SDG&E

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1996 & 1997 Residential Appliance Efficiency Incentives: Refrigerators

Ninth Year Retention Evaluation

March 2006

Study ID No. 982

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1996 & 1997 RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES:

REFRIGERATORS

NINTH YEAR RETENTION EVALUATION

STUDY ID NO. 982

Program Description

SDG&E's PY96 & PY97 Residential Appliance Efficiency Incentives (RAEI) – High Efficiency Refrigerator Program was designed to capture potential lost opportunities by encouraging residential customers to purchase higher efficiency units when replacing current refrigerators. The strategy for this program was to (1) offer discounts to customers purchasing refrigerators exceeding federal standards of appliance efficiency and (2) encourage manufacturers to produce higher efficiency units. The program also included freezers.

A customer who participated in SDG&E's RAEI High Efficiency Refrigerator Program received a rebate at the time of purchase. SDG&E's rebates where on a sliding scale, with higher rebates for higher efficiency units. The dealer was required to collect the name, address, telephone number, and refrigerator model, and then submit this documentation to SDG&E for reimbursement. The retention sample for this study was drawn from this database.

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. For the RAEI High-Efficiency Refrigerator Program in PY96, two measures constitute the top 50% of resource value. The first are those refrigerators exceeding federal efficiency standards by more than 25% and less than 30% (43% of program TRC). The second measure are those refrigerators greater than 20% and less than 25% above federal efficiency standards (25% of program TRC; a cumulative total of 68% of TRC for PY96). In PY97, one measure, refrigerators exceeding federal efficiency standards by more than 35% and less than 40% accounted for 82% of program TRC. These three groups of customers are the basis for estimating the Effective Useful Life (EUL) for refrigerators.

SDG&E contracted with CIC Research, Inc. to conduct telephone surveys on the participants who purchased refrigerators within the three groups. The customers in each of the three groups were provided to CIC Research in random order. SDG&E requested that CIC Research conduct surveys with 450 customers in each group to determine if the refrigerators were still in place and operable – the definition of effective useful life per the M&E Protocols. However, in PY97, only 364 refrigerators exceeding federal efficiency standards by more than 35% and less than 40% participated in the program; thus for PY97, CIC Research tried to contact all of the measure participants. Copies of the survey and tally sheets are provided at the end of this study.

	Number of Completed Surveys by Year						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
PY96 20-25% above stnds	450	450	454	450	450	451	450
PY96 25-30% above stnds	460	462	452	450	450	450	450
PY97 35-40% above stnds	184	151	172	136	155	125	119

Measures/"Like" Measures

In order to apply any changes in EUL to measures not studied, M&E Protocols require that the utility identify any "like" measures within the program. For SDG&E's PY96 & PY97 RAEI High-Efficiency Refrigerator Program, all refrigerators are identified as "like" measures. The *ex ante* estimated EUL for all refrigerators in the program is 18 years.

The only measures excluded as "like" measures are freezers, although the *ex ante* EUL is also 18 years. Freezers were excluded for the following reasons: (1) most freezers would be kept in the garage as opposed to the house, (2) freezers wouldn't be opened as often as in-house refrigerators, and (3) in PY96, freezers accounted for less than 1% of the program and in PY97, there were no freezers in the program.

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,

$$S(j) = prob(lifetime \geq j)$$

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 $S(0) = 1$:

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

Equation 2 (The survivor function)

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

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)

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

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 ω 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,

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

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 THIRD EARNINGS CLAIM

FOR

RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES PROGRAM: REFRIGERATORS

NINTH YEAR RETENTION EVALUATION

MARCH 2006

STUDY ID NO. 982

TABLE 6 for RETENTION STUDIES
PROGRAM: RAEI-Refrigerators
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	Refrig	>=25 AND <30 % EFF REF	18	**	41.6	18	19.8	16.2	67.0	23.4%	1.00	see below
PY96	Refrig	>=20 AND <25 % EFF REF	18	**	40.9	18	18.7	17.0	64.8	22.0%	1.00	see below
PY97	Refrig	>=35 AND <40 % EFF REF	18	***	36.0	18	14.6	17.3	54.8	21.7%	1.00	see below

	9. "Like" Measures to be Adjusted
PY96	>=30 AND <35 % EFF REF
PY96	>=35 AND <40 % EFF REF
PY96	>=20 AND <25 % EFF REF
PY96	1995 carry over DAP refrigs
PY96	>=15 AND <20 % EFF REF
PY96	>=40 AND <45 % EFF REF
PY96	>=25 AND <30 % EFF REF
PY97	>=25 AND <30 % EFF REF
PY97	>=30 AND <35 % EFF REF

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

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

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING

DOCUMENTATION

FOR

RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES PROGRAM: REFRIGERATORS

NINTH YEAR RETENTION EVALUATION

MARCH 2006

STUDY ID NO. 982

M&E PROTOCOLS TABLE 7

DATA QUALITY AND PROCESSING DOCUMENTATION

For RAEI-Refrigeration Program

Ninth Year Retention Evaluation

March 2006

Study ID No. 982

B. Retention Studies

1. OVERVIEW INFORMATION

a. Study Title and Study ID:

1996 & 1997 Residential Appliance Efficiency Incentives: Refrigerators – Ninth Year Retention Evaluation, March 2006, Study ID No. 982.

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

RAEI Refrigeration Program for the 1996 and 1997 program years. The Program is designed to encourage residential customers to purchase higher efficiency units when replacing current refrigerators.

c. End Uses and Measures Covered:

Refrigeration; three measures: refrigerators 20-25%, 25-30%, and 35-40% above federal standards.

d. Methods and Models Used:

See the section of the report entitled Econometric Framework for a complete overview 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
96	20 - 25 %	18,621	18,621	18,621	450 450 454 450 450 451 450	10/1999 6/2000 8/2001 4/2002 5/2003 4-7/2004 4/2005
96	25 - 30 %	14,332	14,332	14,332	460 462 452 450 450 450 450	10/1999 6/2000 8/2001 4/2002 5/2003 4-7/2004 4/2005
97	35 - 40 %	364	364	364	184 151 172 136 155 125 119	10-11/1999 6-7/2000 8/2001 4/2002 5/2003 4-7/2004 4/2005

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

- Refrigerators were determined to be in place and operable by the phone survey 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:

The goal was to achieve a sample of 450 for each of the 3 different levels of efficiency for each program year (see 1.e. above). However, the PY97 measure, 35-40% above federal standards, only had 364 participants, so the goal was to conduct a census. Final tally results:

1999 SDG&E Refrigerator Retention Study
1996A Refrigerator Purchasers
Final Dialing Results
November 1999

Call Result	No.	Percent
Number not in service	233	13.8
Wrong number	263	15.6
Other language	13	0.8
Business number/fax/modem/cell phone	33	1.9
Refusal	45	2.7
Didn't buy a refrigerator in 1996	35	2.1
Busy number	30	1.8
No answer	65	3.8
Answering machine	134	7.9
Callback	306	18.1
Respondent never available	25	1.5
Multiple purchases/no knowledge of frig's status	57	3.4
Completed interviews	450	26.6
Total	**1,689**	**100.0**

1999 SDG&E Refrigerator Retention Study
1996B Refrigerator Purchasers
Final Dialing Results
November 1999

Call Result	No.	Percent
Number not in service	177	14.2
Wrong number	183	14.6
Other language	11	0.9
Business number/fax/modem/cell phone	35	2.8
Refusal	58	4.6
Didn't buy a refrigerator in 1996	36	2.9
Busy number	19	1.5
No answer	74	5.9
Answering machine	116	9.3
Callback	72	5.8
Respondent never available	3	0.2
Multiple purchases/no knowledge of frig's status	6	0.5
Completed interviews	460	36.8
Total	**1,250**	**100.0**

1999 SDG&E Refrigerator Retention Study
1997 Refrigerator Purchasers
Final Dialing Results
November 1999

Call Result	No.	Percent
Number not in service	44	12.1
Wrong number	68	18.7
Other language	2	0.6
Business number/fax/modem/cell phone	16	4.4
Refusal	6	1.6
Didn't buy a refrigerator in 1997	6	1.6
Busy number	2	0.5
No answer	20	5.5
Answering machine	13	3.6
Callback	2	0.6
Respondent never available	1	0.3
Multiple purchases/no knowledge of frig's status	--	--
Completed interviews	184	50.5
Total	**364**	**100.0**

2000 SDG&E Refrigerator Retention Study
1996A Refrigerator Purchasers
Final Dialing Results
July 2000

Call Result	No.	Percent
Number not in service	328	14.1
Wrong number	415	17.8
Other language	20	0.9
Business number/fax/modem/cell phone	119	5.1
Refusal	206	8.8
Didn't buy a refrigerator in 1996	39	1.7
Busy number	36	1.5
No answer	101	4.3
Answering machine	206	8.8
Callback	311	13.3
Respondent never available	24	1.0
Multiple purchases/no knowledge of frig's status	80	3.4
Completed interviews	450	19.3
Total	**2,335**	**100.0**

2000 SDG&E Refrigerator Retention Study
1996B Refrigerator Purchasers
Final Dialing Results
July 2000

Call Result	No.	Percent
Number not in service	239	13.7
Wrong number	327	18.7
Other language	21	1.2
Business number/fax/modem/cell phone	50	2.9
Refusal	163	9.3
Didn't buy a refrigerator in 1996	19	1.1
Busy number	36	2.1
No answer	94	5.4
Answering machine	199	11.4
Callback	105	6.0
Respondent never available	23	1.3
Multiple purchases/no knowledge of frig's status	7	0.4
Completed interviews	462	26.5
Total	**1,745**	**100.0**

2000 SDG&E Refrigerator Retention Study
1997 Refrigerator Purchasers
Final Dialing Results
July 2000

Call Result	No.	Percent
Number not in service	61	16.8
Wrong number	74	20.3
Other language	2	0.6
Business number/fax/modem/cell phone	15	4.1
Refusal	34	9.3
Didn't buy a refrigerator in 1997	2	0.6
Busy number	2	0.6
No answer	14	3.8
Answering machine	4	1.1
Callback	2	0.5
Respondent never available	2	0.5
Multiple purchases/no knowledge of frig's status	1	0.3
Completed interviews	151	41.5
Total	**364**	**100.0**

2001 SDG&E Refrigerator Retention Study
1996A Refrigerator Purchasers
Final Dialing Results
August 2001

Call Result	No.	Percent
Number not in service	262	12.8
Wrong number	253	12.4
Other language	14	.7
Business number/fax/modem/cell phone	551	27.0
Refusal	29	1.4
Didn't buy a refrigerator in 1996	17	.8
Busy number	40	1.9
No answer	155	7.6
Answering machine	169	8.3
Callback	50	2.5
Respondent never available	17	.8
Multiple purchases/no knowledge of frig's status	32	1.6
Completed interviews	454	22.2
Total	**2,043**	**100.0**

2001 SDG&E Refrigerator Retention Study
1996B Refrigerator Purchasers
Final Dialing Results
August 2001

Call Result	No.	Percent
Number not in service	262	17.2
Wrong number	214	14.0
Other language	18	1.2
Business number/fax/modem/cell phone	64	4.2
Refusal	54	3.6
Didn't buy a refrigerator in 1996	7	.5
Busy number	45	3.0
No answer	142	9.3
Answering machine	174	11.4
Callback	47	3.1
Respondent never available	9	.6
Multiple purchases/no knowledge of frig's status	33	2.2
Completed interviews	452	29.7
Total	**1,521**	**100.0**

2001 SDG&E Refrigerator Retention Study
1997 Refrigerator Purchasers
Final Dialing Results
August 2001

Call Result	No.	Percent
Number not in service	50	13.8
Wrong number	62	17.0
Other language	1	.3
Business number/fax/modem/cell phone	31	8.5
Refusal	10	2.7
Didn't buy a refrigerator in 1997	2	3.2
Busy number	6	1.7
No answer	11	.3
Answering machine	7	1.9
Callback	0	0
Respondent never available	5	1.4
Multiple purchases/no knowledge of frig's status	7	1.9
Completed interviews	172	47.3
Total	**364**	**100.0**

2002 SDG&E Refrigerator Retention Study
1996A Refrigerator Purchasers
Final Dialing Results
April 2002

Call Result	No.	Percent
Number not in service	584	19
Wrong number	509	16.6
Other language	40	1.3
Business number/fax/modem/cell phone	405	13.2
Blocked	37	1.2
Refusal	210	6.8
Didn't buy a refrigerator in 1996	57	1.9
Busy number	49	1.6
No answer	411	13.4
Answering machine	272	8.9
Callback	31	1.0
Respondent never available	8	0.3
Multiple purchases/no knowledge of frig's status	4	0.1
Completed interviews	450	14.7
Total	**3067**	**100.00**

2002 SDG&E Refrigerator Retention Study
1996B Refrigerator Purchasers
Final Dialing Results
April 2002

Call Result	No.	Percent
Number not in service	334	18.7
Wrong number	307	17.2
Other language	19	1.1
Business number/fax/modem/cell phone	76	4.3
Blocked	0	0
Refusal	138	7.7
Didn't buy a refrigerator in 1996	23	1.3
Busy number	31	1.7
No answer	235	13.2
Answering machine	132	7.4
Callback	30	1.7
Respondent never available	6	0.3
Multiple purchases/no knowledge of frig's status	3	0.2
Completed interviews	450	25.2
Total	**1784**	**100.0**

2002 SDG&E Refrigerator Retention Study
1997 Refrigerator Purchasers
Final Dialing Results
April 2002

Call Result	No.	Percent
Number not in service	73	20.5
Wrong number	62	17.4
Other language	2	0.6
Business number/fax/modem/cell phone	24	6.7
Blocked Calls	0	--
Refusal	21	5.9
Didn't buy a refrigerator in 1997	6	1.7
Busy number	0	--
No answer	12	3.4
Answering machine	10	2.8
Callback	1	0.3
Respondent never available	9	2.5
Multiple purchases/no knowledge of frig's status	0	--
Completed interviews	136	38.2
Total	**356**	**100.0**

2003 SDG&E Refrigerator Retention Study
1996A Refrigerator Purchasers
Final Dialing Results
May 2003

Call Result	Number	Percent
Completed interviews	450	16.2%
Number not in service	416	14.9%
Wrong number	278	10.0%
Other language	24	0.9%
Business number/fax/modem/cell phone	823	29.5%
Blocked	32	1.1%
Refusal	114	4.1%
Didn't buy a refrigerator in 1996	31	1.1%
Busy number	36	0.6%
No answer	370	13.3%
Answering machine	151	5.4%
Callback	51	1.8%
Respondent never available	5	0.2%
No knowledge of frig's status	5	0.2%
Total	**2,786**	**100.0%**

2003 SDG&E Refrigerator Retention Study

1996B Refrigerator Purchasers

Final Dialing Results

May 2003

Call Result	Number	Percent
Completed interviews	450	25.7%
Number not in service	308	17.6%
Wrong number	278	15.8%
Other language	16	0.9%
Business number/fax/modem/cell phone	173	9.9%
Blocked	39	2.2%
Refusal	58	3.3%
Didn't buy a refrigerator in 1996	39	2.2%
Busy number	53	0.6%
No answer	128	7.3%
Answering machine	181	10.3%
Callback	19	1.1%
Respondent never available	10	0.6%
No knowledge of frig's status	2	0.1%
Total	**1,754**	**100.0%**

2003 SDG&E Refrigerator Retention Study

1997 Refrigerator Purchasers

Final Dialing Results

May 2003

Call Result	**Number**	**Percent**
Completed interviews	155	42.7%
Number not in service	78	21.5%
Wrong number	46	12.7%
Other language	3	0.8%
Business number/fax/modem/cell phone	35	9.6%
Blocked	9	2.5%
Refusal	8	2.2%
Didn't buy a refrigerator in 1997	1	0.3%
Busy number	3	0.6%
No answer	13	3.6%
Answering machine	5	1.4%
Callback	3	0.8%
Respondent never available	2	0.6%
No knowledge of frig's status	2	0.6%
Total	**363**	**100.0%**

2004 SDG&E Refrigerator Retention Study

1996A Refrigerator Purchasers

Final Dialing Results

April - July 2004

Call Result	Number	Percent
Completed interviews	451	15.1%
Number not in service	569	19.0%
Wrong number	380	12.7%
Other language	25	0.8%
Business number/fax/modem/cell phone	793	26.5%
Blocked	52	1.7%
Refusal	52	1.7%
Didn't buy a refrigerator in 1996	30	1.0%
Busy number	41	0.6%
No answer	247	8.2%
Answering machine	206	6.9%
Callback	115	3.8%
Respondent never available	16	0.5%
No knowledge of frig's status	19	0.6%
Total	**2,996**	**100.0%**

2004 SDG&E Refrigerator Retention Study

1996B Refrigerator Purchasers

Final Dialing Results

April - July 2004

Call Result	Number	Percent
Completed interviews	450	17.2%
Number not in service	575	22.0%
Wrong number	349	13.4%
Other language	35	1.3%
Business number/fax/modem/cell phone	246	9.4%
Blocked	27	1.0%
Refusal	163	6.2%
Didn't buy a refrigerator in 1996	45	1.7%
Busy number	93	0.6%
No answer	294	11.3%
Answering machine	241	9.2%
Callback	84	3.2%
Respondent never available	8	0.3%
No knowledge of frig's status	0	0.0%
Total	**2,610**	**100.0%**

2004 SDG&E Refrigerator Retention Study

1997 Refrigerator Purchasers

Final Dialing Results

April - July 2004

Call Result	Number	Percent
Completed interviews	125	34.4%
Number not in service	92	25.3%
Wrong number	56	15.4%
Other language	1	0.3%
Business number/fax/modem/cell phone	26	7.2%
Blocked	7	1.9%
Refusal	5	1.4%
Didn't buy a refrigerator in 1997	4	1.1%
Busy number	3	0.6%
No answer	31	8.5%
Answering machine	3	0.8%
Callback	4	1.1%
Respondent never available	5	1.4%
No knowledge of frig's status	1	0.3%
Total	**363**	**100.0%**

2005 SDG&E Refrigerator Retention Study

1996A Refrigerator Purchasers

Final Dialing Results

April 2005

Call Result	**Number**	**Percent**
Completed interviews	450	17.1%
Number not in service	653	24.8%
Wrong number	265	10.1%
Other language	19	0.7%
Business number/fax/modem/cell phone	748	28.4%
Blocked	4	0.2%
Refusal	41	1.6%
Didn't buy a refrigerator in 1996	26	1.0%
Busy number	40	0.6%
No answer	136	5.2%
Answering machine	209	7.9%
Callback	16	0.6%
Respondent never available	8	0.3%
No knowledge of frig's status	<u>15</u>	<u>0.6%</u>
Total	**2,630**	**100.0%**

2005 SDG&E Refrigerator Retention Study

1996B Refrigerator Purchasers

Final Dialing Results

April 2005

Call Result	**Number**	**Percent**
Completed interviews	450	27.2%
Number not in service	453	27.4%
Wrong number	239	14.4%
Other language	39	2.4%
Business number/fax/modem/cell phone	157	9.5%
Blocked	10	0.6%
Refusal	27	1.6%
Didn't buy a refrigerator in 1996	9	0.5%
Busy number	27	0.6%
No answer	108	6.5%
Answering machine	115	6.9%
Callback	16	1.0%
Respondent never available	1	0.1%
No knowledge of frig's status	4	0.2%
Total	**1,655**	**100.0%**

2005 SDG&E Refrigerator Retention Study

1997 Refrigerator Purchasers

Final Dialing Results

April 2005

Call Result	**Number**	**Percent**
Completed interviews	119	32.7%
Number not in service	128	35.2%
Wrong number	45	12.4%
Other language	0	0.0%
Business number/fax/modem/cell phone	32	8.8%
Blocked	1	0.3%
Refusal	5	1.4%
Didn't buy a refrigerator in 1997	5	1.4%
Busy number	3	0.6%
No answer	14	3.8%
Answering machine	10	2.7%
Callback	1	0.3%
Respondent never available	0	0.0%
No knowledge of frig's status	1	0.3%
Total	**364**	**100.0%**

c. Data Quality Checks:

The data sets for the retention 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.

d. All data collected

All data for this analysis were utilized.

3. SAMPLING

a. Sampling procedures and protocols:

A goal of 450 participants per efficiency level per program year (3 groups of customers) was established. Each of the three groups of customers was provided to CIC Research in random order. CIC Research was instructed to start at the top of each list and get the first 450 customers they could to respond. However, the PY97 measure, 35-40% above federal standards, only had 364 participants, so the goal was to conduct a census. See the section of the report entitled Sampling and Data Collection and 2.b. above for a detailed description.

b. Survey information:

Copies of the SDG&E Refrigerator Surveys are attached at the end of the report. The survey completed response rate ranged from 14.7% - 50.5%; see 2.b. above for reasons for non-completed surveys.

c. Statistical Descriptions:

Measure	Independent or dependent failure analysis (see report)	Variable Designation (see report)	Sample Size (observations or failures)	Age of failure (months)
PY96 20-25%	Independent	n	2,359	Not applicable
		n^Q	24	115
		n_i^F	4	1
		n_i^F	8	12
		n_i^F	3	24
		n_i^F	10	36
		n_i^F	15	48
		n_i^F	20	60
		n_i^F	15	72
		n_i^F	24	84
		n_i^F	19	96
		n_i^F	6	108
PY96 25-30%	Independent	n	2,584	Not applicable
		n^Q	19	115
		n_i^F	4	1
		n_i^F	3	12
		n_i^F	8	24
		n_i^F	22	36
		n_i^F	26	48
		n_i^F	24	60
		n_i^F	10	72
		n_i^F	16	84
		n_i^F	26	96
		n_i^F	10	108
PY97 35-40%	Independent	n	234	Not applicable
		n_i^F	1	26
		n_i^F	1	27
		n_i^F	1	29
		n_i^F	3	48
		n_i^F	1	54
		n_i^F	1	60
		n_i^F	1	65
		n_i^F	2	72
		n_i^F	1	75
		n_i^F	1	80
		n_i^F	1	83
		n_i^F	2	87
		n_i^F	1	97

4. DATA SCREENING AND ANALYSIS

a. Outliers and Missing Data Points:

No outliers and no missing data.

b. Background Variables:

NA

c. Screened Data:

Since surveying occurred over seven years, surveying which duplicated household information was eliminated.

d. Model statistics:

See M&E Protocol Table 6.

e. Specification:

Measure	Specification for dependent failures	Specification for independent failures	Mixed estimation
PY96 20-25%	NA	Linear hazard function	None
PY96 25-30%	NA	Linear hazard function	None
PY97 35-40%	NA	Exponential	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 SURVEY

FOR

RESIDENTIAL APPLIANCE EFFICIENCY INCENTIVES PROGRAM – REFRIGERATORS

NINTH YEAR RETENTION EVALUATION

MARCH 2006

STUDY ID NO. 982

SDG&E Refrigerator Survey

Conducted Annually from 1999 - 2005

Hello. Have I reached the _____ household? (CONTINUE) I'm calling from CIC Research for San Diego Gas & Electric Company. We're conducting a very brief survey on refrigerators. The survey only takes a couple of minutes. May I speak with a person who was involved in the purchase of your refrigerator in (year) ? (REPEAT INTRO IF NECESSARY.)

1.   According to our records, you purchased a new refrigerator in (year). Is that correct?

         1 yes (CONTINUE)   2 no (THANK & TERMINATE)

2.   Do you still have that refrigerator?

1   yes, in my own home (CONTINUE)

2   yes, in my rental or other property (CONTINUE)

3   no, got rid of it (SKIP TO Q5)

4   have no current knowledge of status of refrigerator (DO NOT READ; SPECIFY CIRCUMSTANCES ON PAPER; THANK & TERMINATE)

3.   And is it still plugged in and being used?

         1 yes (THANK & TERMINATE; COUNT AS COMPLETE)

         2 no (CONTINUE)

         9 DK (THANK & TERMINATE; COUNT AS COMPLETE)

4.   Why not?

1   plan to get rid of it but haven't yet

2   seasonal use only

3   keeping/storing for future use

4   other (SPECIFY) _____

(THANK & TERMINATE; COUNT AS COMPLETE)

5.   When did you get rid of it? Month & Year _____

6.   Did it stay in SDG&E territory or go out of SDG&E territory?

<u>1</u>   SDG&E territory (San Diego County & southern Orange County)

<u>2</u>   outside SDG&E's territory

<u>3</u>   other (SPECIFY) _____

<u>4</u>   DK

Those are all my questions. Thank you very much for your time and cooperation.