



Report

Washington Refrigerator and Freezer Recycling Program 2006–2008

Prepared for:

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1. Executive Summary

The Washington Residential Refrigerator and Freezer Recycling Program – See ya later, refrigerator[®] – (the program), offers incentives and free removal and recycling of older and secondary inefficient refrigerators and freezers. The Cadmus Group’s evaluation of this Pacific Power program consisted of the four primary tasks displayed in Table ES1.

Table ES1. Summary of Evaluation Approach

Action	Impact	Process	Details
Participant Survey	X	X	Used for calculating the net-to-gross and assessing implementation. (n=551)
Stakeholder Interviews		X	Provides insight into program design and delivery. (n=7)
Secondary Research		X	Review results of recent appliance recycling evaluations.
Secondary Data Analysis	X		Determine per unit savings based on age and size.

This evaluation covers program years 2006, 2007, and 2008.

PacifiCorp offers this program throughout the five state service territories where it offers demand-side management programs¹. Together these programs recycled over 20,000 refrigerators or freezers in 2009. Within PacifiCorp’s Washington service area, this program is responsible for 23% of the savings that the utility realizes from residential efficiency programs.²

To develop an estimate of program gross savings, Cadmus began with an existing data source containing detailed energy metering information for thousands of refrigerators and freezers at the time of manufacture. With the application of a degradation factor, these data were used to develop per-unit energy savings estimates for every combination of appliance configuration, age, size, and defrost type. Combining this information with data from the program database yielded an energy savings estimate for each appliance participating in the program as well as the per-unit average annual energy consumption.

Once the average annual energy consumption for participating refrigerators and freezers were determined, Cadmus calculated the average gross energy savings for each program year by applying the program’s part-time usage (“part-use”) factor. The part-use factor accounts for all participating appliances not plugged in year-round prior to removal. Survey samples and targets were set to allow part-use factors to be determined separately for refrigerators and freezers in each program year. Table ES2 and Table ES3 show the three usage categories and survey-determined values for each appliance type and for each year. Typically, about 5% of the appliances removed by the program were not used at all prior to participation, and another 3% to 6% were only used part of the year. Based on reported usage data, energy savings were adjusted

¹ PacifiCorp provides electric service in six state territories, but demand-side management programs are managed by the Energy Trust of Oregon, not the Company.

² Based on information contained in PacifiCorp’s *2009 Review of DSM Programs – Washington* located at <http://www.pacificorp.com/es/dsm.html>

to determine the Annual Per-Unit Savings for refrigerators in Table ES2 and for freezers in Table ES3.

Table ES2. Refrigerator Gross Per-Unit Energy Savings—Part-Time Usage Adjusted

Refrigerators	2006			2007			2008		
	Use Category	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year
Not in Use	5.1%	0.0%	0	5.1%	0.0%	0	1.0%	0.0%	0
Used Part Time	2.0%	62.5%	21	3.0%	58.3%	27	3.8%	29.8%	17
Used Full Time	92.9%	100.0%	1,535	91.9%	100.0%	1,427	95.2%	100.0%	1,444
Gross Energy Savings	100.0%		1,556	100.0%		1,454	100.0%		1,461

Table ES3. Freezer Gross Per-Unit Energy Savings—Part-Time Usage Adjusted

Freezers	2006			2007			2008		
	Use Category	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year
Not in Use	3.4%	0.0%	0	6.4%	0.0%	0	4.7%	0.0%	0
Used Part Time	2.3%	50.0%	18	5.1%	39.6%	32	5.9%	25.2%	22
Used Full Time	94.3%	100.0%	1,495	88.5%	100.0%	1,409	89.4%	100.0%	1,376
Gross Energy Savings	100.0%		1,513	100.0%		1,441	100.0%		1,399

Net-to-gross (NTG) ratios were also calculated separately for refrigerators and freezers. The average NTG ratios across all three years were 0.63 for refrigerators, 0.58 for freezers, and 0.62 for the program as a whole.

Table ES4 provides a summary of evaluation results for each program year and the total for all three years.

Table ES4. Evaluated Savings Summary

Year	Units	Gross Savings (kWh)	NTG Ratio	Net Savings (kWh)
2006	3,497	5,648,806	59%	3,344,790
2007	2,620	3,981,569	62%	2,476,987
2008	2,514	3,814,909	66%	2,497,868
Total	8,631	13,445,284	62%	8,319,645

A cost-effectiveness analysis was performed to compare the program's benefits and costs. The energy savings used in the cost-effectiveness analysis are the evaluated kWh from this study.

For recycled refrigerators and freezers, the analysis used a measure life of five years, based on California's Database for Energy Efficient Resources (DEER2008 for 06-07 Updates³). This is a reduction from the measure life of eight years used in prior evaluations and is conservative compared to the six year measure life adopted by the Regional Technical Forum (RTF).

For CFLs included in the energy efficiency measure kit, the analysis used a measure life of 6.6 years. This value is also from DEER2008 and represents the expected life for an interior CFL with a nominal 10,000 hour life. This is a reduction from the measure life of nine years used in prior evaluations. The RTF currently uses a weighted average of 4.6 years.

Cost effectiveness was analyzed for two scenarios. In the first case, freeridership was assumed to be 0% (NTG=100%). In the second case, the evaluated freeridership shown in Table ES4 was used.

The results of the cost effectiveness analysis with freeridership assumed to be 0% are summarized below in Table ES5, Table ES6, and Table ES7 for 2006, 2007, and 2008 respectively. Table ES8 depicts the analysis for the three years combined. These results along with the results using evaluated freeridership values are given in Section 5 below.

Table ES5. Program Cost-Effectiveness Summary for 2006 – IRP 35% LF Decrement (NTG 100%)

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.016	\$450,889	\$1,475,463	\$1,024,574	3.27
Total Resource No Adder (TRC)	\$0.016	\$450,889	\$1,341,330	\$890,441	2.97
Utility (UCT)	\$0.021	\$590,769	\$1,341,330	\$750,561	2.27
Ratepayer Impact (RIM)	\$0.078	\$2,170,778	\$1,341,330	-\$829,448	0.62
Participant (PCT)	NA	\$0	\$1,719,889	\$1,719,889	
Lifecycle Revenue Impact (\$/kWh)				\$0.00004263	

Table ES6. Program Cost-Effectiveness Summary for 2007 – IRP 35% LF Decrement (NTG 100%)

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.017	\$325,666	\$1,111,814	\$786,148	3.41
Total Resource No Adder (TRC)	\$0.017	\$325,666	\$1,010,740	\$685,074	3.10
Utility (UCT)	\$0.021	\$413,791	\$1,010,740	\$596,949	2.44
Ratepayer Impact (RIM)	\$0.082	\$1,608,239	\$1,010,740	-\$597,499	0.63
Participant (PCT)	NA	\$0	\$1,282,573	\$1,282,573	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00003022	

³ <http://www.energy.ca.gov/deer/>

Table ES7. Program Cost-Effectiveness Summary for 2008 – IRP 35% LF Decrement (NTG 100%)

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.017	\$311,637	\$1,140,638	\$829,001	3.66
Total Resource No Adder (TRC)	\$0.017	\$311,637	\$1,036,943	\$725,306	3.33
Utility (UCT)	\$0.021	\$387,057	\$1,036,943	\$649,886	2.68
Ratepayer Impact (RIM)	\$0.085	\$1,586,252	\$1,036,943	-\$549,309	0.65
Participant (PCT)	NA	\$0	\$1,274,615	\$1,274,615	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00002734	

Table ES7. Program Cost-Effectiveness Summary Across 2006-2008 – IRP 35% LF Decrement (NTG 100%)

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.016	\$1,024,288	\$3,499,542	\$2,475,253	3.42
Total Resource No Adder (TRC)	\$0.016	\$1,024,288	\$3,181,401	\$2,157,113	3.11
Utility (UCT)	\$0.021	\$1,311,606	\$3,181,401	\$1,869,795	2.43
Ratepayer Impact (RIM)	\$0.081	\$5,043,401	\$3,181,401	-\$1,861,999	0.63
Participant (PCT)	NA	\$0	\$4,019,112	\$4,019,112	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00007202	

This evaluation draws the following conclusions:

- Program participation has fallen from roughly 3,500 appliances recycled per year in 2006 to 2,500 appliances recycled through the program in 2008.
- The average 62% NTG factor is consistent with other appliance recycling programs including the most recent California statewide evaluation⁴.
- Participants have been very satisfied with the program, with 93% giving the program high scores, and 92% extremely likely to recommend the program to family and friends.
- Pacific Power and JACO are both satisfied with the program. All parties feel the program runs well.
- The program was found to be cost-effective in all three years.
- The program is well established and we have no recommendations for modification.

⁴ CPUC Residential Retrofit High Impact Measure Evaluation Report, 2010, Cadmus et al, http://www.calmac.org/publications/FinalResidentialRetroEvaluationReport_11.pdf

2. Introduction

Program Description

The Washington Residential Refrigerator Recycling Program is part of Pacific Power's ongoing demand-side management (DSM) resource acquisition program. The program's overarching objective is to decrease customer electricity usage (kWh) through the voluntary removal of inefficient secondary refrigerators and standalone freezers and through recycling older primary refrigerators. This prevents older units from remaining active at a participant's premise or elsewhere within Pacific Power's service territory. The program encourages anyone shopping for a replacement to look for ENERGY STAR-labeled models and refers them to the Home Energy Savings (HES) program, where they may be eligible for an incentive. In addition to reducing energy consumption at both the household and utility levels, the program decommissions participating appliances in an environmentally sound manner.⁵

The program provides residential customers with a \$30 incentive, as of May 31, 2007 for each recycled appliance. Participants receive an incentive for up to two refrigerators or freezers. Renters who own the appliances may participate, and apartment complex owners or managers are eligible if they provide tenants with the appliances. Participants also receive a free energy-saving kit, which includes two compact fluorescent light bulbs (CFLs), a refrigerator/freezer thermometer card, and an energy savings brochure. Eligible units must be plugged in, working, and at least 10 cubic feet in size. Pacific Power has contracted with JACO, an appliance recycler, to implement the program. JACO disables and removes the appliances, and recycles up to 90% of the materials, including capture of refrigerant.

Summary of Program Participation

The program was offered to Pacific Power customers in eastern Washington throughout 2006, 2007, and 2008. At the end of these three years, 8,631 old refrigerators and freezers had been permanently removed from Pacific Power's service territory and decommissioned in an environmentally responsible manner. Table 1 shows program participation by appliance.⁶

Table 1: Program Participation 2006, 2007, and 2008

Appliance	2006	2007	2008	Total
Refrigerators	2,801	2,160	1,999	6,960
Freezers	696	460	515	1,671
Total	3,497	2,620	2,514	8,631

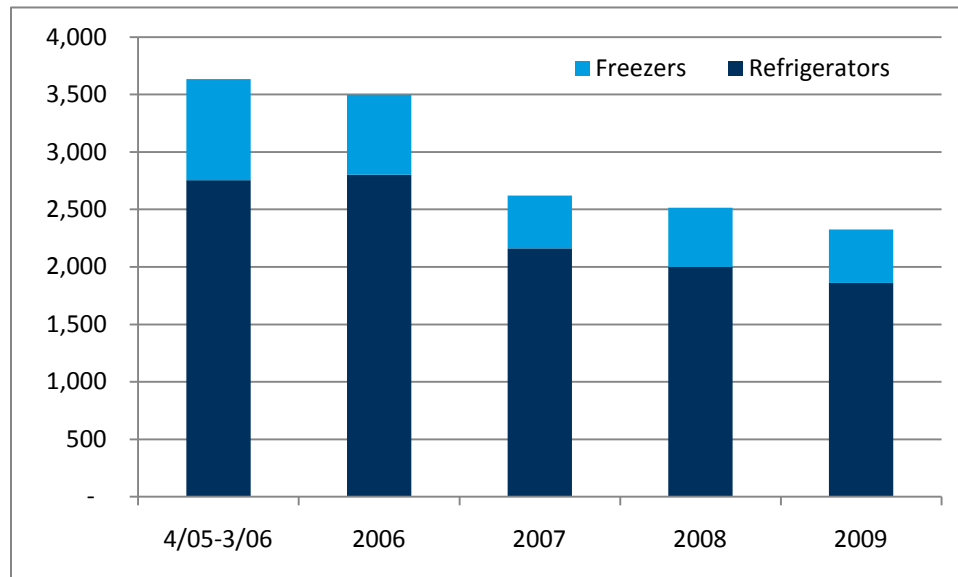
⁵ Environmentally-sound disposal of this equipment includes proper disposal of oils, PCBs, mercury, and CFC-11 foam, and recycling of CFC-12, HFC-134a, plastic, glass, steel, and aluminum.

⁶ For the purposes of this study, each program year begins on December 27 of the previous year, and ends on December 26. E.g., 2006 is defined as December 27, 2005 through December 26, 2006.

The annual program volume dropped by nearly 40%, from just under 3,500 units in 2006 to about 2,500 units per year in 2007 and 2008. During this time there were some changes in the program and in the environment in which it was operating:

- **Pent up demand.** Following their introduction, programs typically experience a high initial volume that drops off after some accumulated inventory has been depleted. This program was introduced in 2006.
- **Advertising reduction.** JACO indicated advertising was reduced for the 2007 and 2008 program years.
- **Incentive reduction.** The 2008 Annual Report⁷ indicated, effective May 31, 2007, the incentive was reduced from \$40 to \$30 to improve program cost-effectiveness.
- **Economic factors.** A general economic downturn in 2008 affected purchases of homes and durable goods such as refrigerators and freezers.

Figure 1: Annual Program Participation 2005-2009⁸



These changes are noted here for informational purposes – this evaluation did not test whether they had significant impact on the program.

Evaluation Questions

Appliance recycling programs differ from most programs in that savings are generated by rebating removal of an operable but inefficient measure rather than rebating installation of an

⁷ Annual Review of 2008 Energy Efficiency Programs in State of Washington, Advice Filing 07-02, change effective May, 31, 2007.

⁸ Note that the first year is comprised of the 12 months from April 2005 through March 2006. The first three months of 2006 are also counted in the 2006 column.

efficient measure. The overarching impact and process evaluation questions driving the study follow below.

Impact Questions

1. What are the gross and net energy savings generated by a participating appliance?
2. What percentage of participating appliances would have been discarded and destroyed, or would have been kept but unused in the program's absence?
3. How do the evaluated savings compare to previously reported savings for each program year?
4. What were the actual program costs and benefits?

Process Questions

1. How did program participants become aware of program?
2. How satisfied are participants with program delivery—schedule, communications, implementer performance, incentive—overall?
3. What improvements would participants recommend?
4. From the implementer's perspective: how is the program working? What could be improved?

3. Evaluation Methods

Analytical Methods

The evaluation plan consisted of four primary tasks (see Table 2). The participant survey informed both the impact and process evaluations. A brief description of each task follows. Additional detail regarding the methodology of each evaluation task is provided in subsequent chapters.

Table 2: Summary of Evaluation Approach

Action	Impact	Process	Details
Participant Survey	X	X	Used for calculating the net-to-gross, and assessing implementation. (n=551)
Stakeholder Interviews		X	Provides insight into program design and delivery. (n=7)
Secondary Research		X	Review results of recent appliance recycling evaluations.
Secondary Data Analysis	X		Determine per unit savings based on age and size.

Participant Surveys

The participant survey asked a number of questions to determine sources of program information, descriptions of recycled appliances, participants' consideration of appliance disposal alternatives, program satisfaction, and demographics.

The evaluation team drafted and finalized a participant survey utilizing industry best practices for appliance recycling evaluations. The survey included questions addressing the following, pertinent issues:

- *Verification of Measure Removal.* This section of the survey contained questions related to recall of participation, involvement in the decision process, and measure removal.
- *Appliance Context and Decision-Making Processes.* These questions addressed key aspects of the customer's decision-making process, and informed freeridership, spillover, and verification analysis.
- *Program Satisfaction.* These questions collected process-related questions regarding participants' satisfaction with the program, including reasons for dissatisfaction, if applicable. The questions also addressed the likelihood that participants would refer others to the program.

Participants cooperated well with survey efforts, with about 50% of sampled respondents agreeing to respond to telephone surveys. A reason for the substantial cooperation rate may have been the high satisfaction level with the program (described in the Process Evaluation section, below).

Stakeholder Interviews

To assess the program's effectiveness and implementation, the evaluation team conducted interviews with a number of stakeholders intimately familiar with the program. Specifically, the

evaluation team interviewed seven stakeholders from Pacific Power and JACO, as detailed in Table 3.

Table 3: Stakeholder Interviews

Title	Organization
Demand Side Management (DSM), Director	PacifiCorp
Class 2 DSM Segment Manager, All Sectors	PacifiCorp
DSM Evaluation and Controls	PacifiCorp
Pacific Power QA/QC Staff (2)	PacifiCorp
Implementer Operations Manager	JACO
Implementer Warehouse Manager	JACO

Stakeholder interviews were conducted utilizing an interview guide aimed at discussing the program's design, delivery, management, communication, effectiveness, and future with each respondent.

Information obtained from stakeholders was used to inform the following evaluation elements:

- Determination of program progress; and
- Identification of changes during implementation.

Secondary Research

To ensure the evaluation aligned with industry's best practices for appliance recycling evaluations, the evaluation team gathered and reviewed multiple previous appliance recycling evaluation final reports. In addition to examining the methodologies employed in each report, the evaluation team assessed participant survey instruments used.

Data collected through secondary research aided the following evaluation elements:

- Development of the gross savings methodology;
- Development of the participant survey instruments; and
- Development of the net savings methodology.

Secondary Data Analysis

To leverage existing appliance recycling data sources, the evaluation team obtained datasets detailing energy consumption for thousands of refrigerators and freezers at the time of their manufacture. Applying a degradation factor, these data were used to develop per-unit energy savings estimates, based on an appliance's age, size, and configuration. Combining this information with data on program participants yielded an estimate of the program's gross savings. Significant detail regarding this process is provided in the following chapter.

The engineering analysis informed the following evaluation elements:

- Determination of estimated per-unit energy savings;
- Determination of appropriate degradation factor; and
- Estimate of program gross savings.

Data Sources

The evaluation team utilized the following data sources to inform the impact and process evaluations:

- Final program databases (provided by JACO).
- Information gathered through participant surveys.
- Information gathered through stakeholder interviews.
- A database containing results of 61,000 metered appliances.⁹
- Other recent appliance recycling evaluations.

Sampling Plan

This section details the sampling plan for the participant survey and stakeholder interviews.

Participant Surveys

The sampling plan was designed to meet the study's goals, including determination of energy savings for each of the three program years: 2006, 2007, and 2008.¹⁰ Accurate determination of energy savings required independent evaluation of refrigerators and freezers as energy consumption and operating patterns were distinct for each. Altogether, this meant six samples were needed: one for each appliance/year combination.

In response to the request for program databases, JACO provided three files—customers, orders, and units—for each calendar year. The “units” file included records for each appliance recycled and a field identifying it as a refrigerator or freezer. The next step was to analyze each participant database to confirm it contained information necessary to complete the data collection. These data included: participant contact information, appliance details, and incentive amounts. Once verified, the evaluation team assigned a random number to each participant, and prioritized the call listed, based on the random number.

To achieve a 90% confidence and 10% precision level, targets were established of 85 surveys per refrigerator/year combination and 85 surveys per freezer/year combination. As Table 4 shows, participants' responses to the survey were higher than anticipated for refrigerators, with 301 surveys completed over the three program years. Based on the actual number of survey responses, precision levels at the 90% confidence interval are shown for each appliance as well as for the overall program.

⁹ http://www.energy.ca.gov/appliances/database/historical_excel_files/2009-03-01_excel_based_files/Refrigeration/

¹⁰ For the purposes of this study, each program year begins on December 27 of the previous year, and ends on December 26. E.g., 2006 is defined as December 27, 2005 through December 26, 2006.

Table 4: Participant Survey Sample

Appliance	2006	2007	2008	Total
Refrigerators	2,801	2,160	1,999	6,960
Freezers	696	460	515	1,671
Total	3,497	2,620	2,514	8,631

Surveys Completed	2006	2007	2008	Total
Refrigerators	98	99	104	301
Freezers	87	78	85	250
Total	185	177	189	551

Level of precision at the 90% confidence interval	2006	2007	2008	All Years
Refrigerators	9.5%	9.1%	8.6%	5.2%
Freezers	9.2%	9.7%	9.8%	4.7%

4. Program Results

Impact Findings

Impact evaluation findings are presented in the following four subsections:

1. Review of Terminology
2. Determination of Average Annual Gross Energy Consumption
3. Determination of Gross Savings
4. Determination of Net Savings

Review of Terminology

Gross and net savings were calculated by determining a program's part-use and NTG factors. First used in the 2002 California Statewide Residential Appliance Recycling Program,¹¹ the factors have become the industry standard for assessing actual outcomes from appliance recycling. Each factor is defined below:

- **Part-Use Factor:** Adjusts for the proportion of the year participants used the appliance and/or the proportion of the year it would have been used had they kept it.
- **NTG Factor:** Adjusts for the percentage of participants that would have disposed of the unit independently of the program in a manner that would have taken the unit out of service.

Determination of Average Annual Gross Energy Consumption

To calculate energy consumption for early retirement of participating refrigerators and freezers, and for distribution of energy-saving kits, the Evaluation Team followed these steps:

1. Develop a model to estimate annual unit energy consumption of older appliances.
2. Adjust annual unit energy consumption for degradation over time.
3. Adjust annual unit energy consumption for part-time usage.
4. Determine gross savings for Energy Saving Kits.

Once gross energy consumption for the average refrigerator, freezer, and kit were known, the program level savings could easily be calculated by multiplying the unit savings by the number of units. Resulting gross program savings are shown at the end of this section.

Step 1: Model to estimate annual Unit Energy Consumption. A multivariable regression model was developed to estimate the Unit Energy Consumption (UEC) of participating refrigerators and freezers. Given the appropriate data, regression models provide a powerful tool to evaluators by enabling them to predict energy consumption based on a small set of appliance characteristics. Prior experience has shown that the appliance model number alone is not sufficient to predict energy consumption since the model number is often recorded incorrectly

¹¹ Measurement and Evaluation Study of 2002 Statewide Residential Appliance Recycling Program, Final Report. KEMA-Xenergy. 2004.

(or is difficult to match due to spaces and dashes) and also since the same model number is often manufactured for several years. In this case where a large database of appliance energy data is available, the regression model is a good fit for the task.

The regression model was based on the California Energy Commission's energy consumption database¹² of over 61,000 specific refrigerator and freezer makes and models manufactured between 1978 and 2008. This database contains the UEC value for each appliance, as reported by the manufacturers, and based on energy consumption found using the DOE established test procedure. The model employs the DOE-based UEC as the dependent variable and the various characteristics (configuration, age, size, etc.) of tested refrigerators as the independent variables.

To develop the regression model, all independent variables were considered where data were available in the energy consumption database. If analysis showed the standard error for a characteristic was less than 10%, it was used in the final model. Table 5 shows potential independent variables and which were included in the final regression model.

Table 5: Possible Independent Variables

Refrigerators		Freezers	
Characteristic	In Model	Characteristic	In Model
Age	Yes	Age	Yes
Volume in Cu Ft	Yes	Volume in Cu Ft	Yes
Bottom Freezer	Yes	Upright Freezer	Yes
Top Freezer	No	Chest Freezer	No
Internal Freezer	No	Automatic Defrost	Yes
Kitchen Unit	No		
Single Door	No		
Side-by-Side	Yes		
Through-Door Ice-Maker	No		
Automatic Defrost	Yes		

The final regression models predicted energy usage based on these characteristics. Model coefficients are shown in Table 6 and Table 7. Parameters shown indicate the regression model fit the energy consumption data well. For both appliance types, age was the most important variable (as shown by the high t-values), with other variables such as volume and automatic defrost having similar, relative importance.

¹² http://www.energy.ca.gov/appliances/database/historical_excel_files/2009-03-01_excel_based_files/Refrigeration/

Table 6: Regression Model Coefficients for Refrigerator Energy Consumption

Refrigerators: R squared = 0.7853			
Independent Variable	Coefficient	Standard Error	t-value
Intercept	-623.78	7.22	-86.37
Age (years)	41.20	0.13	312.18
Volume (CuFt)	27.38	0.31	87.24
Side-by-Side	193.27	2.51	77.05
Bottom Freezer	176.85	4.52	39.12
Automatic Defrost	403.82	5.57	72.54

Table 7: Regression Model Coefficients for Freezer Energy Consumption

Freezers: R squared = 0.8358			
Independent Variable	Coefficient	Standard Error	t-value
Intercept	-250.72	4.49	-55.88
Age (years)	27.89	0.12	237.52
Volume (CuFt)	28.49	0.22	131.79
Upright Freezer	38.94	1.92	20.23
Automatic Defrost	353.10	2.71	130.24

The models were then applied to the set of appliances collected each year by the program. To apply the model, evaluators analyzed the participant database to determine the average value for each of the independent variables. Table 8 and Table 9 provide these average values for each appliance characteristic and each year evaluated.

Because the CEC database does not include appliances manufactured before 1978, Cadmus assumed an appliance manufactured before 1978 consumed the same amount of electricity as an appliance manufactured in 1978. This assumption tended to understate total program savings. The unadjusted average age for each group is shown as the “Reported Age at Time of Recycling”; the adjusted age is shown as “Modeled Age.”

Table 8: Population Characteristics for Refrigerators

Refrigerators: Washington Participant Unit Summary			
	2006	2007	2008
Total participant Refrigerators	2,801	2,160	1,999
Independent Variable	2006 Average	2007 Average	2008 Average
Reported Age at Time of Recycling (Years)	29.21	28.25	27.86
Modeled Age (Years)	24.10	23.33	22.33
Volume (CuFt)	16.77	16.97	17.10
Side-by-Side	14%	16%	13%
Bottom Freezer	3%	3%	3%
Automatic Defrost	71%	62%	68%

Table 9: Population Characteristics for Freezers

Freezers: Washington Participant Unit Summary			
	2006	2007	2008
Total participant Freezers	696	460	515
Independent Variable	2006 Average	2007 Average	2008 Average
Reported Age at Time of Recycling (Years)	36.82	35.86	35.57
Modeled Age (Years)	26.71	26.35	25.54
Volume (CuFt)	16.09	16.98	17.00
Upright Freezer	73%	62%	60%
Automatic Defrost	11%	12%	10%

Step 2: Adjust the annual UEC for degradation over time. Step 1 estimated energy consumption of units at the time of manufacture. Step 2 adjusted this consumption for increases in energy usage occurring as refrigerators and freezers age.

This evaluation used an annual degradation factor of 1.5%, based on the DOE National Energy Audit Tool,¹³ the 2004–2005 appliance recycling study by Quantec,¹⁴ the 2005–2006 appliance recycling study by KEMA,¹⁵ and the CPUC (California) Residential Retrofit report.¹⁶

Table 10 lists UEC values adjusted by the 1.5% degradation factor.

Table 10: UEC adjusted for degradation

Appliance Type	2006–2008 Average	2006 Average	2007 Average	2008 Average
Refrigerators	1,593	1,653	1,552	1,517
Freezers	1,581	1,585	1,592	1,539

Step 3: Adjustment for partial usage. Gross savings needed to be adjusted for units used only a portion of the year. Thus, the evaluation team calculated and applied the program’s part-use factor. As retirement of appliances not previously in operation or operated only part of the year did not yield the full year of energy savings presented in Table 10, a weighted average of part-use factors was used in the following three participant categories:

- Participating units **not used for at least one full year** prior to being recycled were assigned a part-use factor of **0%**. As the unit did not consume electricity, no savings were generated by its retirement. (Note: This assumes that these units never go back into service.)
- Recycled units **operating the full year** prior to participation were assigned a part-use factor of **100%**.

¹³ The DOE National Energy Audit Tool uses a sliding scale between 1% and 2%.

¹⁴ The Evaluation of the Utah Refrigerator and Freezer Recycling Program, Quantec, August 23 2005, used 1%.

¹⁵ Evaluation of the Washington Refrigerator and Freezer Recycling Program, KEMA, August 31, 2007, used 1%.

¹⁶ The CPUC Residential Retrofit Report—also referenced in Footnote 1 above—used 2.2%.

For units **used only a portion of the previous year**, the part-use factor ranged between **0%** and **100%**, based on reported usage.

Table 11 and Table 12 illustrate how part-use factors for each of the three categories above were applied to determine average part-use adjusted gross annual energy savings for refrigerators and freezers for each program year.

Table 11: Refrigerator Gross Per-Unit Energy Savings—Part-Use Adjusted

Refrigerators	2006			2007			2008		
	Use Category	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year
Not in Use	5.1%	0.0%	0	5.1%	0.0%	0	1.0%	0.0%	0
Used Part Time	2.0%	62.5%	21	3.0%	58.3%	27	3.8%	29.8%	17
Used Full Time	92.9%	100.0%	1,535	91.9%	100.0%	1,427	95.2%	100.0%	1,444
Gross Energy Savings	100.0%		1,556	100.0%		1,454	100.0%		1,461

Table 12: Freezer Gross Per-Unit Energy Savings—Part-Use Adjusted

Freezers	2006			2007			2008		
	Use Category	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year	Annual Per-Unit Savings (kWh)	Percent of Units	Percent of Year
Not in Use	3.4%	0.0%	0	6.4%	0.0%	0	4.7%	0.0%	0
Used Part Time	2.3%	50.0%	18	5.1%	39.6%	32	5.9%	25.2%	22
Used Full Time	94.3%	100.0%	1,495	88.5%	100.0%	1,409	89.4%	100.0%	1,376
Gross Energy Savings	100.0%		1,513	100.0%		1,441	100.0%		1,399

Step 4: Determine gross savings for Energy Saving Kits. The kits distributed by JACO included two CFLs, a temperature strip for testing refrigerator or freezer temperatures, and a brochure providing a number of energy-saving tips for the home. Gross savings shown here represented savings if all elements of the kits were installed.

For each CFL in the kit, annual savings were assumed to be 33 kWh per year consistent with the model used by the Regional Technical Forum for Energy Star CFLs in residential applications¹⁷. The Northwest Energy Efficiency Alliance (NEEA) uses a similar figure of 33.1 kWh/year. This is a lower estimate for annual savings than was used in past program evaluations. However, it reflects research that shows increased penetration of CFLs in the home and takes into account a range of possible locations in the home.

¹⁷Residential, Energy Star CFLs, <http://www.nwcouncil.org/rtf/supportingdata/default.htm>

For the temperature strip and informational brochure, we assumed 12 kWh/year, based on previous appliance recycling evaluations.¹⁸ These assumptions are summarized in Table 13.

Table 13: Gross Savings for Energy Saving Kits

Savings per CFL (kWh)	Number of CFLs per Kit	Total CFL Savings (kWh)	Additional Kit Savings (kWh)	Total Savings (kWh)
33	2	66	12	78

Calculate Gross Program Energy Savings

Table 14 shows resulting gross energy savings derived from the per-unit energy savings and the number of units by year.

Table 14: Gross Program Energy Savings

	Year	Gross Savings Per Unit (kWh)	Units	Gross Savings Per Year (kWh)
Refrigerators	2006	1,556	2,801	4,358,407
	2007	1,454	2,160	3,140,212
	2008	1,461	1,999	2,920,604
	Total		6,960	10,419,222
Freezers	2006	1,513	696	1,052,967
	2007	1,441	460	662,894
	2008	1,399	515	720,365
	Total		1,671	2,436,226
Kits	2006	78	3,044	237,432
	2007	78	2,288	178,464
	2008	78	2,230	173,940
	Total		7,562	589,836
Program	2006		3,497	5,648,806
	2007		2,620	3,981,569
	2008		2,514	3,814,909
	Total		8,631	13,445,284

Determination of Net Savings

Assessing freeridership for appliance recycling presented a special set of challenges, as the program sought not only to remove the inefficient appliance from the customer's home, but to remove it from the grid entirely. Thus, freeridership had to be estimated based on participants' reports of what would have happened to the appliance in the program's absence.

¹⁸ Evaluation of the Washington Refrigerator and Freezer Recycling Program, KEMA, August 31, 2007; The Evaluation of the Utah Refrigerator and Freezer Recycling Program, Quantec, August 23 2005.

Participant Survey-Based Methodology

To determine the NTG ratio for each program year and appliance type, surveys were conducted with program participants to estimate freeridership rates. This allowed the evaluation team to calculate program savings net of freeriders (i.e., no program savings were achieved if the unit would have been destroyed in the program's absence or remained unused in the participating home).

Independent of program intervention, participating appliances would have been subject to four potential scenarios:

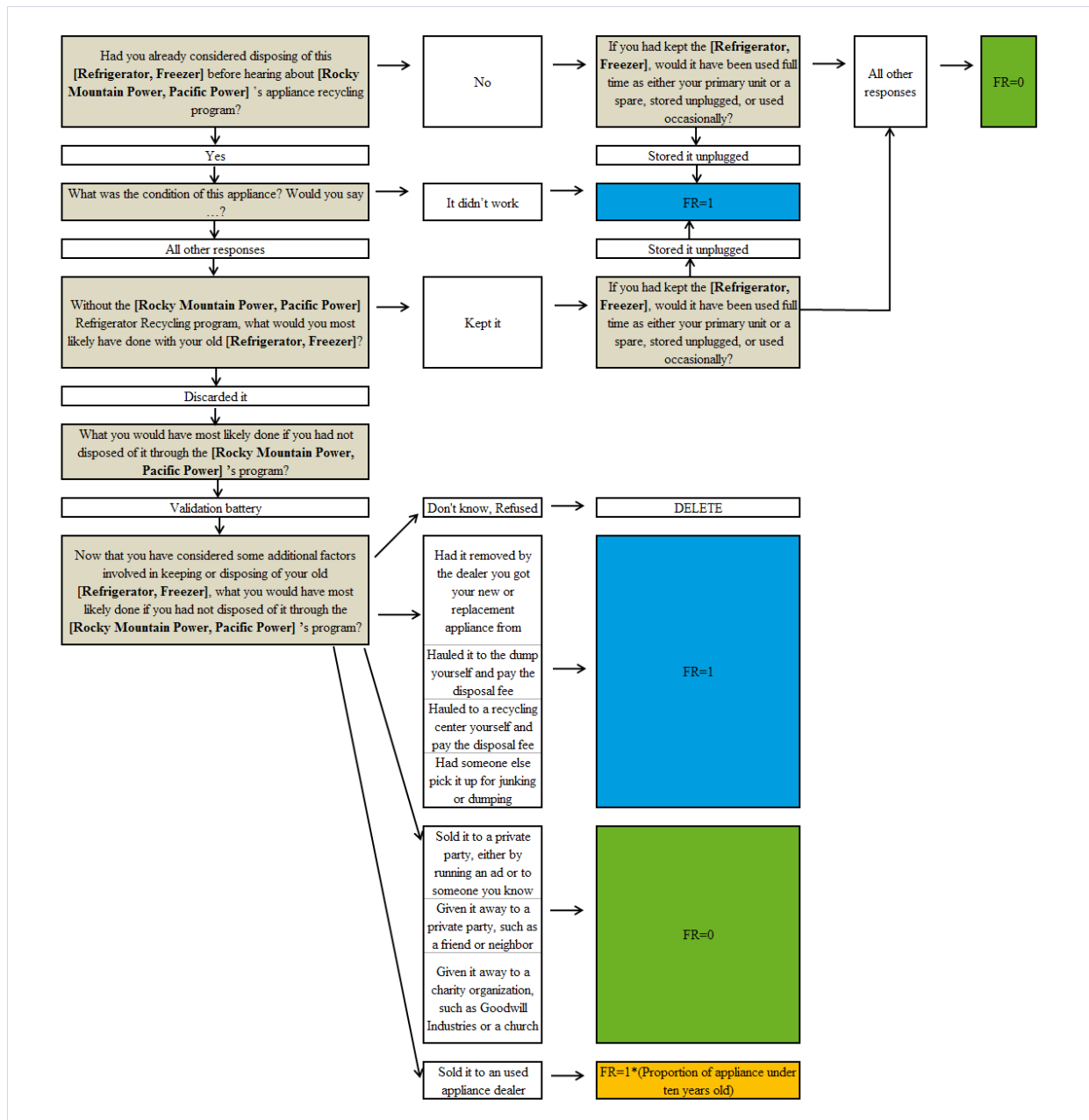
- The unit would have been kept by the participating household but be stored unused;
- The unit would have been kept by the participating household and still be used;
- The unit would have been discarded by the participating household in a manner leading to its eventual destruction; and
- The unit would have been discarded by the participating household in a manner leading to its continued operation elsewhere.

Of these scenarios, two—units kept but stored unused, and units discarded in a manner leading to destruction—were indicative of freeridership as the refrigerator or freezer would not have continued to consume energy independently of program participation.

To inform the NTG calculation, respondents were asked what would have happened to the participating refrigerator or freezer had it not been removed by the program. Each response (such as “sold it to an used appliance dealer” or “hailed to a recycling center myself”) was associated with one of the four scenario categories after a series of follow-up questions (i.e., “Why did you not follow through with this transaction?” and “Do you have the ability to physically move and transport the appliance yourself?”) and validated the response. Once validated and associated with one of the four potential scenarios, individual responses were determined as either indicative or not indicative of freeridership. Using this information, a participant-based NTG value was calculated.

Figure 2 describes the underlying logic of the freeridership analysis. The complete survey instrument is provided in Appendix A.

Figure 2: Analytical Logic for Survey-Based Net-to-Gross



Freeridership Scenarios

Table 15 below, presents the four possible scenarios that could have occurred had a participating refrigerator or freezer not been recycled through the program. Scenarios 1 and 3 indicate freeridership. Both scenarios are explored in further detail below.

Table 15: Potential Freeridership Scenarios

Scenarios Independent of Program	Scenario	Indicative of Free-ridership
Unit Kept But Not Used	1	Yes
Unit Kept And Used	2	No
Unit Discarded and Destroyed ¹⁹	3	Yes
Unit Discarded, Transferred, Used	4	No

Scenario 1

Participant respondents who reported they would have kept the unit had they not participated in the program were asked if they would have used the unit or stored it unplugged. The product of these responses provided the proportion of units that would have been kept but not used. Energy savings associated with these units were subtracted from the program's determined gross savings.

Scenario 3

Calculating freeridership associated with Scenario 3 (units which would have been discarded and destroyed in the program's absence) was slightly more complex as it represented a number of different hypothetical actions. Table 16 presents responses provided by participants related to Scenario 3, indicating actions participants claimed they would have taken had the program not been available.

Table 16: Freeridership Scenario 3—Units Discarded and Destroyed (Participant Responses)

Stated Method of Disposal In Absence of Program	Indicative of Freeridership
Sell it to a private party, either by running an ad or to someone you know	No
Sell it to a used appliance dealer	Partially
Give it away to a private party, such as a friend or neighbor	No
Give it away to a charity organization, such as Goodwill Industries or a church	No
Have it removed by the dealer you got your new or replacement appliance from	Yes
Haul it to the dump yourself	Yes
Haul it to a recycling center yourself	Yes
Hire someone else to haul it away for junking or dumping	Yes
Other ¹	Yes

¹All other responses were reviewed individually and determined to be indicative of freeridership.

¹⁹ It is important to note that while Scenario 3 would have led to the destruction of an appliance, it was unlikely the unit would have been decommissioned in the environmentally responsible manner undertaken by the program. As a result, while the energy impact may have been equivalent, the larger environmental and societal impacts were not.

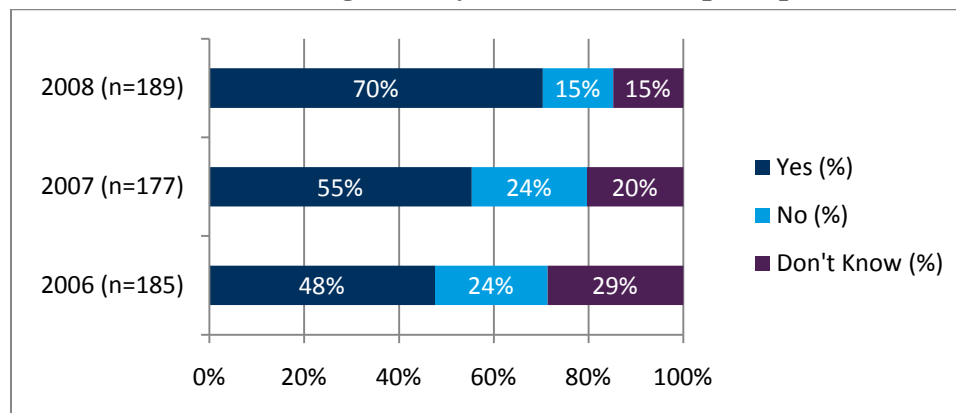
Interviews with appliance dealers and other market actors were relied upon in this analysis. Particularly, the response “Had it removed by the dealer I got my replacement appliance from” was identified as indicative of freeridership, as interviews with appliance dealers indicate the vast majority of such units are destroyed and not resold. Furthermore, investigation into the purchasing patterns of used appliance dealers has shown dealers typically do not purchase appliances over 10 years old. Thus, the freeridership score associated with this response was discounted by the proportion of participant appliances over 10 years old.

Determining the NTG Ratio for Energy-Saving Kits

Program participants also received energy-saving kits containing two CFLs, a temperature test strip, and additional information about energy-saving measures that can be taken in the home. The savings level achieved through the kits were highly dependent on the rate that participants installed the CFLs. Thus, the participant survey asked whether one or both of the CFLs were installed in the home, and the resulting installation rate was used as the kits’ NTG ratio.

The CFL installation rate was based on the response of participants that recalled receiving the energy-saving kit. Generally, the longer it has been since an event, the less people recall about it. Figure 3 shows that this is true with regard to the energy saving kit. Less than half of participants surveyed recall receiving the energy saving kit in 2006 while 70% recalled receiving the kit in 2008.

Figure 3. Participant Responses: Was a free kit containing CFL light bulbs and energy information given to you at the time of pickup?



NTG Ratios

The freeridership calculations outlined above yield the appliance-specific NTG ratios presented in Table 17.

Table 17: NTG Ratios, 2006–2008

Measure	2006	2007	2008
Refrigerators	0.60	0.62	0.67
Freezers	0.56	0.63	0.57
Kits	0.59	0.63	0.75

Net Savings Results

Once NTG ratios were determined for each appliance type and year, total program gross savings were adjusted, as shown in Table 18, to account for freeridership and (in the case of energy-saving kits) installation rates.

Table 18: Net Annual Energy Savings for Refrigerators, Freezers, and Kits

	Year	Gross Savings Per Unit (kWh)	Units	Gross Savings Per Year (kWh)	Net-to-Gross (NTG) Ratio	Net Energy Savings Aggregate (kWh)
Refrigerators	2006	1,556	2,801	4,358,407	0.60	2,615,044
	2007	1,454	2,160	3,140,212	0.62	1,946,931
	2008	1,461	1,999	2,920,604	0.67	1,956,805
	Total		6,960	10,419,222	0.63	6,518,780
Freezers	2006	1,513	696	1,052,967	0.56	589,661
	2007	1,441	460	662,894	0.63	417,623
	2008	1,399	515	720,365	0.57	410,608
	Total		1,671	2,436,226	0.58	1,417,893
Kits	2006	78	3,044	237,432	0.59	140,085
	2007	78	2,288	178,464	0.63	112,432
	2008	78	2,230	173,940	0.75	130,455
	Total		7,562	589,836	0.65	382,972
Program	2006		3,497	5,648,806	0.59	3,344,790
	2007		2,620	3,981,569	0.62	2,476,987
	2008		2,514	3,814,909	0.65	2,497,868
	Total		8,631	13,445,284	0.62	8,319,645

Comparison of Reported Savings to Evaluated Savings

This section provides comparisons of the reported program results to the evaluated program results. Table 19 compares the reported savings to the evaluated values at the program level.

Table 19: Program Reported Savings and Evaluated Savings

Year	Evaluated Savings ²⁰ (MWh)	Reported Savings (MWh)
2006	5,648,806	4,698,405
2007	2,476,987	1,867,219
2008	3,814,909	3,559,672

²⁰ Savings were reported net of free-ridership for 2007 and gross for 2006 and 2008. The evaluated savings are reported at the comparable level.

Process Evaluation

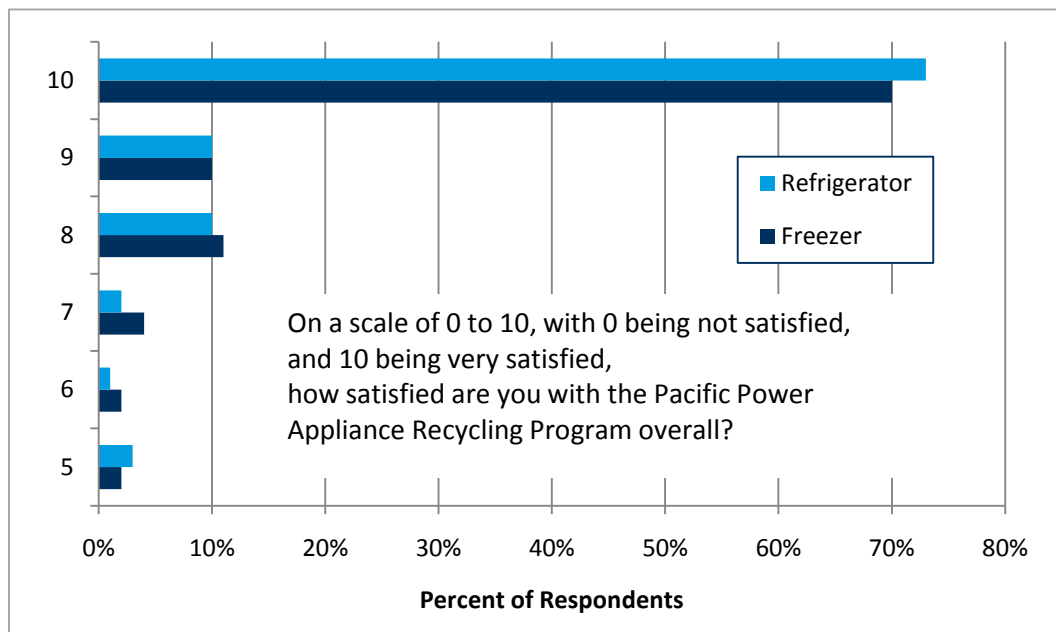
The process evaluation provided answers to the following questions:

1. How satisfied were participants with program delivery: schedule, communications, implementer performance, incentive, and overall?
2. How did program participants become aware of the program?
3. What improvements would participants recommend?
4. From the implementer's perspective: how is the program working? What could be improved?

Participant Survey Findings

Participants expressed significant satisfaction with the program, with 93% rating it an 8, 9, or 10, on a 10-point scale. In fact, only 15 of the 551 respondents rated their program satisfaction at 5 or lower. A breakdown of participants' satisfaction responses is illustrated in Figure 4.

Figure 4: Participant Satisfaction



Similarly, 92% of customers said they would recommend the program to a friend or family member. On a 10-point scale, with 10 indicating the participant being extremely likely to recommend the program to a friend, the average rating for recommending the program was 9.9. Further, 86% of responding participants said they would have participated even if the amount of the incentive had been less.

Participant Awareness

Television commercials (34%), newspapers/other print media (19%), and bill inserts (16%) were the sources 69% of respondents (Table 20) cited for learning about the program. Another 12% reported they had learned about the program through family, friends, or word-of-mouth.

Table 20: Program Awareness

	Freezer		Refrigerator		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
TV	81	32%	105	35%	186	34%
Newspaper / Magazine/Print Media	49	20%	57	19%	106	19%
Bill Inserts/Contact	46	18%	43	14%	89	16%
Family/friends/word-of-mouth	30	12%	34	11%	64	12%
Retailer/Store [i.e. Sears, Best Buy]	5	2%	16	5%	21	4%
Pacific Power Web site	3	1%	3	1%	6	1%
Internet Advertising/ Online Ad	3	1%	2	1%	5	1%
Radio	2	1%	4	1%	6	1%
Billboard/outdoor ad	2	1%	2	1%	4	1%
Direct mail brochure	4	2%	2	1%	6	1%
Other	2	1%	2	1%	4	1%

Refrigerator and Freezer Descriptions and Characteristics

According to JACO records, recycled refrigerators and freezers averaged 32 years old. Of participants replacing their recycled appliance, 76% of units were reported to have been replaced with an ENERGY STAR-labeled appliance. However, it should be noted telephone respondents often had difficulty accurately assessing the efficiency of their appliances.

Appliance locations also played a factor in energy use. As shown in Table 21, 46% of the recycled appliances were located in garages (35%) or basements (11%). Approximately 56% of respondents indicated the location of the recycled appliance was heated, while only 37% had their recycled appliance in an air-conditioned space.

Table 21: Location of Recycled Appliance

	Freezer		Refrigerator		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Garage	123	49%	68	23%	191	35%
Kitchen	26	10%	155	52%	181	33%
Basement	39	16%	22	7%	61	11%
Porch/Patio	24	10%	25	8%	49	9%
Other	38	15%	29	10%	67	12%
Total	250	100%	299	100%	549	100%

*Other responses include: spare room, workshop, laundry room, utility room, and barn

Respondents were asked to describe the working condition of their recycled appliance. As shown in Table 22, about 68% indicated the refrigerator or freezer recycled was still in good physical condition or needed minor repairs, and 23% said the appliance had some problems. However, 47

respondents, or just less than 9%, stated that their appliances did not work (which if true made them ineligible to participate). This issue is discussed further in the Stakeholder Interview Findings below.

Table 22: Condition of Recycled Appliance

	Freezer		Refrigerator		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
In good condition	116	47%	112	38%	228	42%
Needed minor repairs	64	26%	78	26%	142	26%
Had some problems	43	18%	83	28%	126	23%
Didn't work	22	9%	25	8%	47	9%
Total	245	100%	298	100%	543	100%

Reason and Timing for Recycling

The majority of participants (57%) considered disposing of their appliances prior to hearing about the program. In fact, 81% of participants said they were not only considering the option, but would have removed the refrigerator had the program not been available.

The primary driver for recycling the appliance was they had a brand new appliance to replace it. The second reason given was they no longer wanted the appliance and had no need to replace it (see Table 23). Qualitatively, many of these respondents noted the appliance was old and they no longer needed it.

Table 23: Reason for Recycling Appliance

	Freezer		Refrigerator		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Brand new appliance to replace it	131	53%	195	65%	326	60%
No longer wanted appliance w/o replacement	87	36%	68	23%	155	29%
Used appliance to replace it	27	11%	35	12%	62	11%
Total	245	100%	298	100%	543	100%

Respondents identified the incentive (cash), convenience, and free pick-up as the main reasons for choosing to recycle the appliances through the program, as shown in Table 24. Together, these three responses represented 80% of inputs received. Other reasons for participation included: environmental benefits; it was the only program known; and utility sponsorship.

Table 24: Main Reason for Choosing Program over Other Disposal Options

	Freezer		Refrigerator		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Cash	85	34%	121	40%	206	37%
Convenient	69	28%	68	23%	137	25%
Free pick-up	45	18%	53	18%	98	18%
Good for environment	12	5%	19	6%	31	6%
Other [Specify]	28	11%	25	8%	53	10%
Don't Know	10	4%	15	5%	25	5%
Total	249	100%	301	100%	551	100%

Although cash was mentioned more frequently than other reasons, many (76%) of participants told us they still would have participated in the program had the \$30 per appliance incentive not been available. As noted earlier, 86% told us they would have participated with a lower incentive.

The convenience of using the program and free appliance pick-up were the next most frequently mentioned reasons. They saw these program aspects as valuable benefits, as many would have had to pay to have the appliance recycled.

Energy-Saving Kits

When participants were asked whether a “free kit containing CFL light bulbs and energy information were given to you at the time of pickup?”, only 58% said yes. The rest were equally split between no and don’t know. Of participants recalling the kit, 80% rated the kit as very useful (a rating of 7 or higher on a 1-10 scale).

Recommended Improvements

When asked how they would improve the program, 79% of participants said they had no suggestions, and many added they were satisfied with the program. These and other responses to this survey question are summarized in Table 25.

About 5% of participants suggested the program should increase marketing and communications. A typical comment was: “If they had a way to make more people aware of it, more people would use it.”

Another 5% of participants suggested pick up should be improved, most suggestions being requests for faster pickup after contacting the program, with several noting it took a month or longer. A few respondents were unhappy about cancelled pick-up appointments and inconvenient pick-up times.

A few other suggested improvements are shown in the table. Some respondents suggested the incentive should be increased and another group felt the program should consider picking up other appliances or nonworking refrigerators/freezers.

Overall, responses were consistent with the high satisfaction levels reported above.

Table 25: Participants Recommended Improvements

Suggested Improvements	Freezer		Refrigerator		All Responses	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Satisfied, no suggested improvements	197	79%	241	80%	438	79%
Increase marketing	14	6%	16	5%	30	5%
Improve pick up	11	4%	15	5%	26	5%
Increase incentive	9	4%	8	3%	17	3%
Pick up other appliances	6	2%	15	5%	21	4%
More frequent program cycle	2	1%	2	1%	4	1%
Other	11	4%	4	1%	15	3%
Total	250	100%	301	100%	551	100%

Stakeholder Interview Findings

Turnkey program. Pacific Power values this program as it is cost-effective, the concept is sound, and the implementer has been able to manage many program aspects.

Running smoothly. Both Pacific Power and JACO representatives reported the program functions smoothly at present. Neither had concerns they felt needed to be addressed through changes in the program or its processes.

Quality Assurance and Quality Control. Pacific Power has dedicated resources to monitor the implementation contractor and occasionally to help resolve issues when they arise between the field teams and program participants. The evaluators interviewed two of these employees who provide these functions for Washington, Idaho, and Utah. From these interviews, it is clear that they are consistently implementing a QA/QC process for the utility that includes:

- **Follow-up calls.** The QA/QC people contact about 5% of the program participants by telephone to check their experience with the program. Typically, they contact participants who had an appliance picked up within the last 4-6 weeks. Responses are recorded in an excel spreadsheet and provided to the Program Manager. Their brief telephone survey includes the following points:
 - How they heard about the program
 - Experience with the Call Center
 - Experience with the pick up
 - Whether they had received their incentive check and how long it took
 - Whether they had received their energy-saving kit, and
 - Other comments.
- **Site Audits.** In addition to the telephone surveys, these employees meet the field teams at selected sites again targeting about 5% of the program pickups for this monitoring. The QA/QC people obtain the schedule for each field team for a given day and then arrive at the first pick up location before the JACO team. The field staff document what they observe and provide a subset of the recorded data to the Program Manager. They also check that the field teams follow the defined procedures which include the following points.

- Crews start the day on time. There is sometimes a temptation to start earlier but the program policy is to start the day no earlier than 7:50am
- Crews are courteous to every residential customer and
- All appliances picked up pass the standard test for functionality

Appliance Age. The QA/QC staff and JACO staff described the determination of age as follows: the JACO field teams use the nameplate to determine age whenever possible. In many cases, nameplates do not include a date of manufacture. In these cases, JACO staff estimate the age. According to JACO's management, the insulating material in each appliance can be used to place the appliance in one of three age groups:

- Fiberglass insulation was only used up until 1975 and indicates an appliance that is at least 35 years old
- CFC-11 insulation was only used from 1975 until 1995
- Foam insulation other than CFC-11 indicates that an appliance was manufactured more recently than 1995.

The timing of these changes in manufacturing methods has been independently validated. Once an age group has been determined, the JACO staff use additional clues such as the appliance's design, style, and color to refine their estimate. Although the age thus determined is an approximation, the evaluation takes a conservative approach to appliance age as described in the Impact Evaluation above (maximum age for energy consumption is 32 years or 1978 since that is the extent of the available data from manufacturers). Since this approach tends to reduce the average appliance age used in the analysis, it is unlikely that the estimation of age is resulting in a significant overstatement of program savings.

Monthly Program Meetings. It has been the practice of the Program Manager to meet regularly with the JACO Operations Manager to check in on recent program activities. This provided an opportunity for the Program Manager to relay any issues discovered through the QA/QC processes. The JACO manager found this to be a valuable meeting and the evaluators agree that it should be continued.

Functionality of recycled appliances. As shown in Table 22 above, 8-9% of participants reported the machine they recycled was not in working condition. However, all participants had described their appliances as functional when they contacted the Call Center to arrange for a pick up. Further, the field crews follow specific procedures to ensure that every appliance picked up is functional. Given these apparently conflicting pieces of information, the evaluators reviewed the field procedures with staff at JACO and with the QA/QC staff people.

At each site, the JACO team does a functionality check. This check consists of plugging in the appliance and verifying that it is functional by one of the following standards

- Compressor motor runs
- Appliance interior is felt to be cool/cold
- Refrigeration coils are felt to be warm

In practice, the functionality check is limited by a number of considerations. Since an appliance can be left outdoors for pick up, the program does not require that they be plugged in when the

JACO team arrives, only that a powered outlet (or extension cord) be available. In these cases, the JACO team plugs in the appliance and uses the compressor motor test as the primary check. If the compressor runs, the appliance will almost certainly be judged to be functional and picked up. This is dictated to some extent by the time available to the JACO teams at each site. According to the utility QA/QC people, the JACO team is typically at a particular site for approximately ten minutes. Teams are scheduled to pick up appliances at many sites in a day (15 or more in some cases) and often in widely separated sites, which requires minimizing the time spent at each site.

Another reason for the compressor test to be the primary hurdle can be weather conditions. If an appliance is left outdoors and the outdoor temperature is cool or cold, it is difficult for the field team to determine whether the appliance is cooling since the interior is already cold. In such cases, it can be difficult to get the compressor to start even if the appliance is functional.

It must be noted that JACO and the QA/QC staff report that there are appliances that can not be shown to be functional and so are not picked up.

Summary

- All appliances that are picked up have been tested and shown to be functional according to the defined procedures.
- The survey results are inconclusive. Future surveys should probe further when a respondent reports that the appliance didn't work.
- Field procedures include disabling each appliance during the pick up (cord is cut, door seals are disabled, and controls are disabled) which precludes any further testing.
- Until additional information becomes available, no program changes are recommended.

5. Cost-Effectiveness

To assess cost-effectiveness, evaluators conducted an analysis of program costs and benefits from four perspectives, using Cadmus' DSM Portfolio Pro model. These perspectives include:

1. **PacifiCorp Total Resource Cost Test (PTRC):** This test examines program benefits and costs from Pacific Power's and Pacific Power customers' perspectives, combined. On the benefit side, it includes avoided energy costs, capacity costs, and line losses plus a 10% adder to reflect non-quantified benefits. On the cost side, it includes costs incurred by both the utility and participants. (This is the primary test utilized in Washington state)
2. **Total Resource Cost Test (TRC):** This test examines program benefits and costs from Pacific Power's and Pacific Power customers' perspectives, combined. On the benefit side, it includes avoided energy costs, capacity costs, and line losses. On the cost side, it includes costs incurred by both the utility and participants.
3. **Utility Cost Test (UCT):** From Pacific Power's perspective, benefits are avoided energy and capacity costs and line losses. Costs include any program administration, implementation or incentive costs associated with funding the program.
4. **Ratepayer Impact (RIM):** All ratepayers (participants and nonparticipants) may experience an increase in rates to recover lost revenue. This test includes all Pacific Power program costs as well as lost revenues. As benefits, this test includes all avoided energy costs, capacity costs, and line losses.
5. **Participant Cost Test (PCT):** From this perspective, program benefits include bill reductions. Costs include any customer contribution to the measure cost.

Table 26 summarizes the components of the four tests.

Table 26: Benefits and Costs Included in Various Tests

Test	Benefits	Costs
PTRC	Present Value of Avoided Energy and Capacity Costs with 10% Adder for Non-quantified Benefits	Program Administrative and Marketing Cost + Participant Cost
TRC	Present Value of Avoided Energy and Capacity Costs	Program Administrative and Marketing Cost + Participant Cost
UCT	Present Value of Avoided Energy and Capacity Costs	Program Administrative, Marketing and Incentive Cost
RIM	Present Value of Avoided Energy and Capacity Costs	Program Administrative and Marketing Cost + Present Value of Lost Revenues
PCT	Present Value of Bill Savings	Participant Share of Measure Cost

Table 27 provides selected inputs to the cost analysis. These include the evaluated energy savings for each year (from Table 18 above), discount rate, line loss, and program costs. Other than the energy savings, these values are provided by Pacific Power. The discount rate is from Pacific Power's 2008 Integrated Resource Plan. Pacific Power also provided the values for line loss and the program costs. The implementation cost is the amount Pacific Power paid to JACO, the implementing contractor, plus the cost of the energy-saving kits. Incentives normally offset

some of the measure cost, leaving a net participant share of the measure cost. This program has no measure costs, however, so the incentives are treated as a benefit in the participant test.

Table 27: Selected Cost Analysis Inputs

Input Description	2006	2007	2008
Net Program Savings (kWh/year)	3,344,790	2,476,987	2,497,868
Discount Rate	7.40%	7.40%	7.40%
Line Loss	11.03%	11.03%	11.03%
Program Costs			
Implementation Cost	\$ 434,987	\$ 311,600	\$ 297,458
Incentive Costs	\$ 139,880	\$ 88,125	\$ 75,420
Utility Administrative Costs	\$ 15,902	\$ 14,066	\$ 14,178
Total Program Costs	\$ 590,769	\$ 413,791	\$ 387,057

Program benefits are comprised of energy savings and their associated avoided costs. The energy savings used in the cost-effectiveness analysis are the evaluated kWh from this study.

For recycled refrigerators and freezers, the analysis used a measure life of five years, as stipulated for refrigerators by the California Public Utilities Commission in the Database for Energy Efficient Resources (DEER2008 for 06-07 Updates³). This is a reduction from the measure life of eight years used in prior evaluations. For refrigerators, a five year measure life is conservative compared to the six year measure life adopted by the Regional Technical Forum (RTF).

For CFLs, the analysis used a measure life of 6.6 years. This value is also from DEER2008 and represents the expected life for an interior CFL with a nominal 10,000 hour life. This is a reduction from the measure life of nine years used in prior evaluations. The RTF currently uses a weighted average of 4.6 years.

Cost effectiveness was analyzed for two scenarios. In the first case, freeridership was assumed to be 0% (NTG equals 100%). In the second case, the evaluated freeridership shown in Table ES4 was used.

Table 28, Table 29, and Table 30 present the results of the cost-effectiveness analysis with NTG=1.0 for the Program in 2006, 2007, and 2008 respectively. Table 31 depicts the analysis for the three years combined.

Table 31, Table 32, and Table 33 present the results of the cost-effectiveness analysis with the evaluated NTG for the Program in 2006, 2007, and 2008 respectively. Table 35 depicts the analysis for the three years combined.

All analyses are based on the Pacific Power 2008 IRP 35% Westside Residential Whole Home Decrement.²¹

²¹ IRP decrements are detailed in Appendix G of PacifiCorp's 2008 Integrated Resource Plan Vol. II Appendices: http://www.pacificorp.com/content/dam/pacificorp/doc/Environment/Environmental_Concerns/Integrated_Resource_Planning_6.pdf

**Table 28: Cost-Effectiveness Summary for the Program in 2006 – IRP 35% LF Decrement
NTG = 100%**

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.016	\$450,889	\$1,475,463	\$1,024,574	3.27
Total Resource No Adder (TRC)	\$0.016	\$450,889	\$1,341,330	\$890,441	2.97
Utility (UCT)	\$0.021	\$590,769	\$1,341,330	\$750,561	2.27
Ratepayer Impact (RIM)	\$0.078	\$2,170,778	\$1,341,330	-\$829,448	0.62
Participant (PCT)	NA	\$0	\$1,719,889	\$1,719,889	
Lifecycle Revenue Impact (\$/kWh)				\$0.00004263	

**Table 29: Cost-Effectiveness Summary for the Program in 2007 – IRP 35% LF Decrement
NTG=100%**

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.017	\$325,666	\$1,111,814	\$786,148	3.41
Total Resource No Adder (TRC)	\$0.017	\$325,666	\$1,010,740	\$685,074	3.10
Utility (UCT)	\$0.021	\$413,791	\$1,010,740	\$596,949	2.44
Ratepayer Impact (RIM)	\$0.082	\$1,608,239	\$1,010,740	-\$597,499	0.63
Participant (PCT)	NA	\$0	\$1,282,573	\$1,282,573	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00003022	

**Table 30: Cost-Effectiveness Summary for the Program in 2008 – IRP 35% LF Decrement
NTG = 100%**

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.017	\$311,637	\$1,140,638	\$829,001	3.66
Total Resource No Adder (TRC)	\$0.017	\$311,637	\$1,036,943	\$725,306	3.33
Utility (UCT)	\$0.021	\$387,057	\$1,036,943	\$649,886	2.68
Ratepayer Impact (RIM)	\$0.085	\$1,586,252	\$1,036,943	-\$549,309	0.65
Participant (PCT)	NA	\$0	\$1,274,615	\$1,274,615	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00002734	

**Table 31: Cost-Effectiveness Summary for the Program across 2006-2008 – IRP 35% LF
Decrement NTG = 100%**

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.016	\$1,024,288	\$3,499,542	\$2,475,253	3.42
Total Resource No Adder (TRC)	\$0.016	\$1,024,288	\$3,181,401	\$2,157,113	3.11
Utility (UCT)	\$0.021	\$1,311,606	\$3,181,401	\$1,869,795	2.43
Ratepayer Impact (RIM)	\$0.081	\$5,043,401	\$3,181,401	-\$1,861,999	0.63
Participant (PCT)	NA	\$0	\$4,019,112	\$4,019,112	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00007202	

Table 32: Cost-Effectiveness Summary for the Program in 2006 – IRP 35% LF Decrement Evaluated NTG

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.028	\$450,889	\$867,746	\$416,857	1.92
Total Resource No Adder (TRC)	\$0.028	\$450,889	\$788,860	\$337,971	1.75
Utility (UCT)	\$0.036	\$590,769	\$788,860	\$198,091	1.34
Ratepayer Impact (RIM)	\$0.093	\$1,519,978	\$788,860	-\$731,118	0.52
Participant (PCT)	NA	\$0	\$1,069,089	\$1,069,089	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00003758	

Table 33: Cost-Effectiveness Summary for the Program in 2007– IRP 35% LF Decrement Evaluated NTG

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.027	\$325,666	\$694,819	\$369,153	2.13
Total Resource No Adder (TRC)	\$0.027	\$325,666	\$631,653	\$305,987	1.94
Utility (UCT)	\$0.034	\$413,791	\$631,653	\$217,862	1.53
Ratepayer Impact (RIM)	\$0.095	\$1,160,208	\$631,653	-\$528,554	0.54
Participant (PCT)	NA	\$0	\$834,542	\$834,542	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00002674	

Table 34: Cost-Effectiveness Summary for the Program in 2008– IRP 35% LF Decrement Evaluated NTG

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.025	\$311,637	\$749,777	\$438,140	2.41
Total Resource No Adder (TRC)	\$0.025	\$311,637	\$681,615	\$369,978	2.19
Utility (UCT)	\$0.032	\$387,057	\$681,615	\$294,558	1.76
Ratepayer Impact (RIM)	\$0.096	\$1,174,192	\$681,615	-\$492,576	0.58
Participant (PCT)	NA	\$0	\$862,555	\$862,555	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00002452	

Table 35: Cost-Effectiveness Summary for the Program across 2006-2008– IRP 35% LF Decrement, Evaluated NTG

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.027	\$1,024,288	\$2,164,707	\$1,140,418	2.11
Total Resource No Adder (TRC)	\$0.027	\$1,024,288	\$1,967,915	\$943,627	1.92
Utility (UCT)	\$0.034	\$1,311,606	\$1,967,915	\$656,309	1.50
Ratepayer Impact (RIM)	\$0.094	\$3,618,205	\$1,967,915	-\$1,650,290	0.54
Participant (PCT)	NA	\$0	\$2,593,917	\$2,593,917	NA
Lifecycle Revenue Impact (\$/kWh)				\$0.00006383	

Because there are no participant costs for this program, discounted participant payback, the number of years necessary for participants to recuperate their costs through the present value of anticipated energy savings, is not reported.

6. Conclusions

The following conclusions and recommendations have been offered based on findings presented in the previous chapters.

Conclusions

- Program participation has fallen from roughly 3,500 appliances recycled per year in 2006 to 2,500 appliances recycled through the program in 2008.
- Freeridership determined using the survey-based scenario analysis was about 40% for refrigerators and freezers, which is consistent with other recent appliance recycling programs including the most recent California statewide evaluation as noted above. (This is the sole basis for the NTG ratios, which are therefore about 62%.)
- Participants were very satisfied with the program, with 93% giving the program high scores, and 92% very likely to recommend the program to family and friends. Consistent with high satisfaction, 80% had no suggestion for ways to improve the program.
- Pacific Power and JACO were both satisfied with program. All parties felt the program runs well.
- The program was found to be cost-effective in all three years.
- The program is well established and we have no recommendations for modification.

Appendix A: Participant Survey Instrument

PARTICIPANT SURVEY - SEE YA LATER, REFRIGERATOR[®] - APPLIANCE RECYCLING PROGRAM

Hello, my name is _____ from Discovery Research Group. I'm calling on behalf of:

[Utah or Idaho]: Rocky Mountain Power

[Washington]: Pacific Power

I am calling to ask you some survey questions about the See ya later, refrigerator[®] recycling program. Please be assured this is not a sales call. My questions are for research purposes only. We are interested in your opinions to help improve our programs, and understand how to assist customers in saving money on their utility bills. Your individual answers will be used by **[Rocky Mountain Power, Pacific Power]** to evaluate energy efficiency programs. **[If Respondent asks how long, say]: "Less than 15 minutes."**

SCREENING QUESTIONS

These questions screen or qualify the Respondents to ensure that results are comparable across Respondents and that potential biases are avoided. The specific checks include the following:

- Respondent is the same person that contacted Rocky Mountain Power/Pacific Power about the program
- The appliance was removed from a primary residence where Rocky Mountain Power/Pacific Power is the electric utility
- Respondent is not a professional market researcher
- Respondent is not a utility employee

"Now, I need to ask a few screening questions."

1. According to our records, someone in your household contacted **[Rocky Mountain Power, Pacific Power]** to participate in **[Rocky Mountain Power, Pacific Power]**'s "See ya later, refrigerator[®]" recycling program. Are you that person?
 - a. Yes **[Go To 3]**
 - b. No
 98. Don't know
 99. Refused

2. Is that person available to speak with?
 - a. Yes, **[Continue]**
 - b. No, **[Arrange Callback]**
 98. Don't know
 99. Refused

[If "No – Not a convenient time," ask if Respondent would like to 1. Start now and do part of the survey, or 2. Arrange a more convenient time we can call them at home. Emphasize that]:

"It is important for [Rocky Mountain Power, Pacific Power] to include your opinions in this study so they can serve your needs better."

3. Which power company provides electric power to your home or primary residence?
 - a. Rocky Mountain Power/Pacific Power

- b. Other [Terminate]
- 98. Don't know [Terminate]
- 99. Refused [Terminate]

[Note: If Respondent has more than one home and uses Rocky Mountain Power/Pacific Power AND another company, ask]:

“Which utility serves your primary residence in Utah/Idaho/Washington?”

[If NOT Rocky Mountain Power/Pacific Power, Terminate and Tally.]

VERIFICATION

4. Program records indicate that you received an incentive for having [QUANTITY] [Refrigerator(s), Freezer(s)] disposed of by the recycling program around [Date of pickup]. Is this the correct quantity you recall being picked up by the recycling program? [Record 1 number.]

MEASURES	Response	IF QUANTITY DIFFERENT, Record NUMBER HERE
A. [QUANTITY, product type 1]	01 Yes	
	02 No	
	98 Don't know	
	99 Refused	
B. [QUANTITY, product type 2]	01 Yes	
	02 No	
	98 Don't know	
	99 Refused	

AWARENESS AND PURCHASE INFORMATION

5. How did you first learn about [Rocky Mountain Power, Pacific Power] 's appliance pick up and recycling program? [PROBE: Did you hear about the program from any other sources?] [Do not read list, record one number only.]
- a. Newspaper / Magazine/Print Media
 - b. Bill Inserts/Contact
 - c. [Rocky Mountain Power, Pacific Power] Web site
 - d. Other Web site [If yes, which Web site[s]? _____]
 - e. Internet Advertising/ Online Ad
 - f. Family/friends/word-of-mouth
 - g. [Rocky Mountain Power, Pacific Power] Representative
 - h. Radio
 - i. TV
 - j. Billboard/outdoor ad
 - k. Direct mail brochure
 - l. Realtor
 - m. Home Builders
 - n. Other newsletter
 - o. Retailer/Store [i.e. Sears, Best Buy, Ace Hardware]
 - p. Sporting event
 - q. Home Shows/Trade Shows
 - r. Appliance Recycling Contractor
 - s. Other [specify, record verbatim]_____.
 - 98. Don't Know

99. Refused
6. How does your household typically learn about energy efficiency opportunities? **[Do not read, prompt if necessary. Check all that apply and record verbatim.]**
- Newspaper / Print Media
 - Equipment Vendor Phone calls
 - Utility Bill Inserts
 - Utility Web site
 - Other Web site **[If yes, which Web sites?]** _____
 - Presentations
 - Trade Shows
 - Retail stores [e.g., Sears or Best Buy]
 - Home shows
 - Direct mail
 - Friends and family
 - Radio
 - TV
 - Other, **[Specify]** _____
 - None, have not learned of any energy efficiency opportunities
7. Which of the information sources that you just named do you rely on the most to gather information about energy efficient ways to save? **[Do not read, prompt if necessary. Check all that apply and record verbatim.]**
- Newspaper / Print Media
 - Equipment Vendor Phone calls
 - Utility Bill Inserts
 - Utility Web site
 - Other Web sites **[If yes, which Web sites?]** _____
 - Presentations
 - Trade Shows
 - Retail stores **[i.e. Sears or Best Buy]**
 - Home shows
 - Direct mail
 - Friends and family
 - Radio
 - TV
 - Other, **[Specify]** _____
8. How would you rate your current understanding of energy efficiency technologies? I'm going to read a list and I'd like you to tell me which are true for you? Would you say you: **[Read full list, check all that apply.]**
- Have no knowledge of energy efficient technologies
 - Are just getting started.
 - Have done some research to understand how energy use affects your bills.
 - Have done some research to understand how energy efficient technologies or equipment work.
 - Have installed some energy efficient appliances or equipment.
 - Which ones? _____
 - Have installed all possible cost effective energy efficient appliances or equipment at my home.
 - Which ones? _____
98. Don't Know
99. Refused

APPLIANCE DESCRIPTION

9. ASK IF [QUANTITY] = 1

Now I'm going to ask you some specific questions about the [Refrigerator, Freezer] that was picked up and recycled.

During the time just before you decided to get rid of the [Refrigerator, Freezer], was it being used as your main [Refrigerator, Freezer], or had it been a secondary or spare?

[Interviewer: a main refrigerator is typically in the kitchen, a secondary or spare is usually kept someplace else and might or might not be running. If the person recently bought a new main refrigerator and was just waiting for the old one to be picked up, it should be classified as "main."]

- a. Main
- b. Secondary or Spare
- 98 Don't Know
- 99 Refused

10. ASK IF [QUANTITY] > 1

The rest of the survey focuses on just one appliance. Since you mentioned that you had more than one appliance recycled through the program, we would like you to select just one of them and then answer the rest of the questions about it.

Can you tell me which of the [refrigerator(s), freezer(s)] you've selected?

During the time just before you decided to get rid of this [reiterate which of the multiple units was selected] refrigerator/freezer, was it being used as your main [Refrigerator, Freezer], or had it been a secondary or spare?

[Interviewer: a main refrigerator is typically in the kitchen, a secondary or spare is usually kept someplace else and might or might not be running. If the person recently bought a new main refrigerator and was just waiting for the old one to be picked up, it should be classified as "main."]

- a. Main
- b. Secondary or Spare
- 98 Don't Know
- 99 Refused

IF 9 or 10 = b ASK 11

11. How long had it been a secondary or spare? [Get months or years][If Respondent is confused, reinforce]: **"How long had it been a spare when you decided to get rid of it?"**

- a. Months _____ [1-11]
- b. Years _____ [1-50, Half = 0.5]
- 98 Don't Know
- 99 Refused

12. Thinking about the [last 12 months [IF 1 YEAR OR MORE]/months [ALL OTHER]] you had it as a spare prior to getting it picked up, was it plugged in and running ...

- a. All the time
- b. For special occasions only
- c. During certain months of the year only, or
- d. Never plugged in or running

- 98 Don't Know
- 99 Refused

Ask 13 only if 12= b or c

13. IF you were to add up the total time it was running as a spare in the last 12 months, how many months would that be? Your best estimate is okay. **[Get nearest month or half month]**
- a. MONTHS _____ **[1-11, half = 0.5]**
 - b. All the time
- 98 Don't Know
- 99 Refused
14. Where was it located?
- a. Kitchen
 - b. Garage
 - c. Porch/Patio
 - d. Basement
 - e. Other **[Specify]**
- 98 Don't Know
- 99 Refused
15. Was the location heated?
- a. Yes
 - b. No
- 98 Don't Know
- 99 Refused
16. Was the location air-conditioned?
- a. Yes
 - b. No
- 98 Don't Know
- 99 Refused
17. Did you decide to get rid of it because you... **[Read]**
- a. Got a brand new **[Refrigerator, Freezer]** to replace it
 - b. Got a used **[Refrigerator, Freezer]** to replace it
 - c. Or to get rid of a **[Refrigerator, Freezer]** you no longer wanted without replacing it **[Go To 19]**
- 98 Don't Know **[Go To 19]**
- 99 Refused **[Go To 19]**
18. Is the **[Refrigerator, Freezer]** you are replacing it with ENERGY STAR labeled?
- a. Yes
 - b. No
- 98 Don't Know
- 99 Refused
19. Had you already considered disposing of this **[Refrigerator, Freezer]** before hearing about **[Rocky Mountain Power, Pacific Power]** 's appliance recycling program? By dispose we mean getting rid of

it either by selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center.

- a. Yes
- b. No
- 98 Don't Know
- 99 Refused

20. Without the **[Rocky Mountain Power, Pacific Power]** Refrigerator Recycling program, what would you most likely have done with your old **[Refrigerator, Freezer]**? **[Read]**

- a. Gotten rid of it
- b. Kept it
- 98 Don't Know
- 99 Refused

21. **[ASK IF 20=a]** How soon would you have disposed of your old **[Refrigerator, Freezer]**? Would you have disposed of it within a year of when the Program took it, or more than a year later?

- a. Within a year of when the program took it
- b. More than a year later
- 98 Don't Know
- 99 Refused

22. What was the condition of this appliance? Would you say ...? **[Read list, record one response only.]**

- a. It worked and was in good physical condition
- b. It worked but needed minor repairs **[example: door seal or handle]**
- c. It worked but had some problems **[example: it wouldn't defrost]**
- d. Or, it didn't work **[Go To 24]**
- 98 Don't Know
- 99 Refused

23. **[IF 20=b]** If you had kept the **[Refrigerator, Freezer]**, would it have been used full time as either your primary unit or a spare, stored unplugged, or used occasionally **[example: at holidays]**? **[Do not read, if needed only]: "Your best estimate is fine."**

- a. Used full time
- b. Store it unplugged
- c. Use it occasionally
- 98 Don't Know
- 99 Refused

CONSIDERATION OF ALTERNATIVES

24. I am now going to read a list of alternative ways that you could have disposed of this appliance. For each, tell me if this is a method you had considered using or doing. **[Programmer: Item E only if 17=a OR b. Randomize a-i. Always place i and j last.]**

- a. Sell it to a private party, either by running an ad or to someone you know
- b. Sell it to a used appliance dealer
- c. Give it away to a private party, such as a friend, relative, or neighbor
- d. Give it away to a charity organization, such as Goodwill Industries or a church
- e. Have it removed by the dealer you got your new or replacement appliance from
- f. Haul it to the dump yourself and pay the disposal fee

- g. Haul it to a recycling center yourself and pay the disposal fee
- h. Hire someone else haul it away for junking or dumping
- i. Keep it
- j. Or something else I've not mentioned

For Each:

- 01 Yes – considered using/doing
- 02 No – did not consider or did not know about
- 98 Don't Know
- 99 Refused

Katie will add a question: which one of these would have been the most likely method

ASK 25 IF 24a = 01 or 24b = 01

25. Why did you not follow through with your consideration to sell the **[Refrigerator, Freezer]**?
- a. Couldn't find an interested dealer/non-dealer at the price I wanted
 - b. Couldn't find an interested dealer/non-dealer because of the unit's condition
 - c. Decided recycling unit was more important than selling it
 - d. Other **[Specify :___]**
 - 98 Don't Know
 - 99 Refused

ASK 26 IF 24e = 01

26. If an appliance dealer were to take it away, how much, if anything, do you think you would have to pay for this service?
- a. Nothing / Free Service
 - b. Dollars _____ **[\$1 - \$2000]**
 - 98 Don't Know
 - 99 Refused

ASK 27IF 24h = 01

27. If you were to hire someone else to haul it away for junking or dumping, how much, if anything, do you think you would have to pay for this service?
- a. Nothing / Free Service
 - b. Dollars _____ **[\$1 - \$2000]**
 - 98 Don't Know
 - 99 Refused

ASK 28 and 29 IF 24f = 01 or 24g = 01

28. One factor in disposing of an appliance is being able to physically move and transport it. You mentioned earlier that you considered hauling the **[Refrigerator, Freezer]** to the dump or recycling center yourself. Do you or someone in your immediate family have the ability to do this or would you have needed assistance such as renting or borrowing a truck?
- a. Yes, could do it myself
 - b. Would need assistance
 - 98 Don't Know

99 Refused

29. Most garbage dumps and recycling center charge a fee of at least \$25 to dispose of a refrigerator or freezer due to requirements that coolant and oil be collected and disposed of in an environmentally safe way. Were you aware that you would have to pay a fee of at least \$25 at the dump or recycling center and would you have paid it?

- a. Yes, I would have paid the fee
 - b. No, I wouldn't pay
- 98 Don't Know
99 Refused

ASK 30 IF 24c = 01 or 24d = 01

30. You mentioned earlier that you considered giving the **[Refrigerator, Freezer]** away to a private party, such as a friend, relative, or neighbor or to a charity. Did you identify and contact a specific person or charity to give the **[Refrigerator, Freezer]** to?

- a. Yes
 - b. No
- 98 Don't Know
99 Refused

31. Now that you have considered some additional factors involved in keeping or disposing of your old **[Refrigerator, Freezer]**, what you would have most likely done if you had not disposed of it through the **[Rocky Mountain Power, Pacific Power]**'s program. You said you would have **[Insert most likely method answer from 24]**. Is this still what you would have been most likely to do or something else? **[Probe if something else]: "What would you have done?" [Read list only if needed]**

- a. Sold it to a private party, either by running an ad or to someone you know
 - b. Sold it to an used appliance dealer
 - c. Given it away to a private party, such as a friend or neighbor
 - d. Given it away to a charity organization, such as Goodwill Industries or a church
 - e. Had it removed by the dealer you got your new or replacement appliance from
 - f. Hauled it to the dump yourself and pay the disposal fee
 - g. Hauled to a recycling center yourself and pay the disposal fee
 - h. Had someone else pick it up for junking or dumping
 - i. Kept it
 - j. Some Other Way **[Specify]**
- 98 Don't Know
99 Refused

32. What is the MAIN reason you chose this service over other methods of disposing of your appliance? **[If multiple are mentioned, ask]: "Of those, which is the main reason?" [Do not read, accept one answer only.]**

[If Respondent says: "I didn't need or want the refrigerator," re-ask the question.]

- a. Cash/incentive payment
- b. Free pick-up service/others don't pick up/don't have to take it myself
- c. Environmentally safe disposal/recycled/good for environment
- d. Recommendation of a friend/relative
- e. Recommendation of retailer/dealer
- f. Utility sponsorship of the program
- g. Easy way/convenient

- h. Never heard of any others/only one I know of
- i. Other [**Specify**]
- 98 Don't Know
- 99 Refused

33. Would you have participated in the program without the incentive check?

- a. Yes
- b. No
- 98 Don't Know
- 99 Refused

CFL INSTALLATION

34. Was a free kit containing CFL light bulbs and energy information given to you at the time of pickup?

- a. Yes
- b. No [**Go To 40**]
- 98 Don't Know [**Go To 40**]
- 99 Refused [**Go To 40**]

35. On a scale of 1 to 10, with 10 being the very helpful, how would you rate the information found in this kit?

- a. Score 1-10 ____
- 98 Don't Know
- 99 Refused

36. Why did you assign this rating? [**Do not prompt**]

- a. Information too general
- b. Already aware of information
- c. Information did not apply
- d. Used the suggestions provided in information
- e. Written well
- f. Passed information along to others
- g. Other, Record ____
- 98 Don't know
- 99 Refused

37. Did you install the CFLs that came in the kit?

- a. Yes, One of them [**One of**]
- b. Yes, Two of them
- c. No
- 98 Don't know
- 99 Refused

ASK 38 IF 37= a OR c

38. Why didn't you install [**One of**] the CFLs?

- a. Did not fit fixtures
- b. Intend to install later
- c. Do not like style
- d. Do not like quality

- e. Defective product
- f. Other, Record _____
- 98 Don't Know
- 99 Refused

ASK 39 IF 37= a OR b

- 39. Where did you install the CFL[s]?
 - a. Living room
 - b. Master bedroom
 - c. Other bedroom
 - d. Kitchen
 - e. Bathroom
 - f. Garage/storage
 - g. Outside
 - h. Other, Record _____
- 98 Don't know
- 99 Refused

SPILLOVER AND MARKET IMPACT

- 40. Since participating in the appliance pick-up and recycling program, have you participated in any other programs offered by [**Rocky Mountain Power, Pacific Power**]?
 - a. Yes
 - b. No [**Go To 42**]
 - 98 Don't Know [**Go To 42**]
 - 99 Refused [**Go To 42**]
- 41. Which programs did you participate in? [**Record**]
 - a. _____
 - 98 Don't Know
 - 99 Refused
- 42. On a scale from 1-10 where 1 is not at all important and 10 is very important, how important or influential was your participation in the recycling program in your decision to participate in other [**Rocky Mountain Power, Pacific Power**] energy efficiency programs?
 - a. _____
 - 98 Don't Know
 - 99 Refused
- 43. Besides recycling your old [**Refrigerator, Freezer**], have you made other energy efficiency improvements or purchases on your own without any assistance from a utility or other energy organization?
 - a. Yes
 - b. No [**Go to 46**]
 - 98 Don't Know [**Go to 46**]
 - 99 Refused [**Go to 46**]
- 44. What did you install? [**Do not prompt**]
 - a. High efficiency dishwasher
 - b. High efficiency washer
 - c. High efficiency dryer
 - d. High efficiency refrigerator
 - e. High efficiency water heater
 - f. CFLs [**Compact Fluorescent Light bulbs or curly bulbs**]

g. Other, [**Record Response**]_____

45. On a scale from 0-10, with 0 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement: “My experience with the See ya later, refrigerator[®] program influenced my decision to install other high efficiency equipment on my own.”

a. _____Rating

98. Don't know

99. Refused

PROGRAM SATISFACTION

“I'd like to ask about your satisfaction with the program.”

46. On a scale of 0 to 10, with 0 being not satisfied, and 10 being very satisfied, how satisfied are you with the Rocky Mountain Power/Pacific Power Appliance Recycling Program overall?

a. _____Rating [**If > 4, Go To 48**]

98 Don't know

99 Refused

47. For what reason do you give it that rating?? [**Do not read; mark all that apply**]

a. _____ [**Record Response—Use below for code**]

1. Incentive was too small.
2. Contractor never called me back.
3. Contractor never showed up/showed up late.
4. Contractor was unreliable/unprofessional.
5. Difficult to get an appointment time that was convenient for me.
6. Wanted to use a different [**non-program**] contractor.
7. Other [**Record Response**]_____

98 Don't know

99 Refused

48. Would you have participated in the program if the amount of the rebate had been less?

a. Yes

b. No

98. Don't know

99. Refused

49. On a scale of 0-10, where 0 is not at all likely and 10 is very likely, how likely are you to recommend the [**Rocky Mountain Power, Pacific Power**] Appliance Recycling Program to friends and family members?

a. _____Rating

98. Don't know

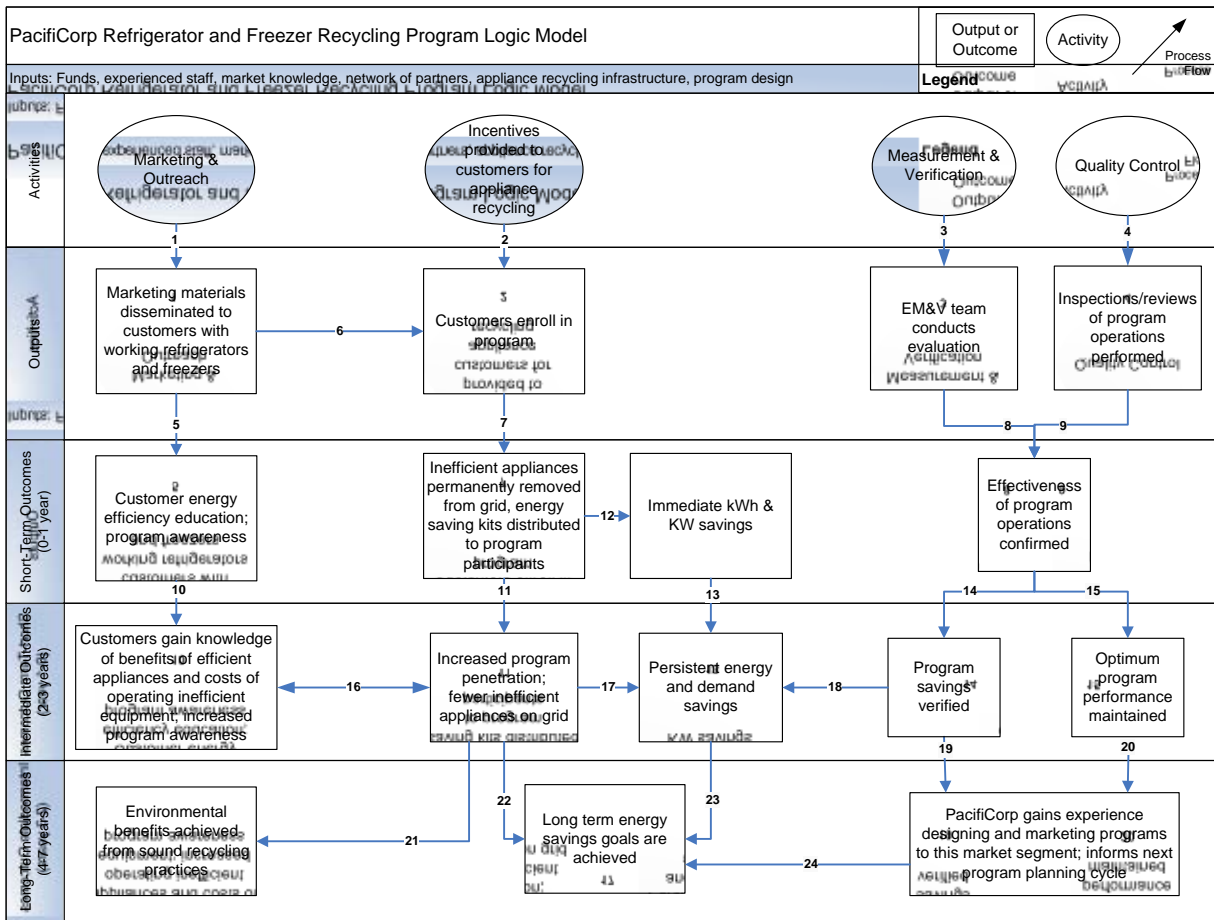
99. Refused

50. Is there anything you would suggest to improve the [**Rocky Mountain Power, Pacific Power**] Appliance Recycling Program? [**Record response**]

Thank you and terminate.

This completes the survey. [Rocky Mountain Power, Pacific Power] appreciates your participation. Thanks for your time. Have a good evening.

Appendix B: Program Logic Model



Link	Working Hypotheses	Indicators
1	Marketing and outreach lead to targeting communications to residential customers with refrigerators and freezers.	Number of eligible potential participants that express interest; marketing materials in bill inserts, on company Web site, in schools, in newspapers and on radio; presence at seminars, conferences, home shows, and community events
2	Incentives lead to customers enrolling in the program.	Number of participants; participant interviews indicate role of incentives on enrollment activities
3	Measurement and verification lead to the evaluation team conducting an evaluation.	Completed evaluation informs future program cycles
4	Quality control leads to inspections being performed.	Number of inspections indicate that quality control occurred

Link	Working Hypotheses	Indicators
5	The delivery of marketing materials leads to increased customer awareness regarding energy efficiency and the program.	Increased customer awareness regarding energy efficiency identified in surveys
6	Marketing efforts lead to customers enrolling in program.	Number of participants enrolled in the program who indicate they were reached by marketing efforts
7	Customer participation results in removing inefficient appliances from the grid.	Number of appliances recycled due to participation in the program
8	The evaluation leads to confirming program effectiveness.	Implementer interviews (qualitative); evaluation identifies best practices
9	Inspections and reviews leads to confirming program effectiveness.	Implementer interviews (qualitative); inspections and reviews should be indicated as improving program effectiveness
10	Education leads to program awareness.	Participant interviews (qualitative) should indicate that education led to program awareness
11	Removing inefficient appliances from the grid leads to increased program penetration.	Number of appliances recycled compared to overall market
12	Removal of inefficient appliances leads to kWh and kW savings.	Energy/demand savings generated expressed in kW and kWh
13	kWh and kW savings leads to persistent demand savings.	Energy/demand savings over time; Participant interviews regarding measure persistence
14	Confirming effective program operations leads to verified program savings.	Implementer interviews (qualitative); effective program theory and demonstrated links indicate savings are attributable to the program
15	Confirming effective program operations leads to the maintenance of optimum performance.	Implementer interviews (qualitative); program operations should be confirmed as effective
16	Increased program awareness leads to fewer inefficient appliances on the grid.	Interviews regarding awareness and resulting behavior
17	Fewer inefficient appliances on the grid lead to persistent energy savings.	Market study/ number of appliances recycled; participant interviews regarding measure persistence
18	Verified program savings leads to persistent energy and demand savings.	Energy/demand savings over time expressed in kW and kWh
19	Verified program savings leads to Pacific Power gaining experience with designing and marketing programs.	Implementer interviews (qualitative); the increased experience will be investigated
20	Maintaining optimal performance leads to Pacific Power gaining experience with designing and	Implementer interviews (qualitative); increased experience will be investigated

Link	Working Hypotheses	Indicators
	marketing programs.	
21	Fewer inefficient appliances on the grid lead to environmental benefits.	Energy/demand savings quantified using engineering estimates, analysis of reduced need to build power plants, environmental impacts of power plants that were not built quantified using EPA and other secondary data
22	Fewer inefficient appliances on the grid lead to achieving long term energy savings.	Energy/demand savings, analysis of reduced need to build power plants
23	Persistent energy savings lead to achieving long term energy savings.	Energy/demand savings in kW and kWh using engineering analysis and assessed over time
24	Pacific Power gaining experience with designing and marketing programs leads to achievement of long term energy savings goals.	Implementer interviews (qualitative); interviews will determine if the experience is positively impacting program processes and outcomes