IMPACT EVALUATION OF
1994 SPARE REFRIGERATOR RECYCLING PROGRAM
Project ID 515

Final Report

Prepared for

Southern California Edison
San Dimas, California

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1 INTRODUCTION

1.1 OVERVIEW

Southern California Edison (SCE) has been implementing its Spare Refrigerator Recycling Program (Program) for several years. Through the Program, customers can schedule an appointment to have their working and operating spare refrigerator or freezer picked up and hauled away. The appliance is then taken to a recycling center where the metals, components and refrigerant are recycled using environmentally sound procedures. Over 48,000 refrigerators and freezers were recycled through the Program during 1994. For participating in the Program during 1994 customers received a $50 U. S. Savings Bond or $25.00 cash.

SCE has contracted XENERGY Inc. (XENERGY) to perform the data collection and analysis necessary to estimate the energy impacts of the Program. XENERGY developed a methodological approach which investigated the net-to-gross issues of an appliance recycling program. A telephone survey of 450 program participants was conducted to gather the primary data for estimating the net-to-gross ratio. An analysis of secondary data was performed to estimate the annual energy consumption (also termed the unit energy consumption or UEC) for recycled refrigerators.

1.2 KEY FINDINGS

1.2.1 Net Impacts

The key impact findings are summarized in Table 1-1. Total net savings for the program were 31.1 GWh per year. The net savings per unit was 674 kWh per year for refrigerators, and 473 kWh per year for freezers.

Table 1-1
Summary of Impact Findings

Unit Type	Number Collected	Program Planning Estimate (kWh/year)	Full-Year UEC (kWh/year)	Net-to-Gross	Net Savings Per Unit kWh/year	Net Savings Program Total GWh/year	Realiz. Rate Relative to Planning	Precision at 90% Confidence Relative (%)
Refrigerator	41,299	1,338	1,593	0.423	674.0	27.8	0.504	5.6
Freezer	6,887	1,338	1,250	0.379	473.4	3.3	0.354	16.4
All Units	48,186	1,338	1,544	0.418	645.4	31.1	0.482	5.3

Savings for freezers were lower than for refrigerators for several reasons. One was that the full-year UEC was lower. Another was that removed freezers would have been used less, averaging eight months a year, as compared with ten months a year for refrigerators. Finally, the fraction of removals that the program was given credit for was somewhat lower for freezers.

For refrigerators, the unit net savings was 42 percent of the full-year UEC estimated by this evaluation. For freezers, the net savings was only 38 percent of the full-year UEC.

In addition to part-use, the other factor affecting the net-to-gross ratio was the way the unit would otherwise have been disposed of, if at all, without the Program. This is the factor that determines the credit assigned to the Program for the removal. For both refrigerators and freezers, it is estimated that about half the collected units would have been taken out of use without the Program.

The Program planning estimate of savings was the same for both refrigerators and freezers. The full-year UEC estimated in this evaluation was 19 percent higher than the program planning estimate for refrigerators, and 7 percent lower for freezers. Relative to the planning figures, the net savings represent a realization rate of 48 percent for the program as a whole, 50 percent for refrigerators, and 35 percent for freezers.

1.2.2 Program Targeting

Refrigerator recycling programs are generally targeted to removal of existing spare refrigerators that will not be replaced. However, based

on survey results, spare refrigerator removals (without replacement) accounted for only 54 percent of the refrigerators collected through the Program. About 18 percent of the collected units were main refrigerators, and 33 percent of the units were replaced. Overall, freezers accounted for 14 percent of collected units. These differences between the program design concept and actual participation patterns turn out not to be problems for SCE's Spare refrigerator program: the net-to-gross ratios for main and/or replaced refrigerators were similar to those for spare units not replaced.

1.3 REPORT ORGANIZATION

The remainder of this report is organized as follows:

Section 2	estimation of net program impacts;
Appendix A	estimation of refrigerator and freezer UEC's;
Appendix B	survey methodology;
Appendix C	detailed net-to-gross factors;
Appendix D	questionnaire;
Appendix E	Selected database tabulations;
Appendix F	Survey database record layout; and
Appendix G	Summary tables.

2 NET SAVINGS ESTIMATION

2.1 NET-TO-GROSS FACTOR

In Appendix A, the Unit Energy Consumption (UEC) is determined for refrigerators and freezers collected by the program. This UEC represents the energy consumed in a full year of operations, for an average refrigerator or freezer with characteristics like those of the units collected by SCE's 1994 Spare Refrigerator Recycling Program. This consumption level is the gross savings associated with removing an average unit from use. The net savings is the reduction in energy use that can be attributed to the Program. This net savings differs from the gross savings number for two reasons:

1. The unit might have been taken out of use by the customer at about the same time even without the program.
2. A unit removed may have operated less than a full year in the absence of the program. As a result, its removal lowers energy use by less than the full-year UEC.

For this evaluation, net savings is determined by multiplying the gross, full-year UEC by a net-to-gross factor (NTG). This factor consists of two components:

- the attribution factor; and
- the part-use factor.

The attribution factor accounts for what the disposition of a recycled unit would have been in the absence of the program. This factor is like a simple free ridership factor. The part-use factor accounts for the fact that a unit that would have stayed in use would have been in use only part of the time. For example, the savings due to removal of a unit that would have been used only 3 months of the year is only one-quarter (3/12) the savings associated with full-year use (assuming essentially constant use over the year for a full-use unit). The net-to-gross factor, NTG, is thus given by Equation 1.

(Eq. 1)

$$NTG = A*U,$$

where

A = the attribution factor, and
U = the part-use factor.

The attribution and part-use factors are determined separately for each surveyed unit, based on the survey responses. The net-to-gross factor is then determined for each unit. The program net-to-gross factor is the average net-to-gross factor across the surveyed units.

As a matter of interest to the program operations, average attribution, part-use, and net-to-gross factors are computed separately for different categories of disposals. Refrigerators that were previously used as spares are reported separately from main refrigerators. Also, units that were turned in because they were replaced with a new one are reported separately from outright removals. However, these classifications are available for the surveyed customers only, not for all participants. To calculate program impacts, the average net-to-gross across all units is applied to the average UEC across all units picked up by the program. This program-level impact calculation is done separately for refrigerators and freezers.

The conceptual framework for assigning attribution and part-use factors is described below, followed by the details of the assignments based on the survey responses. The results of the attribution, part-use, and net savings analysis are then presented.

2.2 PRINCIPLES FOR ASSIGNING ATTRIBUTION AND PART-USE FACTORS

2.2.1 Attribution Factors

For a unit that would otherwise have been destroyed, we assign an attribution factor of zero; no credit for removal of this unit is attributed to the program. For a unit that would otherwise have been left in place, the attribution factor is one; full credit for removal is attributed to the program. A third possibility is that the unit would otherwise have been transferred to another owner, by being sold, given away, or left in place when the original owner moved. For these units, the attribution factor is a fraction between zero and one; the program is given partial credit for removing the unit.

The rationale for giving part credit for removal of units that would otherwise have been transferred is that preventing this transfer results in some savings to SCE, on average. The details of what type of

transfer would have occurred has an effect on savings, but could not be determined reliably from a survey. For this reason, we assign a somewhat subjective estimate of the attribution factor for transfer cases.

If the transfer would have been to a customer outside the service territory, the savings from removal are zero. However, if the transfer would have been to another SCE customer who would have used the unit for a second refrigerator, and would not otherwise acquire a second refrigerator, the savings are the same as if the unit would have stayed in place and been used as a second refrigerator; the attribution factor would be one. In other cases, the recipient of the transfer would have used the refrigerator as a primary unit. Preventing this transfer by recycling the unit means that the would-be recipient must acquire a different unit. If the different unit is a new one, the removal from the original customer has resulted in effectively moving the would-be recipient from an older unit to a new one. In this case the program deserves credit for the accelerated replacement of an older, less efficient unit by a new, more efficient one. The different possible dispositions and corresponding attribution factors are indicated in Table 2-1.

In the case of accelerated replacement, the attribution factor can be computed as the difference in UEC between a new unit and the average unit picked up by the program, expressed as a fraction of the program's average UEC. Assuming a program average UEC around 1,300 to 1,700 kWh per year and a new-unit UEC around 600 to 700 kWh per year, the accelerated replacement factor would be 30 to 50 percent.

Table 2-1
Attribution Factor for Transferred Refrigerators for Different Disposition Details

If unit had not been recycled		Actual actions by recipient	Program credited for	Attribution factor
Recipient location	Recipient's use of unit			
Outside SCE	Any	Any	None	0
In SCE	Second	No second	Full removal of second unit	1
In SCE	Second	Buy other second	None	0
In SCE	Main	New Main	Accelerated replacement of old by new	0.3 to 0.5
In SCE	Main	Buy other Used Main	None	0

The program participant who would otherwise have given away or sold the recycled refrigerator typically cannot know how the would-be recipient would have used it, and often would not know who that recipient would have been. Thus, we cannot determine from the participant survey what the mix of attribution factors is among the transfer cases. Based on the scenarios considered in Table 1, we assign the value $A_t = 0.5$ as the attribution factor for transfers.

If the unit would not have been discarded until a year or more from the time of the survey, the unit is considered to be kept instead of discarded. It is therefore assigned the attribution factor for kept units, $A_k = 1$.

For cases where the unit would have been discarded by the customer, but it is not known if it would have been transferred or destroyed, the attribution factor assigned A_{dk} is the average of the attribution factors for units that would have been discarded by known means. The average A_{dk} is determined separately for each category defined by whether a unit was a refrigerator or freezer, a removal or a replacement, and (for refrigerators) a main or spare unit. For refrigerators, these attribution factors range from .382 to .494. For

freezers, the unspecified discard attribution factor A_{dk} is .485 for removals and .222 for replacements.

The attribution factors for different possible dispositions are summarized in Table 2-2. The rules for assigning the disposition categories based on the survey responses are described below.

Table 2-2
Attribution Factors by General Disposition Category

Disposition if unit had not been recycled	Program credited for	Attribution Factor	
		Notation	Value
Kept	Full removal	A_k	1
Transferred	Secondary market reduction	A_t	0.5
Destroyed	None	A_d	0
General Discard	Possible transfer	A_{dk}	0.2 to 0.5

2.2.2 Part-Use Factor

The part-use factor is the fraction of the year the recycled unit would have been operated if it had not been picked up. The survey collected data on how many months the collected unit had been used in the past 12 months. However, the usage that would have occurred in the following year if the unit had not been picked up is not necessarily the same as the prior year's usage. Units that had been used as the main unit but were disposed of would presumably have been converted to spares if they had stayed in use in the home. Likewise, units that were replaced by another, even if they were already spares, would not necessarily have been used the same way if they had remained in the home.

For units that were previously used as spares, and were removed and not replaced, the part-use factor is computed from the number of months the unit was used during the 12 months prior to pick-up. However, for units that were turned in because they were replaced, the usage in the previous 12 months is not a good indicator of how the unit would have been used in the following 12 months. For main or replaced refrigerators, the average part-use for removed spare

refrigerators is assumed as the part-use factor. For replaced freezers, the average part-use of removed freezers is applied.

Some participants reported that their refrigerators would have been kept, but would have been stored unused. In these cases, an attribution factor of 1 was assigned (Disposition = kept) but the part-use factor U was set to zero. The computations are summarized in Table 2-3.

Table 2-3
Part-Use Computations

Disposition	Unit Type	Replacement/ Removal	Main/ Spare	Part-Use Factor U
Kept but stored unused	Any	Any	Any	0
All others	Refrigerator	Removal	Main	Average U for Spare Refrigerator removals
	Refrigerator	Removal	Spare	(Months Used in Past 12)/12
	Refrigerator	Replacement	Either	Average U for Spare Refrigerator removals
	Freezer	Removal		(Months Used in Past 12)/12
	Freezer	Replacement		Average U for Freezer removals

2.2.3 *Assignment of Variable Values Based on Survey Responses*

The analysis described above requires the following variables:

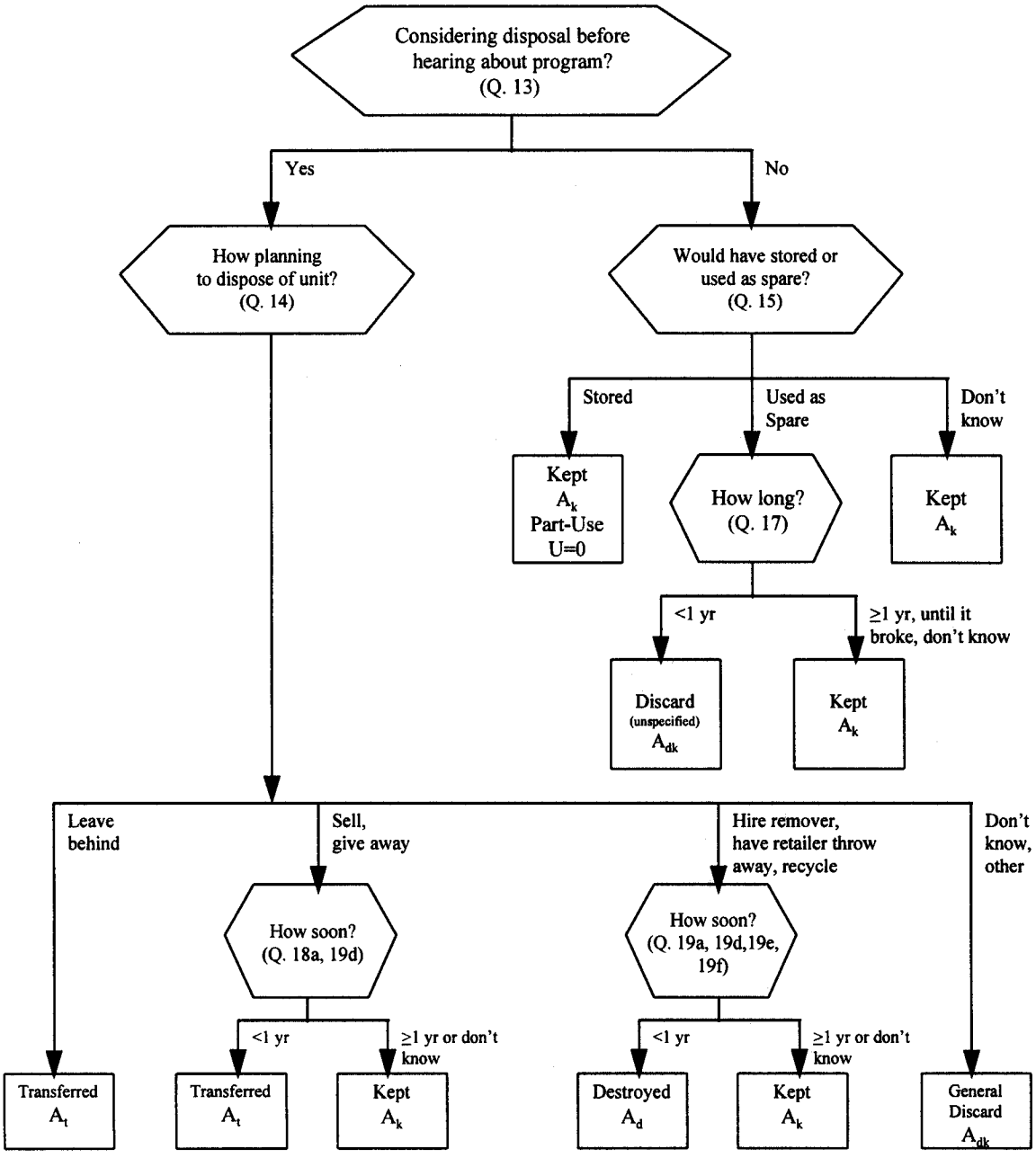
- Attribution category: kept, transferred, destroyed, or general discard
- Replacement/removal category
- Main or spare category
- Months of use in past 12 months

This section describes how these variables are assigned from the survey responses. The survey instrument is shown in Appendix D.

Attribution Category

The attribution category is based on responses to Questions 13 through 19. The classification procedure is shown in Figure 2-1. The steps are as follows.

Figure 2-1
Attribution Classification Based on Survey Responses



A_{dk} = Average A for "planning to dispose" (Q.13 = YES) and "how planning to dispose" specified (Q.14 = DON'T KNOW or OTHER). Computed separately for categories defined by main or spare, removal or replacement, refrigerator or freezer.

1. If the customer *was not* planning to discard the unit prior to hearing about the program (Q. 13)

    a. and would have kept the unit in use (Q. 15)

        i. *and* would have kept it in use for a year or more, or until it broke, or for an unknown time (Q. 17)

            Attribution = Kept

        ii. *and* would have kept it in use for less than a year (Q. 17)

            Attribution = General Discard

    b. and would have stored the unit unplugged (Q. 15)

        Attribution = Kept
        Part-Use = 0

    c. if the customer did not know if the unit would have been used or stored (Q. 15)

        Attribution = Kept

2. If the customer *was* planning to discard the unit prior to hearing about the program (Q. 13)

    a. if the customer was planning to leave the unit behind when moving (Q. 14)

        Attribution = Transferred

    b. if the customer was planning to sell the unit or give it away (Q. 14)

        i. *and* was planning to do so within one year (Q. 18a, 19d)

            Attribution = Transferred

ii. *and* was *not* planning to do so within one year (Q. 18a, 19d)

Attribution = Kept

c. if the customer was planning to throw away the unit, hire someone to remove it, recycle it, or have an appliance dealer pick it up (Q. 14)

i. *and* was planning to do so within one year (Q. 19a, 19c, 19e, 19f)

Attribution = Destroyed

ii. *and* was *not* planning to do so within one year (Q. 19a, 19c, 19e, 19f)

Attribution = Kept

c. if the customer did not know how they would have disposed of the unit,

Attribution Factor = average of Attribution Factors assigned under 2a 2b, and 2c.

The questionnaire included additional questions (Q. 18, 19, 19b) designed to determine how realistic the stated intention to dispose of the unit was. These questions included an estimate of the cost of having the unit removed, or the price that it would have been sold for. Many customers indicated they did not know these costs, but those who did respond gave reasonable answers. These questions were not used as additional screens for the attribution classification.

Removal/Replacement

The replacement issue was addressed in two ways in the survey. Question 8 asked if the customer had acquired a new unit within the past two years (Q. 8a and 8d), and if this acquisition was a major reason for disposing of the old unit (Q. 8c and 8f). Under the first approach, the unit was classed as a replacement if the customer answered yes to both questions. An additional question (Q. 8b and 8e) asked when the acquisition occurred. This question was intended to

verify that the pick-up was within a short time of the new acquisition, before classifying the unit as a replacement case. However, the responses to the date question indicated that customers misunderstood the question; many appeared to be reporting the date they acquired the turned-in unit, not its replacement. The date question was not used as part of the screening to determine replacement or removal assignment.

The second approach to determining if units were replaced was to ask how many refrigerators and how many freezers the customer had plugged in and running before participating and currently (Q. 21 and 22). If the number of refrigerators (freezers) was the same currently as before participation (or greater), the turned in refrigerator (freezer) was classified as a replacement. If the number was smaller currently than before participating, the unit was classified as a removal.

These two classification approaches gave the same assignments for about three-fourths of the surveyed participants (Table 2-4). The second approach, based on the difference in number of units in place, was deemed to be less reliable, because of the ambiguity of the timing. For example, a customer who had a single working refrigerator, purchased a new one, and shortly thereafter contacted the program to collect the old one is a replacer. However, this customer might report having two refrigerators before participating and only one currently, therefore be counted as a remover under the second approach. In the final analysis, the replacement classification is based on the first approach.

Table 2-4
Replacement Classification by Alternate Approaches
Number of Units in Sample

	Approach 2 (Q. 21 and 22)		
Approach 1 (Q. 8)	Replacement	Removal	Total
Refrigerators			
Replacement	99	49	148
Removal	66	185	251
Total	165	234	399
Freezers			
Replacement	13	0	13
Removal	28	44	72
Total	41	44	85

Usage in Prior 12 Months

Question 7a asked how many months the turned-in unit had been used out of the past 12. Question 7b asked if the unit was used only for certain seasons or holidays, for those units reported (Q. 7a) to be used less than a full year. For customers who did not know how many months the unit had been used, the prior usage was estimated as the average of those with less than 12 months of use. Table 2-5 indicates the prior usage assigned based on the responses to Q. 7a.

Table 2-5
Prior Usage Based on Question 7a

Response		Prior Usage	
Category	Text	(months)	(fraction)
1	None	0	0.000
2	Less than one month	0.5	0.042
3	1-3 months	2	0.166
4	4-6 months	5	0.417
5	7-9 months	8	0.667
6	10-11 months	10.5	0.875
7	All year/12 months	12	1.000
8	Don't know	Average of category 1-6 respondents	

Main or Spare

Refrigerators were classified as main or spare based directly on the response to Question 5. This question asked if the refrigerator was being used as the main refrigerator or a spare at the time the customer called to participate in the program. For freezers, there was no survey question for accurately determining whether a unit was main or spare.

2.2.4 Results

Unit Classifications

Table 2-6 shows the proportions of replacers versus removers, main versus spare units, and attribution categories based on the survey data. The proportions are shown separately for refrigerators and freezers. For further perspective on the disposition decisions, the table presents cross-tabulations of the proportions, as well as the proportions across all units collected.

Table 2-6
Distribution of Unit Classifications
(Percent of Column Total)

REFRIGERATORS									
n =	399	Replacement/ Removal		Main/Spare		Disposition			
	All Units	Replacement	Removal	Main	Spare	Kept	Transferred	Destroyed	General Discard
Replacement	37.1%	100.0%	0.0%	60.9%	30.4%	34.1%	32.8%	50.9%	36.0%
Removal	62.9%	0.0%	100.0%	39.1%	69.6%	65.9%	67.2%	49.1%	64.0%
Main	21.8%	35.8%	13.5%	100.0%	0.0%	23.9%	19.4%	34.5%	18.0%
Spare	78.2%	64.2%	86.5%	0.0%	100.0%	76.1%	80.6%	65.5%	82.0%
Kept	22.1%	20.3%	23.1%	24.1%	21.5%	100.0%	0.0%	0.0%	0.0%
Transferred	16.8%	14.9%	17.9%	14.9%	17.3%	0.0%	100.0%	0.0%	0.0%
Destroyed	13.8%	18.9%	10.8%	21.8%	11.5%	0.0%	0.0%	100.0%	0.0%
General Discard	47.4%	45.9%	48.2%	39.1%	49.7%	0.0%	0.0%	0.0%	100.0%
All Units	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

FREEZERS									
n =	85	Replacement/ Removal				Disposition			
	All Units	Replacement	Removal			Kept	Transferred	Destroyed	General Discard
Replacement	15.3%	100.0%	0.0%			14.3%	12.5%	37.5%	6.3%
Removal	84.7%	0.0%	100.0%			85.7%	87.5%	62.5%	93.8%
Kept	24.7%	23.1%	25.0%			100.0%	0.0%	0.0%	0.0%
Transferred	18.8%	15.4%	19.4%			0.0%	100.0%	0.0%	0.0%
Destroyed	18.8%	46.2%	13.9%			0.0%	0.0%	100.0%	0.0%
General Discard	37.6%	15.4%	41.7%			0.0%	0.0%	0.0%	100.0%
All Units	100.0%	100.0%	100.0%			100.0%	100.0%	100.0%	100.0%

The table shows that about two-thirds of the main refrigerators turned in were replaced, as compared with about one-third of the spare refrigerators. Recall that a unit is classified as replaced if the acquisition of a new unit was a major reason the unit was disposed of by the customer. Main refrigerators accounted for only about one-fifth of the total collected by the program.

The distribution of dispositions if the program had not been available was similar for replacement and removal units, except that replacement units were somewhat more likely to have been destroyed than removals. Likewise, the distributions were similar for main and spare refrigerators. These findings are somewhat surprising; we might expect the units to be handled differently in these different cases.

A key reason so little difference is evident among these groups may be the fact that nearly half of the units were classified as "General

Discards." Units ended up in this category when respondents indicated that they had been considering discarding the unit but did not know how they would have. About 90 percent of respondents indicated that they had been considering discarding the unit prior to learning about the program.

2.2.5 Net-to-Gross Factors

Table 2-7 shows the average attribution, part-use, and net-to-gross factors. The factors are shown for all units, and also broken down by different categories. A more detailed tabulation of the computations by category is given in Appendix C.

Table 2-7
Average Attribution, Part-Use, and Net-to-Gross Factors by Unit Classification

Unit Type	Category	Subset	Proportion of Sample*	Attribution Factor	Part-Use Factor	Net-to-Gross**
Refrigerator	Replace/remove					
(n = 399)		Replacement	0.371	0.459	0.832	0.369
		Removal	0.629	0.556	0.834	0.455
	Main/spare					
		Main	0.218	0.485	0.826	0.385
		Spare	0.782	0.530	0.835	0.434
	Disposition					
		Kept	0.221	1.000	0.745	0.745
		Transferred	0.168	0.500	0.876	0.438
		Destroyed	0.138	0.000	0.834	0.000
		General Discard	0.474	0.455	0.859	0.391
	All Units		1.000	0.520	0.833	0.423
Freezer	Replace/remove					
(n = 85)		Replacement	0.153	0.342	0.784	0.268
		Removal	0.847	0.549	0.706	0.399
	Disposition					
		Kept	0.247	1.000	0.747	0.747
		Transferred	0.188	0.500	0.733	0.367
		Destroyed	0.188	0.000	0.674	0.000
		General Discard	0.376	0.469	0.712	0.332
	All Units		1.000	0.518	0.718	0.379

* Sample proportions are determined separately for refrigerators and freezers.
** Attribution, usage, and net-to-gross are determined separately for each sampled unit.
Average net-to-gross may differ from the product of average attribution and average part-use.

Table 2-7 shows that the overall net-to-gross factor was 0.42 for refrigerators, and 0.38 for freezers. The standard errors of these estimates are 0.01 and 0.04, respectively.

The average attribution factors are similar for main and spare refrigerators. These similarities reflect the similarity of the distributions of dispositions, discussed above. Likewise, replacement units had somewhat lower attribution on average, reflecting the higher likelihood that these units would have been destroyed in the absence of the program. The average attribution factor was 0.52 for both refrigerators and freezers. That is, roughly half of the units collected by the program would have been taken out of use even without the program.

The average part-use factor was 0.83 for refrigerators, and 0.72 for freezers. These factors were similar for removals and replacements in each category, because the part-use for replacements was estimated based on the part-use of removals, as described above. These results reflect the fact that the great majority of refrigerators that were used as spares were in use ten to eleven months each year. The average usage for freezers was about ten months. The lower part-use factor for freezers results in the lower net-to-gross factor for those units.

As discussed above, the net-to-gross factor is computed separately for each unit, then averaged over all sampled units to give the overall net-to-gross factors for refrigerators and freezers. These average values is close, but not identical, to the values obtained by multiplying together the average attribution factors and the average part-use factors.

2.2.6 Net Savings Estimates

The net savings based on the UEC's determined in Appendix A and the net-to-gross factors determined above are summarized in Table 2-8. Unit net savings are estimated at 674 kWh per year for refrigerators, and 473 kWh per year for freezers. Total program savings for all units are estimated at 31.1 GWh per year.

The relative precision at 90 percent confidence is 5.6 percent, or 1.6 GWh per year. This relative precision is based on the variance in the individual customers' computed net-to-gross factors across the total sample. Not reflected in this precision estimate is any uncertainty in the rules for assigning attribution and part-use factors. While the

precision level is quite good for the given procedures, different assignment rules would result in different net-to-gross factors.

Table 2-8
Net Savings for the 1994 Spare Refrigerator Recycling Program

Unit Type	Number Collected	Full-Year UEC (kWh/year)	Net-to-Gross	Net Savings Per Unit kWh/year	Net Savings Program Total GWh/year	Precision at 90% Confidence Relative (%)	Precision at 90% Confidence Absolute (GWh/year)
Refrigerator	41,299	1,593	0.423	674.0	27.8	5.6	1.55
Freezer	6,887	1,250	0.379	473.4	3.3	16.4	0.54
All Units	48,186	1,544	0.418	645.4	31.1	5.3	1.64

*Full-year UEC, Net-to-Gross, and net savings per unit for the total are weighted averages of the corresponding refrigerator and freezer values.

Table 2-9 shows the net demand reduction for the Spare Refrigerator Recycling Program.

Table 2-9
Net Demand Reduction for the 1994 Spare Refrigerator Recycling Program

Unit Type	Number Collected	Demand Per Unit (kW)	Gross Program Total (kW)	Net-to-Gross	Net Program Total (kW)
Refrigerator	41,299	0.245	10,118	0.423	4,281
Freezer	6,887	0.191	1,315	0.379	498

*Demand per unit, Net-to-Gross, and net demand reduction for the total are weighted averages of the corresponding refrigerator and freezer values.

G

SUMMARY TABLES

G.1 SUMMARY TABLE: IMPACT EVALUATION OF THE SPARE REFRIGERATOR RECYCLING PROGRAM, SOUTHERN CALIFORNIA EDISON

1. Study Title and Study ID: Impact Evaluation Of The Spare Refrigerator Recycling Program, Southern California Edison, Project I.D. 515.
2. Program, Program Year or Years, and Program Description: The program evaluated in this study was Southern California Edison's Spare Refrigerator Recycling Program for 1994. Through the Spare Refrigerator Recycling Program, Southern California Edison's customers can schedule an appointment to have their working and operating spare refrigerator or freezer picked up and hauled away. The appliance is then taken to a recycling center where the metals, components and refrigerant are recycled using environmentally sound procedures. During 1994 over 48,000 refrigerators and freezers were recycled through the Program. For participating in the Program during 1994 customers received a $50 U. S. Savings Bond or $25.00 cash.
3. End Uses and/or Measures Covered: The program covered spare refrigerators that were recycled through the Program.
4. Study Type: Engineering
5. Method(s) and Model(s) Used: An engineering analysis was used to estimate the program impacts. Net-to-gross ratios were estimated through a telephone survey. The methodology employed in this study is described in detail in Appendices A and B.
6. Program Participants: Program participants include all customers that were included in the Program tracking database for the 1994 program year.
7. Sample Strategy: The sample strategy employed for the net-to-gross survey was a random sample of 1994 Program participants.
8. Billing Period and/or Metering Period: Not relevant
9. Summary of Results: See Table 6 below.
10. Utility Intentions for Use of Results: The results will be filed with the CPUC for the annual earning assessment proceedings.

G.2 TABLE 6: RESULTS OF IMPACT MEASUREMENT STUDIES USED TO SUPPORT EARNINGS CLAIMS

1. Average consumption for spare refrigerators and freezers

Appliance	Number of Appliances Recycled	Base Usage (for spare refrigerator used year-round) (kWh/year)
Refrigerator	41,299	1,593
Freezer	6,887	1,250

2. Average net and gross end use load impacts

Appliance	Gross Program Energy Savings (GWh/year)	Net Program Energy Savings (GWh/year)	Average Annual per-unit Gross Energy Savings (kWh/year)	Average per-refrigerator Net Energy Savings (kWh/year)	Average Per-Unit Percentage Savings
Refrigerator	65.8	27.8	1,593	674.0	42.3
Freezers	8.6	3.3	1,250	473.4	37.9
All Units	74.4	31.1	1,544	645.4	41.8

Utility	Gross Peak Demand Savings (kW)	Net Peak Demand Savings (kW)	Average Per-Unit Gross Peak Demand Savings (Watts)	Average per-refrigerator Net Peak Demand Savings (Watts)	Average Per-Unit Percentage Savings
Refrigerators	10,118	4,281	0.245	0.104	42.3
Freezers	1,315	498	0.191	0.072	37.9

3. Net-to-gross ratio

Unit Type	Net-to-Gross
Refrigerator	0.423
Freezer	0.379
All Units	0.418

4. Designated unit intermediate data: There were no intermediate data in this analysis.

5. Precision: The relative precision is based on the variance in the customers' computed net-to-gross factors across the total sample.

Unit Type	Precision at 90% Confidence	
	Relative (%)	Absolute (GWh/year)
Refrigerator	5.6	1.55
Freezer	16.4	0.54
All Units	5.3	1.64

6. Measure Count:

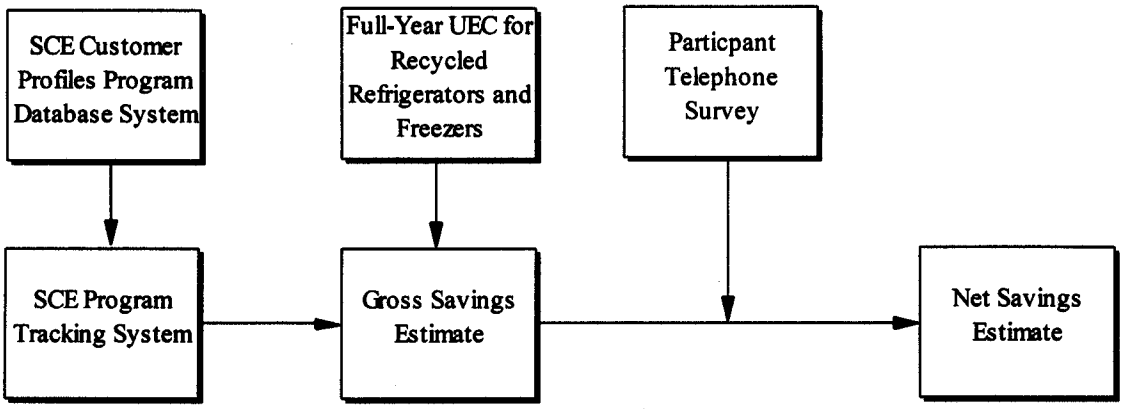
Unit Type	Number Collected
Refrigerator	41,299
Freezer	6,887
All Units	48,186

7. Market Segment: The market was the residential segment for each utility's program.

G.3 TABLE 7: DOCUMENTATION OF PROTOCOLS FOR DATA QUALITY AND PROCESSING

A. Database management

Figure G-1
Flow of Data Elements Used in Analysis



A description of how the data elements were integrated and used is described in Appendices A and B of the report.

B. Data screening and analysis criteria:

Data treatment is discussed in Appendix A and Section 2, Net Savings Estimation, of the report.

C. Data interpretation and application:

A complete description of methods used to calculate the impacts is provide in Appendix A, Methodology and Section 2 of the report.