardwire Fxtr	154	11,248	11,248	8,013	Aug-Nov '99
PY96	Exit Sign Kit (LED) 1 Face Red	1,089	9,719	9,719	490	Aug-Nov '99
PY96	11-15W Replacement CFL	544	147,098	147,098	44,035	Aug-Nov '99
PY97	Traffic Signals (12 inch Ball)	15	18,219	18,219	910	Oct '99
PY97	Exit Sign LED 1 Side with Battery	1,302	13,811	13,811	66	Aug '99
PY97	Traffic Signals (12 inch Arrow)	15	5,043	5,043	291	Oct '99
PY97	Opt Refl(4ft/2dlamp)	107	10,590	10,590	10,005	Aug-Nov '99
PY97	VAV Air Handlers w/ASDs	2	4	4	4	Oct '99
PY97	T-8 El Bal (4ft/2la)	156	35,888	35,888	31,390	Aug-Nov '99
PY97	Opt Refl(4ft/1dlamp)	70	11,803	11,803	10,974	Aug-Nov '99
PY97	ASD on VAV fan Dual Duct	1	1	1	1	Oct '99
PY97	4FO32/1B4T8-4L	62	3,056	3,056	2,431	Aug-Nov '99
PY97	1x600 Ton & 1x 400 Ton Water Cooled Chillers	2	2	2	2	Oct '99

2. DATABASE MANAGEMENT

a. Data sources:

The data came from the following sources

- Customer name, address, phone number, installed measures, and participation date from the program tracking database
- Measures were determined to be in place and operable by the on-site data collection described in the section of the report entitled Sampling and Data Collection.

The data were merged together to form the dataset for the econometric analysis leading to the estimated Effective Useful Life

b. Data Attrition:

There was minimal data attrition as a result of customer refusals to participate in the audits. For PY96, 393 out of 409 (96.1%) and for PY97, 140 out of 142 (98.6%) audits were successfully completed on commercial customers. All military site audits were successfully completed in PY96 (11) and in PY97 (3). Given the large sample sizes detailed in 1.e. above, customer refusals were ignored in the analysis.

c. Data Quality Checks:

The data sets for the analysis were merged in SAS by the appropriate key variables. Counts of the datasets before and after the merges were verified to ensure accurate merging.

d. Unused collected data:

All data collected was used in the analysis.

3. SAMPLING

a. Sampling procedures and protocols:

Refer to the Sampling and Data Collection section of the report. Section 1.e. above shows how the sample covered the participant population.

b. Survey information:

Copies of the Surveys are attached at the end of the report. The commercial response rate for PY96 was 393 out of 409, or 96.1%. Reasons for refusals include: safety concerns for the auditor (1), protection of trade secrets (2), lack of manpower to escort auditors at restricted sites (2), and pending litigation (non-DSM) involving SDG&E (11; actually one customer with 11 sites that participated in PY96).

PY97 commercial response rate was 140 out 142, or 98.6%. The refusal was the customer with an outstanding lawsuit (non-DSM) against SDG&E that participated with 2 sites in PY97. All military audits were successfully completed in both PY96 (11) and in PY97 (3).

c. Statistical Descriptions:

Measure	Independent or dependent failure analysis (see report)	Variable Designation (see report)	Sample Size (observations or failures)	Age of failure (months)
T-8 El Bal (4ft/2la)	Independent (Comm-PY 96)	n	81,562	Not applicable
		n_i^F	16	21
		n_i^F	19	27
		n_i^F	90	41
	Independent (Comm-PY 97)	n	24,970	Not applicable
		n_i^F	255	33
	Dependent* (Mil-PY 96)[2]	n	422	Not applicable
		n^Q	44	44
Opt Refl (4ft/2dlamp)	Dependent* (Comm-PY 96)	n	260	Not applicable
		n_i^F	1	5
		n_i^F	1	40
	Dependent* (Comm-PY 97)	n	139	Not applicable
		n^Q	3	32
Opt Refl (4ft/1dlamp)	Dependent* (Mil-PY 96)[3]	n	81	Not applicable
		n_i^F	2	33
CF-13Q Hardwire Fxtr	Dependent* (Comm-PY 96)	n	166	Not applicable
		n^Q	2	44
		n_i^F	1	12
		n_i^F	1	38
	Dependent* (Mil-PY 96)	n	123	Not applicable
		n^Q	12	44
11-15W CFL	Independent (Comm-PY 96)	n	14,710	Not applicable
		n_i^F	5	12
		n_i^F	30	16
		n_i^F	78	17
		n_i^F	11	24
		n_i^F	82	29
		n_i^F	25	30
		n_j^F	10	31

[2] There were no failures for the PY 1997 military sample. Subsequently, PY 1996 military failures were applied only to the PY 1996 military sample.

[3] There were no failures for the PY 1997 military sample. Subsequently, PY 1996 military failures were applied only to the PY 1996 military sample.

Measure	Independent or dependent failure analysis (see report)	Variable Designation (see report)	Sample Size (observations or failures)	Age of failure (months)
	Dependent* (Comm-PY 96)	n	348	Not applicable
		n_i^F	2	12
		n_i^F	1	16
		n_i^F	1	17
		n_i^F	4	24
		n_i^F	1	29
		n_i^F	1	30
		n_i^F	1	31
		n_i^F	1	33
		n_i^F	1	36
		n_i^F	1	38
		n_i^F	1	39
		n_i^F	2	41
		n_i^F	2	42
	Dependent* (Mil-PY 96)	n	10	Not applicable
		n^Q	2	44
11-15W Replacement CFL	Independent (Comm-PY 96)	n	31,823	Not applicable
		n^Q	60	44
		n_i^F	50	25
		n_i^F	416	41
		n_i^F	118	43
		n_i^F	2	44
	Dependent* (Comm-PY 96)	n	166	Not applicable
		n^Q	8	44
		n_i^F	2	12
		n_i^F	2	17
		n_i^F	1	23
		n_i^F	1	29
		n_i^F	1	31
		n_i^F	1	32
		n_i^F	3	33
		n_i^F	2	35
		n_i^F	1	36
		n_i^F	1	38
		n_i^F	1	39
		n_i^F	1	40
		n_i^F	3	41
		n_i^F	3	42
		n_i^F	4	43
		n_i^F	2	44
		n_j^F	1	45

Measure	Independent or dependent failure analysis (see report)	Variable Designation (see report)	Sample Size (observations or failures)	Age of failure (months)
19-30W CF Fixture (Inside)	Independent (Comm-PY 96)	n	17,346	Not applicable
		n^Q	40	44
		n_i^F	15	17
		n_i^F	55	19
		n_i^F	2	23
	Dependent* (Comm-PY 96)	n	332	Not applicable
		n^Q	5	44
		n_i^F	1	17
		n_i^F	1	19
		n_i^F	1	23
		n_i^F	2	29
		n_i^F	4	30
		n_i^F	1	32
		n_i^F	2	33
		n_i^F	1	36
		n_i^F	1	41
		n_i^F	2	43
		n_i^F	1	45
21-25W CFL	Dependent* (Comm-PY 96)	n	75	Not applicable
		n^Q	1	44
		n_i^F	1	25
		n_i^F	1	27
		n_i^F	1	29
		n_i^F	1	30
		n_i^F	1	33
		n_i^F	1	37
		n_i^F	1	40
		n_i^F	1	43
Exit Sign Kit (LED)	Dependent* (Comm-PY 96)	n	136	Not applicable
		n^Q	1	44
		n_i^F	1	38
		n_i^F	1	40
	Dependent* (Mil-PY 96)	n	10	Not applicable
		n^Q	3	44
Exit Sign LED 1 Side with Battery	Dependent* (Comm-PY 96)	n	70	Not applicable
		n_i^F	1	41
		n_i^F	1	42
	Dependent* (Comm-PY 97)	n	8	Not applicable

Measure	Independent or dependent failure analysis (see report)	Variable Designation (see report)	Sample Size (observations or failures)	Age of failure (months)
Exit Sign Kit (LED) 1 Face Red	Dependent* (Comm-PY 96)	n	43	Not applicable
		n_j^F	1	25
*A group of measures is said to have undergone "dependent failure" if the number of failures is more than 40% of the group. A typical set of dependent failures is 100% of the group. For dependent failures, n is the number of groups, not the number of measures in the group.				

Weighting Schemes for Combined Estimates

Data Source	Measure	Weight (res. ben.-$)	Weight (%)	Unweighted Median (estimated or ex ante)	Weighted Median
ComPY96	T-8 El Bal (4ft/2la)	3,447,850	66.0%	47.5	41.0
ComPY97	T-8 El Bal (4ft/2la)	408,497	7.8%	47.5	
Mil PY96	T-8 El Bal (4ft/2la)	1,208,734	23.1%	23.6	
Mil PY97	T-8 El Bal (4ft/2la)	162,650	3.1%	(exante)16.0	
ComPY96	Opt Refl(4ft/2dlamp)	2,815,873	60.3%	187.1	154.3
ComPY97	Opt Refl(4ft/2dlamp)	910,428	19.5%	187.1	
Mil PY96	Opt Refl(4ft/2dlamp)	779,284	16.7%	26.5	
Mil PY97	Opt Refl(4ft/2dlamp)	162,742	3.5%	(exante)16.0	
ComPY97	Opt Refl(4ft/1dlamp)	508,824	92.6%	77.2	72.7
Mil PY97	Opt Refl(4ft/1dlamp)	40,789	7.4%	(exante)16.0	
ComPY96	CF-13Q Hardwire Fxtr	1,681,055	76.2%	106.7	87.3
Mil PY96	CF-13Q Hardwire Fxtr	525,635	23.8%	25.3	
ComPY96	11-15W CFL	2,761,505	96.5%	20.7	20.2
Mil PY96	11-15W CFL	100,253	3.5%	7.7	
ComPY96	Exit Sign Kit (LED)	4,655,728	99.4%	117.2	116.5
Mil PY96	Exit Sign Kit (LED)	29,606	0.6%	7.3	

4. DATA SCREENING AND ANALYSIS

a. Outliers and Missing Data Points:

No outliers and no missing data.

b. Background Variables:

NA.

c. Screened Data:

None.

d. Model statistics:

See M&E Protocol Table 6.

e. Specification:

Measure	Specification for dependent failures	Specification for independent failures	Mixed estimation
T-8 El Bal (4ft/2la)	Exponential	Linear hazard function	Joint estimation using independent and dependent failures
Opt Refl(4ft/2dlamp)	Exponential	NA	None
Opt Refl(4ft/1dlamp)	Exponential	NA	None
CF-13Q Hardwire Fxtr	Exponential	NA	None
11-15W CFL	Exponential	Linear hazard function	Joint estimation using independent and dependent failures
11-15W Replacement CFL	Exponential	Linear hazard function	Joint estimation using independent and dependent failures
19-30W CF Fixture (Inside)	Exponential	Linear hazard function	Joint estimation using independent and dependent failures
21-25W CFL	Exponential	NA	None
Exit Sign Kit (LED)	Exponential	NA	None
Exit Sign LED 1 Side with Battery	Exponential	NA	None
Exit Sign Kit (LED) 1 Face Red	Exponential	NA	None

1) Heterogeneity: See section of the report entitled “Econometric Framework.”

2) Omitted Factors: None omitted.

f. Error in Measuring Variables:

NA.

g. Influential Data Points:

None.

h. Missing Data:

None.

i. Precision:

The calculation for the standard error is based on the expectation of the second-derivative matrix for the log-likelihood function.

MEASURE RETENTION SURVEYS

FOR

COMMERCIAL ENERGY EFFICIENCY INCENTIVES PROGRAM

FOURTH YEAR RETENTION EVALUATION

MARCH 2001

STUDY ID NO. 993 & 1017

PY96 and PY97 SDG&E Retention Study

CEEI – Commercial Sector

Aug – Nov 1999

Site Name=>

Prem ID =>

Program=>

Site Address=>

1. Measure	New Qty	No. Verified	Plus %	No. Operable	No. Removed	Date Removed
19-30W CF Fixture (Inside)						
Exit Sign LED 1 Side with Battery						
Exit Sign Kit (LED)						
T-8 El Bal (4ft/2la)						
21-25W CFL						
Opt Refl(4ft/2dlamp)						
11-15W CFL						
CF-13Q Hardwire Fxtr						
Exit Sign Kit (LED) 1 Face Red						
11-15W Replacement CFL						
Traffic Signals (12 inch Ball)						
Traffic Signals (12 inch Arrow)						
VAV Air Handlers w/ASDs						
Opt Refl(4ft/1dlamp)						
ASD on VAV fan Dual Duct						
4FO32/1B4T8-4L						
1x600 Ton & 1x 400 Ton Water Cooled Chillers						

VIEWtech

11/10/99

SDG&E CEEI – Military Survey for PY96 & PY97

Aug – Nov 1999

SDG&E PY96 & PY97 CEEI Program - Military Sector
Measure Retention Survey

Site_nbr: **Site_sec:** **PART:**
Site_nm:
Rank: **Address:**
Site_Cty:
Bldg_sz: **Bldg_lgt:**
ENDUSE:

Site Contact (DB): _____
Contact Ph: _____
Alternate contact name: _____
Alternate contact phone: _____
Surveyor: _____
Suvey Date: _____

Contract	MSR #	NEW DESC	kWh Sav.	kW Red.	Th. Sav.	MSR LOC	Ins. Qty	Run Hrs	Ver. Schedule (incl.date of change in schedule)

SDG&E PY96 & PY97 CEEI Program - Military Sector

Measure Retention Survey

Site_nbr: **Site_sec:** **PART:**

Site_nm:

Rank: **Address:**

Site_Cty:

Bldg_sz: **Bldg_lgt:**

ENDUSE:

Site Contact (DB): _____
Contact Ph: _____

Alternate contact name: _____
Alternate contact phone: _____

Surveyor: _____
Suvey Date: _____

SURVEY DISPOSITION

Audit Completed?: [ ]Yes [ ]No (check one)

Reason for not completed: [ ]
1 = Unable to reach/contact.
2 = Changed mind about participation in study.
3 = Premise closed/not operating.
4 = Site/contact info incorrect and could not find alternate contact.
5 = Requested to call back, could not complete call.
6 = Rescheduled upon arrival at site.
7 = Other: Describe:

DISCREPANCIES

Reason for discrepance in counts (check one and describe if necessary)
[ ]=Removed, not replaced (include date of rernoval:,
[ ]=Never installed
[ ]=Exceeds tracking system counts (describe reasons for additional eqmt, eg, retrofits part of SDG&E Program in 1997).
[ ]=Removed, replace with more efficient equipment
[ ]=other, describe situation fully

Description/Comments:

SDG&E PY96 & PY97 CEEI Program - Military Sector

Measure Retention Survey

Site_nbr: **Site_sec:** **PART:**

Site_nm:

Rank: **Address:**

Site_Cty:

Bldg_sz: **Bldg_lgt:**

Site Contact (DB): _____
Contact Ph: _____

Alternate contact name: _____

Alternate contact phone: _____

Surveyor: _____

Suvey Date: _____

Facility Tenancy/Ownership:

Have Tenant and Owner remained the same? [ ] Yes [ ] No (check one)

If NO, what best describes the situation [ ] (select one, describe below)

1. New tenant-same owner.
2. Same tenant-New owner
3. New tenant-New owner
4. Premise closed.

Description/Comments:

Building/Facility Configuration:

Check one box that represents the facility layout (check all that apply, describe below):

[ ] Same as time of installation.
[ ] Same tenant, had tenant improvements
[ ] Same tenant, increased floorspace
[ ] Same tenant, decreased floorspace
[ ] New tenant, no tenant improvements
[ ] New tenant, and had tenant improvements
[ ] New tenant, increased floorspace
[ ] New tenant, decreased floorspace, ie, there is empty floorspace.

Description/Comments: