



Appliance Recycling Program Evaluation – PY 2

Prepared for
Ameren Illinois

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1. Executive Summary

The Ameren Illinois Appliance Recycling Program (Program) offers free recycling of secondary refrigerators, freezers, and room air conditioners to residential and some commercial customers. The Cadmus Group Inc's (Cadmus') evaluation of Program Year 2 (PY2) consisted of the five primary tasks displayed in Table ES-1.

Table ES-1. Summary of Evaluation Approach (PY2)

Action	Impact	Process	Details
Participant Survey	✓	✓	Inform net-to-gross calculation and assess program implementation. (n=159)
Nonparticipant Survey	✓	✓	Inform net-to-gross calculation and assess program implementation. (n=32)
Stakeholder Interviews		✓	Provide insight into program design and delivery. (n=5)
Market Actor Interviews	✓	✓	Inform net-to-gross calculation and assess program implementation. (n=10)
Database Analysis	✓		Determine per unit savings based on age and size. (Census)

To develop an estimate of gross program savings, Cadmus conducted analysis using an existing data source containing detailed energy metering information for thousands of refrigerators and freezers at the time of manufacture. These data were used to develop a regression model to estimate per-unit energy savings based on appliance configuration, age, size, and defrost type. Combining this information with data from the program database and applying a degradation factor yielded average per-unit annual energy consumption estimates for participating refrigerators and freezers.

Once annual energy consumption for participating refrigerators and freezers was determined, Cadmus calculated the average gross energy savings for PY2 by applying the program's part-use factor. The part-use factor, determined through the participant survey, accounts for all participating appliances not plugged in year-round prior to removal. As Table ES2 shows, 2.2% of the removed refrigerators were not used at all prior to participating, and 15.3% were only used for a portion of the year. Applying these findings to the average annual energy consumption yields a gross per-unit energy savings of 1,467 kWh annually for refrigerators. A similar analysis for freezers results in annual per-freezer savings of 1,331 kWh. Gross savings for room air conditioners were estimated using the ENERGY STAR[®] savings calculator at 968 kWh per unit annually.

Table ES-2. Part-Use Adjusted Gross Per-Unit Energy Savings for Refrigerators and Freezers (PY2)

Operational Status	Refrigerator			Freezer		
	Percent of Recycled Units	Part-Use Factor	Adjusted Per-Unit Energy Savings*	Percent of Recycled Units	Part-Use Factor	Adjusted Per-Unit Energy Savings*
Not Running	2.2%	-	-	4.6%	-	-
Running Part Time	15.3%	0.36	596	4.6%	0.50	714
Running All Time	82.5%	1.00	1,668	90.9%	1.00	1,428
Total	100.0%		1,467	100%		1,331

* Adjusted per-unit energy savings in kWh/yr

Using findings from the participant and nonparticipant surveys, Cadmus determined the net-to-gross (NTG) ratio to be 0.79 and 0.82 for refrigerators and freezers, respectively. Because no incentive was offered for room air conditioners (which were picked up as an additional service for customers recycling another appliance) and because only a small number of units were recycled, Cadmus assumed a NTG ratio of 1.0 for this measure. Applying these NTG values and the total program participation to the gross per-unit savings listed in Table ES2 yielded an estimate of the program net savings.

A summary of per-unit gross and net energy savings, along with program participation and total program gross and net energy (MWh) and demand (kW) savings, is provided in Table ES3.¹ To facilitate comparing Program Years 1 and 2, Table ES4 shows PY1 evaluation results.

Table ES-3. PY2 Evaluated Participation, NTG, and Annual Energy Savings

Appliance	Total Recycled Units	Net-to-Gross Ratio	Per-Unit Gross Annual Energy Savings (kWh)	Per-Unit Net Annual Energy Savings (kWh)	Program Gross Annual Energy Savings (MWh)	Program Net Annual Energy Savings (MWh)	Program Gross Annual Demand Savings (kW)	Program Net Annual Demand Savings (kW)
Refrigerators	7,762	0.79	1,467	1,159	11,387	8,996	1,418	1,120
Freezers	3,422	0.82	1,331	1,091	4,555	3,735	567	465
Room Air Conditioners	27	1.0	968	968	26	26	26	26
Total	11,211	n/a	n/a	n/a	15,968	12,757	2,011	1,612

¹ Participation, NTG, and kWh and MWh impacts are based on the findings of the PY2 impact. Demand (kW) impacts for refrigerators and freezers were calculated using the coincidence factor determined in the PY1 evaluation. Demand impacts for room ACs were calculated using the coincidence factor assumed for Central ACs in Ameren Illinois' 2007 Energy Efficiency and Demand-Response Plan.

Table ES-4. PY1 Evaluated Participation, NTG, and Annual Energy Savings

Appliance	Total Recycled Units	Net-to-Gross Ratio	Per-Unit Gross Annual Energy Savings (kWh)	Per-Unit Net Annual Energy Savings (kWh)	Program Gross Annual Energy Savings (MWh)	Program Net Annual Energy Savings (MWh)	Program Gross Annual Demand Savings (kW)	Program Net Annual Demand Savings (kW)
Refrigerators	2,752	.51	1,522	776	4,188	2,143	522	267
Freezers	1,096	.63	1,247	786	1,367	868	170	108
Total	3,848	n/a	n/a	n/a	5,555	3,011	692	375

PY2 showed a significant increase in participation over PY1, logging nearly four times the number of recycled refrigerators and freezers. Per-unit net savings were found to be substantially higher in PY2, due primarily to higher NTG ratios. These factors combined to yield net program savings of nearly 13,000 MWh, up from only approximately 3,000 MWh saved in PY1. The change in NTG ratios was driven by a number of factors, including improvements to evaluation methodology and maturation of the program over time.

Table ES-5 illustrates the program's net savings using both a prospective and retrospective approach and also reports the gross realization rate. Prospective net savings were calculated by multiplying gross realized savings by the PY1 NTG ratio, while retrospective net savings were calculated by applying the PY2 NTG ratio to gross realized savings.

Table ES-5. Ex Ante Gross Savings, Realized Savings, and Net Savings

Measure	Ex Ante Gross Savings	Realized PY2 Gross Savings	Realization Rate	PY1 NTGR	Prospective Net Savings	PY2 NTGR	Retrospective Net Savings
Refrigerators	14,748	11,387	0.77	.51	5,807	0.79	8,996
Freezers	5,687	4,555	0.80	.63	2,869	0.82	3,735
Room Air Conditioners	n/a	26	n/a	1.0	26	1.0	26
Total	n/a	15,968	n/a	n/a	8,703	n/a	12,757

This evaluation draws the following conclusions:

- **Program Design Did Not Impede Participation in PY2.** Despite some skepticism expressed by program staff regarding the program's limitation to secondary appliances only, the program saw high levels of participation in the early part of PY2, indicating that it could continue to meet participation goals with its current design.
- **Spring Participation in PY2 Slowed due to Funding Changes.** As staff reported, and as the program data reflects, the program's funding reduction in April 2010 resulted in lower than anticipated participation for the last two months of the year.

- ***Participants may be Recycling Primary Units.*** The survey data indicate that a significant portion (27%) of units recycled through the program had been kept in the kitchen. Because unit location is a strong indicator of whether the unit is a primary or secondary appliance, this may signify that some of these appliances were in fact primary units. The contractor does ask the appliance owner to confirm the appliance is secondary, however.
- ***Small Commercial Participation was Limited.*** Ameren Illinois followed the PY1 recommendation to open up participation to small commercial customers; however, only 26 appliances were recycled by small commercial customers during PY2, representing less than 1% of total participation.
- ***The Program Team has Continued to Work Well Together.*** Based on feedback from interviewed staff, satisfaction levels expressed by surveyed participants, and the observed program participation level, it appears the program's management and implementation team have continued to administer the program successfully in PY2.
- ***Market Actors in the Used Appliance Market are Aware of the Program.*** Cadmus interviewed used appliance market actors, who indicated the program did not have a large impact on their businesses, but were aware that it was operating in their service area.

Recommendations for future actions include:

- ***Reexamine Procedures and Definitions Regarding Secondary Units.*** The survey finding that 27% of units were located in the kitchen prior to recycling is cause for a reexamination of the procedures the implementer uses to determine a unit's primary or secondary status. It may be necessary to revise definitions or procedures to ensure that customers are not replacing their primary unit and then considering the replaced unit to be secondary. Alternatively, as described in the next recommendation, Ameren Illinois could evaluate the cost effectiveness of allowing for primary unit recycling.
- ***Explore the Possibility of Broadening Eligibility for Increased Participation.*** While the current participation rate appears to be robust, allowing customers to recycle primary units would increase the number of eligible units substantially, and eliminate some concerns over eligibility as noted in the previous recommendation. If increased participation is desired in future program years, Ameren Illinois should consider eliminating the restriction on primary units from their program design. Because savings are considered at the system level rather than at the household level, unit replacement does not reduce per-unit savings (i.e. a household replacing a primary unit may be disposing it through a dealer who resells the unit to another household). This change would likely cause lower NTG ratios in future years, but with a significant enough increase in participation, the net effect could be increased savings, and the program would remain cost-effective.

2. Introduction

Program Description

The Ameren Illinois Appliance Recycling Program offers free recycling of secondary refrigerators and freezers to residential and small commercial customers. Participants receive a \$35 incentive payment, and the program implementer picks up and hauls the appliances to their recycling facility in Springfield, Illinois. The program not only removes older, inefficient appliances from use in Ameren Illinois' service territory, but also disposes of them in an environmentally responsible manner.²

Conservation Services Group (CSG) is the primary implementer for all of Ameren Illinois' residential demand-side management (DSM) programs, and Appliance Recycling Centers of America (ARCA) is the subcontractor with primary responsibility for implementing the Appliance Recycling Program.

The program is available to Ameren Illinois electric customers served under Residential Delivery Service (Rate DS-1) or Small General Delivery Service (Rate DS-2). Qualifying equipment is defined as follows:

- Appliances must be secondary units;
- Appliances must be located on the account premises and must be operational at the time of pickup; Appliances must be between 10 and 27 cubic feet;
- Appliances must be manufactured before 1993; and
- Appliances must be household type models (i.e., commercial refrigerators and freezers are not eligible).

As an additional service, the program will also pick up and recycle any working room air conditioners when picking up a refrigerator or freezer. No incentive is offered for air conditioners.

Evaluation Questions

From an evaluation perspective, 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 efficient measure.

Impact Questions

1. What are the average gross 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. What is the program's net-to-gross (NTG) ratio?

² Oils, PCBs, mercury, and CFC-11 foam are properly disposed of, and CFC-12, HFC-134a, plastic, glass, steel, and aluminum are recycled.

4. What are the total net program energy and demand savings?

Process Questions

1. Did program design or delivery change during PY2 implementation?
2. How effective were the employed marketing efforts?
3. How well did Ameren Illinois and the implementation team work together?
4. Were program participants satisfied with their experiences?
5. What changes can be made to the program's design or delivery to improve its effectiveness?

3. Evaluation Methods

Analytical Methods

The research activities that informed this evaluation are summarized in Table 1. This chapter contains a brief description of each major task and data source, and Chapter 4 outlines the analytical steps followed in greater detail.

Table 1. Summary of Evaluation Approach (PY2)

Action	Impact	Process	Details
Participant Survey			Inform net-to-gross calculation and assessment of implementation and participant satisfaction.
Nonparticipant Survey			Inform net-to-gross calculation and assessment of nonparticipant familiarity and attitudes.
Stakeholder Interviews			Provide insight into program design and delivery.
Market Actor Interviews			Inform net-to-gross calculation and assessment of refrigerator/freezer disposal market.
Database Analysis			Determine per unit savings based on age and size.

Participant Survey

Participant surveys were conducted in August 2010. The participant survey asked questions to determine how participants learned about the program, how participants had been using the appliance they recycled, what alternative methods of disposal participants considered, program satisfaction, and demographics.

Cadmus designed the participant survey utilizing industry best practices for appliance recycling evaluations. The survey instrument is included in this report as Appendix A. The survey included questions addressing the following pertinent issues:

- *Verification of Measure Removal.* This section of the survey ensured that we spoke with the appropriate person. It 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 customers' decision-making process and informed freeridership, spillover, and verification analysis.
- *Program Satisfaction.* These questions collected process-related information regarding participants' satisfaction with the program and reasons for dissatisfaction, if applicable. These questions also addressed whether participants will refer others to the program.
- *Demographics.* This section captured household and respondent characteristics, which included income, age, type and square footage of home, energy use, and energy expenditures. A summary of the responses to these questions is included as Appendix C.

Nonparticipant Survey

Surveys with nonparticipants – defined as Ameren Illinois customers who discarded an operable secondary refrigerator or freezer but did not participate in the program – provide valuable insight into what happens to older, functional appliances in the absence of the program. As participant survey respondents are often subject to socially desirable response bias (in the case of an appliance recycling program, exaggerating the frequency with which they would have recycled their appliance even without the program’s assistance), Cadmus collected supplementary information from nonparticipants to support the NTG analysis. Using both participant and nonparticipant responses to determine the program’s NTG increases the reliability of the final NTG and aligns this evaluation with the approach most recently employed in evaluations of similar programs nationwide.³

Nonparticipant survey data collection was conducted in conjunction with the CFL User Survey conducted for the PY2 evaluation of Ameren Illinois’ Residential Lighting and Appliance Program. Survey respondents were asked screener questions to determine whether they had disposed of an operable secondary refrigerator or freezer during PY2 in some way other than through participation in the Appliance Recycling Program. Qualifying nonparticipants were then asked a battery of questions about their use of the appliance and the method used to dispose of it. Additionally, the survey asked nonparticipants whether they were aware of the Ameren Illinois program and why they chose not to participate. The nonparticipant survey module is included in this report as Appendix B.

Stakeholder Interviews

To assess the program's effectiveness and implementation, Cadmus conducted interviews with a number of stakeholders intimately familiar with the program. Specifically, we interviewed five stakeholders from Ameren Illinois, CSG, and ARCA. Details regarding interviewed stakeholders are provided in Table 2.

Table 2. Stakeholder Interviewees

Title	Organization
Energy Efficiency Advisor	Ameren Illinois
Implementation Team Project Manager	CSG
Vice President of Resource Efficiency Programs	ARCA
Customer Service Manager	ARCA
Client Support Supervisor	ARCA

Stakeholder interviews were conducted utilizing interview guides aimed at discussing the program’s design, implementation and delivery, marketing efforts, implementation barriers, and communication.

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

³ Similar evaluations have recently been performed in Michigan, Arizona, California, Washington, Utah, and Idaho, among others.

- Determination of program progress
- Identification of changes during implementation
- Assessment of program marketing

Market Actor Interviews

Cadmus conducted an assessment of market actors in order to understand what happens to refrigerators and freezers disposed of through traditional channels. Interviews with two key types of market actors, appliance dealers and appliance haulers, provided a clearer understanding of the dynamics of the used refrigerator and freezer market in Illinois. Furthermore, the results of these interviews inform the NTG analysis by estimating the portion of used appliances that are destroyed and thereby removed from the grid by dealers or haulers. The objectives of the market actor interviews include:

- To describe what happens to used units that are picked up by appliance retailers or appliance haulers
- To assess the impact of the program on the used refrigerator market
- To estimate the percentage of used refrigerators resold and the percentage destroyed as well as the key characteristics and criteria
- To understand the various roles played by each market actor
- To estimate how many units are working and not working upon disposal/removal

Cadmus conducted interviews with a small sample of market actors with the aim of collecting anecdotal information about the used appliance market. The results of this market research are not statistically significant, as the size of the market in Ameren Illinois' service territory is unknown, and the interviewees were not randomly selected. Nonetheless, the information gathered through interviews with market actors improves our understanding of the market within which the Appliance Recycling Program functions, and allows us to make informed assumptions about how the market treats used appliances. In total, 10 interviews were conducted. Table 3 presents the number of completed interviews for each market actor segment.

Table 3. Market Actor Interviewees

Market Actor	Sample Size
Appliance Retailers	6
Appliance Haulers	4

To garner information specific to the unique experiences of appliance retailers and appliance haulers, two market actor interview guides were developed. Although the guides focused on each market actor's specific role in the Illinois appliance market, similar issues were addressed in each guide in order to ascertain a comprehensive view of the market from multiple perspectives.

The interviews were conducted with store owners and managers or individuals who otherwise had firsthand knowledge of the dynamics of the used refrigerator market. The goal of the

interviews was to collect more information on the actual number of units on the market and the overall impact of the program on the used refrigerator market. Quantitatively-based questions - such as how many, how often, and what percent - were asked to elicit actual estimates. Open-ended and opinion questions were also asked in order to elicit subjective responses about the program's impact on the used refrigerator market.

Secondary Data Analysis

To leverage existing data sources on appliances, Cadmus obtained datasets maintained by the California Energy Commission (CEC) detailing energy consumption of thousands of refrigerators and freezers at the time of their manufacture. With the application of a degradation factor, these data were used to develop a regression model estimating energy savings as a function of an appliance's age, size, and configuration. Combining this information with data on participant units yielded an estimate of the program's gross savings. Significant detail regarding this process is provided in the Chapter 4.

The regression analysis informed the following evaluation elements:

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

Data Sources

The following data sources informed the impact and process evaluation:

- Final PY2 program database (provided by CSG)
- Information gathered through participant surveys
- Information gathered through nonparticipant surveys
- Information gathered through stakeholder interviews
- Information gathered through market actor interviews
- Database containing results of over 60,000 metered appliances⁴
- ENERGY STAR[®] Savings Calculator for Room Air Conditioning⁵
- Marketing and informational materials (provided by Ameren Illinois)

Sampling Plan

The following text details the sampling plan for the participant and nonparticipant surveys and stakeholder and market actor interviews.

⁴ http://www.energy.ca.gov/appliances/database/historical_excel_files/2009-03-01_excel_based_files/Refrigeration

⁵ http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorConsumerRoomAC.xls

Participant and Nonparticipant Surveys

The sample sizes for the participant surveys, as shown in Table 4, allowed for estimation of NTG ratios and part-use factors at 90% confidence and 10% precision for refrigerators. A less rigorous standard was applied to freezer estimates, which were estimated at 80% confidence and 20% precision. Note that the total number of participants (in Table 4) is lower than the total number of units recycled (cited throughout this report as 11,211) because some participants recycled more than one appliance.

Table 4. Participant and Nonparticipant Survey Samples

Survey Respondent Type	Population of Participants (June 2009–May 2010)	Number of Completed Surveys	Confidence Interval	Level of Precision
Participant Refrigerator	7,195	137	90%	±10%
Participant Freezer	3,141	22	80%	±20%
Nonparticipant	n/a	32	n/a	n/a
Total	10,336	189	n/a	n/a

Stakeholder and Market Actor Interviews

Cadmus requested a list of utility and implementer contracts from Ameren Illinois, and then balanced the proposed number of interviews (n=5) between the three stakeholder groups (Ameren Illinois, CSG, and ARCA) to gain the broadest possible perspective on the program. A sample of 10 market actors was interviewed, again balancing the sample across the various types of interviewees. In interviewing this small sample of market actors, we aimed to collect anecdotal information about the used appliance market without the cost associated with a detailed market characterization study.

4. Program Results

Impact Findings

Impact evaluation findings are presented in the following four subsections:

1. Summary of Program Participation
2. Determination of Average Annual Gross Energy Consumption
3. Determination of Gross Savings
4. Determination of Net Savings

Summary of Program Participation

Ameren Illinois' Appliance Recycling Program greatly increased participation in PY2, recycling more than twice as many appliances as it had in PY1. The vast majority of participants were residential customers, and more refrigerators than freezers were recycled. This is typical of appliance recycling programs nationwide. Table 5 summarizes participation by appliance type, and

Table 6 summarizes participation by type of customer account.⁶

Table 5. PY2 Program Participation by Appliance Type

Appliance	Recycled Units	Percent of Total Participation
Refrigerator	7,762	69.2%
Freezer	3,422	30.5%
Room Air Conditioner	27	0.2%
Total	11,211	100%

Table 6. PY2 Program Participation by Customer Type

Customer Account Type	Recycled Units	Percent of Total Participation
Residential (DS-1)	11,185	99.8%
Small Commercial (DS-2)	26	0.2%
Total	11,211	100%

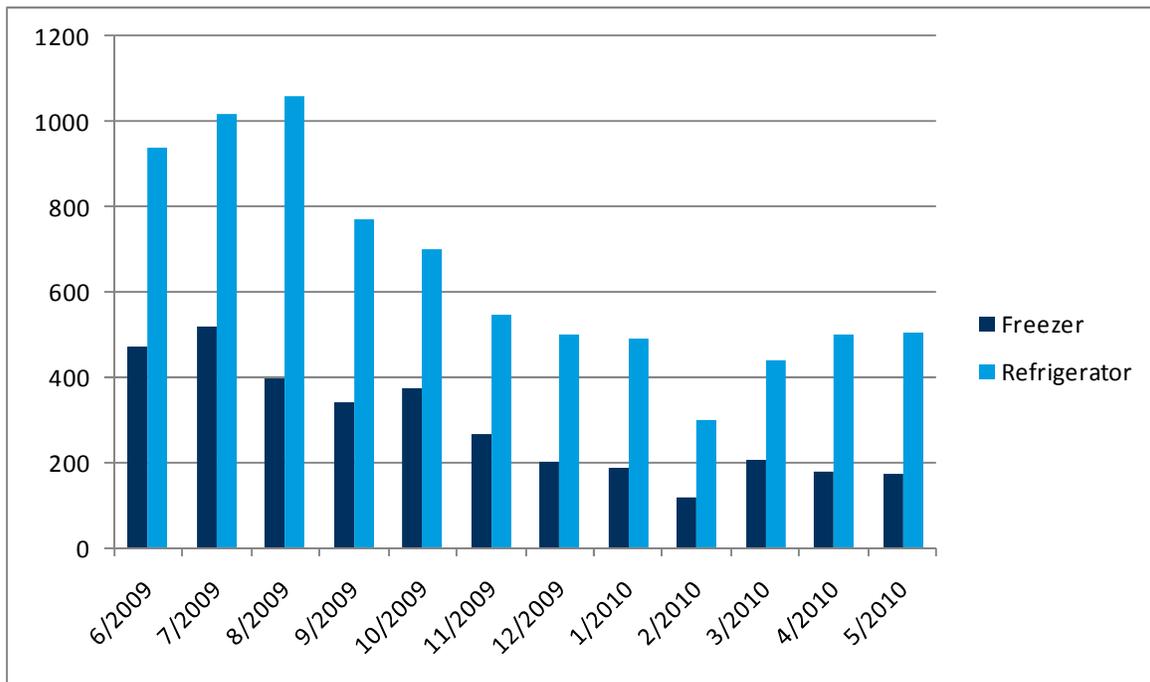
As shown in Figure 1, the highest levels of participation occurred in June, July, and August 2009. Participation then declined through the fall, and remained low through the winter. Lower winter participation rates followed by surges in spring participation are not uncommon with U.S. appliance recycling programs.

⁶ All room air conditioners were picked up from residential customers.

This seasonality in appliance recycling participation is commonly attributed to two factors. First, most remodeling and home organization efforts leading to program participation occur during warmer and drier weather. Second, secondary appliances typically have their greatest utility in winter, and households are often reluctant to enroll in an appliance recycling program until they have used the appliances to handle food surpluses that can occur during the holiday season.

In the case of PY2, however, the participation remained relatively low in the spring of 2010 due to a reduced rebate budget and a corresponding reduction in marketing efforts that occurred in April 2010. These changes are explained in greater detail in the Stakeholder Interview Findings section.

Figure 1. PY2 Participation by Month



Determination of Average Annual Gross Energy Consumption

In a refinement of the methodology used in the PY1 evaluation, Cadmus developed multivariate regression models to estimate average unit energy consumption (UEC) of retired refrigerators and freezers at the time of manufacture for PY2. As compared with the PY1 method, this method used a similar theoretical approach in that energy consumption was predicted based on existing energy use data, yet provides slightly more accurate estimates. This approach aligns this evaluation with industry best practices for estimating the gross energy consumption of appliance recycling programs.

The measure-specific regression models were based on the CEC's energy consumption database⁷ of over 61,000 specific refrigerator and freezer makes and models manufactured between 1978

⁷ http://www.energy.ca.gov/appliances/database/historical_excel_files/2009-03-01_excel_based_files/Refrigeration

and 2008. This database contains UEC values for each appliance as reported by manufacturers, as well as the energy consumption determined using Department of Energy (DOE) appliance testing protocols. The regression model employs the DOE-based UEC as the dependent variable, and various characteristics (configuration, age, size, etc.) of tested refrigerators or freezers as independent variables.

To develop the regression models, Cadmus first cleaned the CEC data to contain only units that fit the participation criteria of Ameren Illinois' program. Next, all potential independent variables were considered. If analysis showed the relative standard error for a characteristic as less than 10%, that characteristic was used as an independent variable in the final model. This simplified the model by eliminating less-influential variables. The models are described in Table 7 and

Table 8.

Table 7. PY2 Refrigerator Regression Model: Independent Variables

Refrigerators: R ² =0.83			
Independent Variable	Coefficient	Standard Error	t-value
Intercept	-1,166.6	9.59	-121.6
Age (years)	47.8	0.21	223.7
Volume (CuFt)	37.3	0.39	96.3
Dummy: Side-by-Side	227.5	3.03	75.0
Dummy: Bottom Freezer	211.4	4.91	43.0
Dummy: Automatic Defrost	429.5	5.62	76.5

Table 8. PY2 Freezer Regression Model: Independent Variables

Freezers: R ² = 0.79			
Independent Variable	Coefficient	Standard Error	t-value
Intercept	-477.6	8.04	-59.4
Age (years)	30.3	0.24	125.1
Volume (CuFt)	31.2	0.25	124.4
Dummy: Upright Freezer	28.5	2.22	12.9
Dummy: Automatic Defrost	413.6	3.48	118.8

Once the final regression models were specified based on the CEC database, the corresponding characteristics (the independent variables) for participating appliances (as captured in the program database by ARCA, the program implementer) were analyzed. Program averages for each independent variable (i.e., average age, average size, and proportion of each configuration) were calculated. Participant unit characteristics are summarized in Table 9 and Table 10. Note that an adjustment was made to the average age to account for the fact that the CEC database does not contain data on appliances manufactured prior to 1978. To prevent overstatement of consumption, any participating appliance manufactured before 1978 was assumed to have been

manufactured in 1978. Without this adjustment, the average ages for participant refrigerators and freezers were 31.6 and 34.3, respectively.

Table 9. PY2 Participant Unit Characteristics: Refrigerators

Independent Variable	Average
Adjusted Age (years)	27.20
Volume (CuFt)	16.91
Dummy: Side-by-Side	0.12
Dummy: Bottom Freezer	0.04
Dummy: Automatic Defrost	0.70

Table 10. PY2 Participant Unit Characteristics: Freezers

Independent Variable	Average
Adjusted Age (years)	28.82
Volume (CuFt)	16.21
Dummy: Upright Freezer	0.53
Dummy: Automatic Defrost	0.01

Next, Cadmus applied the average participant unit characteristics to the regression models to calculate an estimate of annual UEC at the time of manufacture for average participating refrigerator and freezer. This approach ensures the resulting UEC is based on the specific units recycled through Ameren Illinois' program during PY2, and is not simply a secondary data source.

Finally, a degradation factor was applied. The regression model estimates the energy consumption of units at the time of manufacture, not at the time of retirement. As a result, this consumption estimate must be adjusted for increases in energy usage that occur as refrigerators and freezers age. For this evaluation, Cadmus applied an annual degradation factor of 1.5%, based on the U.S. Department of Energy's National Energy Audit Tool, which uses a sliding scale of 1% to 2%.⁸

Table 11 reports estimated per-unit average annual energy consumption for participating refrigerators and freezers. The next section describes how these estimates are adjusted to arrive at gross per-unit savings estimates for participant refrigerators and freezers.

⁸ The previous year's evaluation used slightly less conservative and now outdated degradation factors based on data from the 2004–2005 California Residential Appliance Recycling Program evaluation. A 1.5% degradation factor is in line with recent studies conducted by Cadmus. More information on the National Energy Audit Tool can be found on the Oakridge National Labs Website: <http://weatherization.ornl.gov/assistant.shtml>.

Table 11. Estimate of Per-Unit Annual Energy Consumption (PY2)

Appliance	Average Unit Energy Consumption (kWh/Year)
Refrigerator	1,668
Freezer	1,428

Determination of Gross Savings

To determine the average per-unit gross energy savings for refrigerators and freezers, Cadmus next calculated and applied the program's part-use factor. The part-use factor accounts for participating appliances not plugged in year-round prior to participation. Retirement of appliances not previously in operation or operated for only part of the year does not yield the full year of energy savings presented in Table 11. To adjust annual energy consumption estimates provided above for participating appliances not in use throughout the entire year, data from the participant survey was analyzed to calculate part-use factors that were 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 was not consuming any electricity, no savings were generated by its retirement.
- Recycled units **operating the full year** prior to participation were assigned a part-use factor of **1**.
- To determine the part-use factor for units **used only a portion of the previous year**, the average number of months such units were used was divided by 12. The part-use factor for these appliances ranged between **0** and **1**.

In the case of PY2, participants recycling a refrigerator operated for only a portion of the year estimated that their refrigerator was used an average 4.3 months a year. The same figure for freezers averaged 6 months a year.

Table 12 illustrates how the part-use factors for each of the three categories above were applied to determine the average per-unit gross annual energy savings for refrigerators and freezers.

Table 12. Part-Use Adjusted Gross Per-Unit Energy Savings for Refrigerators and Freezers (PY2)

Operational Status	Refrigerator (90%/±10)			Freezer (80%/±20)		
	Percent of Recycled Units	Part-Use Factor	Adjusted Per-Unit Energy Savings (kWh/Yr)	Percent of Recycled Units	Part-Use Factor	Adjusted Per-Unit Energy Savings (kWh/Yr)
Not Running	2.2%	-	-	4.6%	-	-
Running Part Time	15.3%	0.36	596	4.6%	0.50	714
Running All Time	82.5%	1.00	1,668	90.9%	1.00	1,428
Total	100.0%		1,467	100%		1,331

The values shown in

Table 12 are comparable to the values found for PY1 in the previous evaluation. It should be noted that because the sampling plan was designed to achieve a less rigorous level of confidence and precision for freezers, the gross and net freezer savings estimates are correct within 20% precision for an 80% confidence interval.

Air Conditioner Savings

Gross savings for room air conditioners were determined through an engineering analysis based on the ENERGY STAR[®] savings calculator for room air conditioning. Using Peoria, IL as a reference city for weather adjustment, savings were assumed to equal a full year of energy consumption for a room air conditioner with EER 9.8. This assumption is conservative, given that older units are likely to be less efficient.⁹ Table 13 shows per-unit gross savings for room air conditioners.

Table 13. Per-Unit Gross Energy Savings for Room Air Conditioners (PY2)

Appliance	Gross Energy Savings (kWh/Year)
Room Air Conditioner	968

Using the part-use adjusted per-unit gross annual energy savings presented in

⁹ The average year of manufacture of the recycled units, according to the implementer database, was 1986.

Table 12 and the room air conditioner savings from Table 13, the program-wide annual gross energy savings generated by Ameren Illinois' Appliance Recycling Program in PY2 are presented in

Table 14.

Table 14. PY2 Part-Use Adjusted Gross Annual Energy Savings

Appliance	Gross Energy Savings (kWh/Year)	Participation	Total Program Gross Savings (kWh/Year)	Confidence and Precision*
Refrigerator	1,467	7,762	11,386,854	90%/±5.2%
Freezer	1,331	3,422	4,554,682	80%/±7.4%
Room Air Conditioner	968	27	26,136	n/a
Total		11,211	15,967,672	n/a

* Precision is calculated to reflect the combined effect of error generated by the regression model and the survey-based part-use estimate.

Determination of Net Savings

In calculating a net-to-gross ratio for the program, Cadmus based our analysis on the methodological approach established by the 2004–2005 California Residential Appliance Recycling Program evaluation and continued in more recent evaluations in California and elsewhere around the United States.¹⁰ This methodology, which was discussed and refined by industry experts at the International Energy Program Evaluation Conference (IEPEC), has gained acceptance as the industry standard for assessing appliance recycling program NTG.

The NTG ratio eliminates savings from participants whose appliances would have been removed from service independently of the program (freeriders), but credits the program for destroying units that would otherwise have been transferred to other users. Participant and nonparticipant surveys informed freeridership analysis.

Note that this approach differs from the evaluation of freeridership for a typical energy-efficiency program. In the case of appliance recycling, savings occur when the appliance is permanently removed from service. Freeridership occurs when a customer's appliance would have been permanently removed from service had it not been recycled through the program. Therefore, the savings occur at the grid or system level, and are not affected by the replacement of recycled appliances within a given household.

For example, consider a customer who replaces their refrigerator with a new one and sells the old unit to a neighbor to use as a spare. If the customer instead opts to recycle the old unit through the program, the savings take place not in the participant's household, but in the neighbor's household. The program prevents the system-level increase in energy consumption that would have occurred had the customer sold their refrigerator.

The NTG analysis applies only to refrigerators and freezers. As room air conditioners are picked up only as an additional service to customers already recycling another appliance, and no additional rebate is offered, a NTG ratio of 1.0 is applied for this measure.

Participant Freeridership

For program participants, only four possible scenarios could happen to a refrigerator, freezer, and/or room air conditioner, had it not been recycled through the program:

¹⁰ http://www.calmac.org/publications/EM&V_Study_for_2004-2005_Statewide_RARP_-_Final_Report.pdf

- The unit would have been kept by the household, but not used;
- The unit would have been kept by the household, and still used;
- The unit would have been discarded by the household through a method in which the unit would be destroyed; and
- The unit would have been discarded by the household through a method in which the unit would be transferred to another person and kept in use.

Of the four scenarios, two are indicative of freeridership:

- The unit would have been kept by the household but not used; and
- The unit would have been discarded by the household through a method in which the unit would be destroyed.

Freeridership occurs under these scenarios because units would have been removed from the grid and not used and/or destroyed even if had they not been recycled through the program. As a result, the program cannot claim energy savings generated by the appliance's retirement. Table 15 summarizes these scenarios. Both Scenario 1 and 3 are explored in detail below.

Table 15. Potential Attribution Scenarios

Scenarios Independent of Program	Scenario	Indicative of Freeridership
Unit Kept but Not Used	1	Yes
Unit Kept and Used	2	No
Unit Discarded and Destroyed*	3	Yes
Unit Discarded, Transferred, Used	4	No

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

Scenario 1

The participant survey determined which units would have been kept and not used. Participant responses to a series of questions provided the proportion of units that would have been kept and not used (therefore not drawing electricity from the grid, and indicating freeridership). Energy savings associated with these units must therefore be subtracted from the program's determined gross savings.

Table 16 provides details for this calculation. As shown, according to the self-reported participant survey results, 4% and 0% of refrigerators and freezers, respectively, would have been kept and stored unplugged independently of program intervention. These figures are significantly lower than those found in last year's evaluation, perhaps due to the maturation of the program over time.

Table 16. Freeridership Scenario 1—Units Kept but Not Used

Appliance	Percent of Appliances Kept	Percent of Kept Appliances that Would Not be Used	Percent of All Appliances Kept and Not Used
Refrigerator	30%	13%	4%
Freezer	43%	0%	0%

Scenario 3

Calculating freeridership associated with Scenario 3 (units that would have been discarded and destroyed in the program’s absence) is more complex, and relies on a number of different data sources. Specifically, the calculation typically utilizes the results of both the participant survey and the nonparticipant survey, as well as the findings of prior market research efforts.

While Scenario 1 relied exclusively on self-reported data from the participants, information gathered from nonparticipants was used to supplement Scenario 3 analysis, since participants of utility programs often exaggerate the frequency with which they would have acted favorably—in this case, recycling their old appliance independently of the program. Since surveyed participants’ stated intentions may have differed from what they would have actually done, information gathered from nonparticipants about what actually happened to units discarded independently of the program was used to supplement an analysis.

It should be noted the responses “*Sell it to a used appliance dealer*” and “*Have it removed by the dealer they got their replacement appliance from*” were identified as partially indicative of freeridership for both participants and nonparticipants, based on results of the market actor interviews which found that some appliance retailers resell used appliances, while other dispose of them. Cadmus assigned these responses a freeridership score of 0.6, which represents the portion of dealers who reported that they did not resell appliances.

Table 17 provides the details of our findings. It should be noted that a significant portion of respondents did not choose any of the methods of disposal offered. These responses are listed as “*Don’t know*” in the table below, and were not included in subsequent NTG analysis.

**Table 17. Freeridership Scenario 3—Units Discarded and Destroyed:
Participant Responses**

Stated Method of Disposal in Absence of Program	Indicative of Freeridership	Refrigerators (n=123)	Freezers (n=20)
Sell it to a private party, either through an ad or selling to someone they know	No	3%	17%
Sell it to a used appliance dealer	Partial	1%	-
Give it away to a private party, such as a friend or neighbor	No	23%	17%
Give it away to a charity organization, such as Goodwill or a church	No	7%	17%
Put it on a curb with a “Free” sign on it	No	5%	8%
Have it removed by the dealer they got their replacement appliance from	Partial	20%	8%
Haul it to the dump or recycling center themselves	Yes	16%	25%
Hire someone else to haul it away for junking or dumping	Yes	7%	-
Don’t know	n/a	16%	8%
Total		100%	100%

Scenario 1 and Scenario 3 freeridership were combined, and two additional adjustments were made to determine total participant freeridership. First, if a participant stated that their unit did not work – which should have rendered it ineligible for program participation – they were marked as a freerider. This applied to only one participant, who stated that their refrigerator did not work prior to recycling. It is possible that the unit simply did not work to the customer’s satisfaction, but did in fact turn on when plugged in. Nonetheless, Cadmus conservatively elected to designate freeridership for that respondent. Second, any participant who did not indicate Scenario 1 freeridership and said they had never considered disposing of or discarding their appliance prior to hearing about the program was considered a nonfreerider. These calculations yielded the freeridership results reported in Table 18.

Table 18. Participant Freeridership (PY2)

Appliance	Percent of Participants Determined to be Freeriders
Refrigerators	18.7%
Freezers	15.0%

Nonparticipant Freeridership

As stated above, information gathered from nonparticipants was used to supplement our analysis of the Scenario 3 type of freeridership, since participants often exaggerate the frequency with which they would have acted favorably. Since surveyed participants’ stated intentions may have differed from what they would have actually done, nonparticipants who actually discarded units independently of the program were used as a control group.

The analysis of nonparticipant freeridership is considerably more straightforward, as it relies on nonparticipant reports of what they actually did with a discarded appliance, rather than what they thought they might do in a hypothetical situation. Using the same categories as Scenario 3 in the participant analysis, the nonparticipant responses are shown in Table 19.¹¹

Table 19. Nonparticipant Freeridership: Survey Responses

Stated Method of Disposal In Absence of Program	Indicative of Freeridership	Nonparticipants (n=32)
Sell it to a private party, either through an ad or selling to someone they know	No	22%
Sell it to a used appliance dealer	Partial	0%
Give it away to a private party, such as a friend or neighbor	No	16%
Give it away to a charity organization, such as Goodwill or a church	No	0%
Put it on a curb with a "Free" sign on it	No	9%
Have it removed by the dealer they got their replacement appliance from	Partial	31%
Haul it to the dump or recycling center themselves	Yes	9%
Hire someone else to haul it away for junking or dumping	Yes	0%
Other	n/a	12%
Total	-	100%

This analysis shows a 32 percent freeridership (those who were already permanently disposing of the appliance) among surveyed nonparticipants. However, this cannot be directly compared to or combined with participant freeridership, as it only includes Scenario 3 freeridership. An adjustment must be made to account for nonparticipants who kept their appliance (Scenario 1), in order to avoid overstating nonparticipant freeridership. As shown in Table 20, data from the participant survey provides an assumed percentage of nonparticipants who would have kept their appliance and continued using it (nonfreeriders). The estimate of freeridership resulting from the nonparticipant survey data reported in Table 19 was adjusted downward by 27 percent to account for the corresponding nonparticipant nonfreeriders.

Table 20. Adjustment to Nonparticipant Freeridership (PY2)

Percent Nonparticipant Scenario 3 Freeridership	Percent Scenario 1 Participant Non-Freeriders	Adjusted Nonparticipant Freeridership
32.1%	27.3%	23.4%

¹¹ After Cadmus had concluded the NTG analysis of nonparticipant survey data, the survey contractor alerted us that one nonparticipant household may have been surveyed twice due to a software glitch. The impact of this potential error on the NTG calculation would have been minimal (on the order of less than 1%) and Cadmus elected to proceed with analysis using the complete data set.

This adjusted nonparticipant freeridership figure is used in Table 21 to calculate program freeridership.

Program Net Savings

Participant and nonparticipant freeridership were combined to determine overall program freeridership, and then subtracted from 1 to yield the program's NTG ratio, as presented in Table 21.¹² The participant and nonparticipant figures were combined using inverse-variance weighting, because the size of the nonparticipant population is unknown.

Table 21. Participant and Nonparticipant Freeridership and Program NTG Ratio (PY2)

Appliance	Percent Participant Freeridership	Percent Nonparticipant Freeridership	Weighted Average Program Freeridership	Program Net-to-Gross Ratio
Refrigerators	18.7%	23.4%	20.9%	0.79
Freezers	15.0%	23.4%	18.5%	0.82

The NTG ratios determined in the PY2 evaluation are substantially higher than those found in the PY1 evaluation. The higher NTG ratios are explained in part by this year's addition of market actor research, which allowed Cadmus to refine our criteria for freeridership with regards to appliance dealers. In the PY1 evaluation Cadmus conservatively designated freeridership for all respondents who said they would have had the appliance picked up by a dealer. This year, the additional information gathered in the market actor interviews allowed us to alter this designation to partial freeridership, indicated by a freeridership score of 0.6. This Illinois-specific aspect of the freeridership analysis will benefit from the continued market actor research that is planned for the PY3 evaluation. The impact on the PY2 NTG was marked, not only because of the change in approach, but also because of a statistically-significant increase in the portion of participants who said they would have had their appliance removed by an appliance dealer.

Furthermore, as noted, PY2 saw a decreased incidence of participants who said they would have kept their appliance but not used it if they had not participated in the program. Here again, there was a statistically significant decrease from PY1 to PY2. It is possible that the first year of the program appealed to people who were not planning to continue using their secondary appliance but had no plans to dispose of it. The instance of this type of freeridership is likely to decline as PY1 may have eliminated a backlog of participants who are in this position. Continued evaluation in PY3 will shed more light on the development of the program in this respect.

The PY2 NTG ratios are also somewhat higher than what is typically found for appliance recycling programs in the United States. This is likely due largely to Ameren Illinois' program design, which focuses on secondary appliances only. In the absence of the program, a secondary

¹² Note the sample of surveyed nonparticipants was not large enough to calculate appliance-specific NTG. As a result, the overall nonparticipant NTG is applied to both refrigerators and freezers.

appliance is more likely to stay in the home and in use than a primary appliance that is being replaced.

Once the PY2 NTG ratios were determined for each measure, total program gross savings were adjusted, to account for freeridership, as presented in Table 22.

Table 22. PY2 Net Annual Energy Savings

Appliance	Total Program Gross Savings (kWh/Year)	NTG	Total Program Net Savings (kWh/Year)	Confidence and Precision*
Refrigerator	11,386,854	0.79	8,995,615	90%/±18.2%
Freezer	4,554,682	0.82	3,734,839	80%±18.9%
Room Air Conditioner	26,136	1.00	26,136	n/a
Total	15,941,536		12,756,590	n/a

* Precision is calculated to reflect the combined effect of error generated by the regression model, part-use estimate, participant NTG, and nonparticipant NTG.

Spillover

The participant survey also asked a number of questions to determine if any spillover resulted from program participation. Fifty three percent of respondents reported that they have made additional energy-efficiency improvements or purchases without any assistance from a utility since participating in the program. The most common action taken was installing CFLs, reported by 29% of the respondents who made improvements, followed by installing high-efficiency washers and dryers (20% and 18% respectively). Of the respondents who made improvements, 32% said gave a rating of 7 out of 10 or higher when asked if their participation in the appliance recycling program influenced their decision to improve energy-efficiency. While these actions are not quantified in terms of additional energy savings attributable to the program, they show that the program exerts some degree of influence on participants' future actions with respect to energy-efficiency.

Impact Evaluation Summary

A summary of PY2 per-unit gross and net energy savings, along with program participation and total program gross and net energy (MWh) and demand (kW) savings is provided in Table 23.¹³ To facilitate comparison between the first and second years of program implementation,

Table 24 depicts the results of the PY1 evaluation.

¹³ Participation, NTG, and kWh and MWh impacts are based on the findings of the PY2 impact. Demand (kW) impacts for refrigerators and freezers were calculated using the coincidence factor determined in the PY1 evaluation. Demand impacts for room ACs were calculated using the coincidence factor assumed for Central ACs in Ameren Illinois' 2007 Energy Efficiency and Demand-Response Plan.

Table 23. PY2 Evaluated Participation, NTG, and Annual Energy Savings

Appliance	Total Recycled Units	Net-to-Gross Ratio	Per-Unit Gross Annual Energy Savings (kWh)	Per-Unit Net Annual Energy Savings (kWh)	Program Gross Annual Energy Savings (MWh)	Program Net Annual Energy Savings (MWh)	Program Gross Annual Demand Savings (kW)	Program Net Annual Demand Savings (kW)
Refrigerators	7,762	0.79	1,467	1,159	11,387	8,996	1,418	1,120
Freezers	3,422	0.82	1,331	1,091	4,555	3,735	567	465
Room Air Conditioners	27	1.0	968	968	26	26	26	26
Total	11,211	n/a	n/a	n/a	15,968	12,757	2,011	1,612

Table 24. PY1 Evaluated Participation, NTG, and Annual Energy Savings

Appliance	Total Recycled Units	Net-to-Gross Ratio	Per-Unit Gross Annual Energy Savings (kWh)	Per-Unit Net Annual Energy Savings (kWh)	Program Gross Annual Energy Savings (MWh)	Program Net Annual Energy Savings (MWh)	Program Gross Annual Demand Savings (kW)	Program Net Annual Demand Savings (kW)
Refrigerators	2,752	.51	1,522	776	4,188	2,143	522	267
Freezers	1,096	.63	1,247	786	1,367	868	170	108
Total	3,848	n/a	n/a	n/a	5,555	3,011	692	375

PY2 showed a strong increase in participation over PY1, logging nearly four times the number of recycled refrigerators and freezers. Per-unit net savings were found to be substantially higher in PY2, due primarily to higher NTG ratios as described above. These factors combined to yield net program savings of nearly 13,000 MWh, up from only approximately 3,000 MWh saved in PY1.

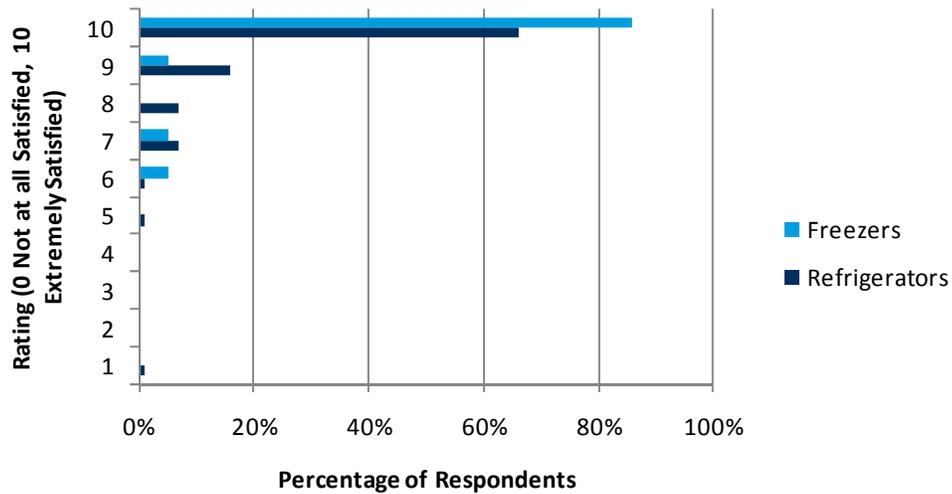
Process Evaluation

Participant Survey Findings

Participants expressed significant satisfaction with the program, with 90% rating the program with an 8, 9, or 10 on a 10-point scale. In fact, only six of the 159 respondents rated their program satisfaction as less than 7 out of 10. Participants' satisfaction responses are illustrated in

Figure 2.

Figure 2. PY2 Participant Satisfaction



Similarly, 98% of customers said they would recommend the program to a friend or family member. Further, 61% of the responding participants said they would have participated even without an incentive. This indicates that participating customers are generally quite pleased with their experience with the program.

Participant Awareness

Sources by which participants became aware of the program are indicated in Table 25 (multiple responses were allowed). Bill inserts (56%) and newspapers or magazines (17%) were the two leading factors cited. Additional ways participants heard about the Appliance Recycling Program included family/friends/word-of-mouth, billboard ads, TV, direct mail brochures, retail stores, radio, and the Ameren Illinois website.

Table 25. PY2 Program Awareness

Type of Marketing	Refrigerator		Freezer		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Bill insert	75	55%	14	64%	89	56%
Newspaper/magazine	25	18%	2	9%	27	17%
Family/friends	20	15%	1	5%	21	13%
Billboard/Outdoor Ad	15	11%	2	9%	17	11%
TV	12	9%	3	14%	15	9%
Direct mail brochure	7	5%	0	0%	7	4%
Retail Store	5	4%	0	0%	5	3%
Radio	4	3%	0	0%	4	3%
Ameren website	2	1%	0	0%	2	1%
Other	1	1%	1	5%	2	1%

Refrigerator and Freezer Descriptions and Characteristics

According to Participant Survey respondents, recycled refrigerators and freezers averaged approximately 25 years old. This is roughly in line with the average age recorded in the participant database by implementation technicians, which was just over 30 years. The difference between the two is likely due to the fact that estimating the age of an appliance can be difficult for customers, since they may not know or remember when the appliance was manufactured. Of those replacing their recycled appliance, 73% were replaced with an ENERGY STAR®-labeled appliance. However, it should be noted the majority of telephone respondents rated their knowledge of energy efficient technologies below a 7 out of 10 (on a 10 point scale).

Appliance location also factors into energy use. As shown in Table 26, almost 70% of the recycled appliances were located in the garage (42%) or kitchen (27%). Approximately 58% of respondents indicated the location of the recycled appliance was heated, while 41% had their recycled appliance in an air conditioned space.

Table 26. PY2 Location of Recycled Appliance

Location	Refrigerator		Freezer		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Garage	55	40%	11	50%	66	42%
Kitchen	42	31%	1	5%	43	27%
Basement	28	20%	9	41%	37	23%
Porch/Patio	2	1%	0	0%	2	1%
Other*	8	6%	1	5%	9	6%
Refused/Don't Know	2	2%	0	0%	2	1%
Total	137	100.0%	22	100.0%	159	100.0%

* Other responses include utility room, laundry room, storage room, pool barn, and living room.

In PY1, only 3.2% of recycled appliances had been in the kitchen, as opposed to 27% in PY2. We can assume that this is because more PY2 respondents were replacing a primary appliance rather than disposing of a secondary appliance, given that 55% of respondents said they replaced the appliance they recycled through the program. This may merit further examination of the method used to ensure that participants are recycling secondary appliances only.¹⁴

Respondents were asked to describe the working condition of the recycled appliance. The majority (63%) indicated the refrigerator or freezer recycled was still in good physical condition. Another 21% said the appliance needed minor repairs, and 14% said the appliance had some problems. Two respondents did not know the condition of their appliance, and only one respondent noted their appliance did not work (which would have made the appliance ineligible to participate had the participant said so when signing up for the program). The fact that the

¹⁴ The NTG analysis independently accounts for the fact that a participant recycling a primary unit might have behaved differently in the absence of the program than a participant recycling a secondary unit, and therefore it is not necessary to confirm whether or not these were indeed primary units.

majority of appliances were cited in good condition reflects positively on the program's ability to capture working but inefficient appliances.

Table 27. PY2 Condition of Recycled Appliance

Condition	Refrigerator		Freezer		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
In good condition	84	63%	13	62%	97	63%
Needed minor repairs	28	21%	5	24%	33	21%
Had some problems	20	15%	2	10%	22	14%
Didn't work	1	1%	0	0%	1	1%
Don't know	1	1%	1	5%	2	1%
Total	134	100.0%	21	100.0%	155	100.0%

Reason and Timing for Recycling

The majority of participants (58%) had considered disposing of their appliances prior to hearing about the program. Alternate ways in which respondents considered disposing of their appliance are listed in Table 28. Respondents gave multiple responses to this question, and the methods of disposal *considered* should not be confused with the method of disposal that respondents would have pursued had they not participated in the program. The later is used to determine freeridership and is discussed in the section on Determination of Net Savings (above).

Table 28. PY2 Alternate Disposal Methods Considered

Disposal Method	Refrigerator (n=97)		Freezer (n=12)		Total (n=109)	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Having it removed by new or replacement dealer *	27	28%	4	33%	31	28%
Giving it away for free	61	63%	8	67%	69	63%
Taking it to a dump or recycling center	47	48%	7	58%	54	50%
Selling it	21	22%	3	25%	24	22%
Hiring someone to take it to the dump or recycling center	19	20%	1	8%	20	18%
Other	18	19%	1	8%	19	17%

* 41 respondents to this question reported that they had replaced their appliance

Survey responses showed that the rebate and convenience of the program influenced participants' decision to recycle their appliance at the time when they did. Table 29 shows that almost half (42%) of respondents stated the main reason they decided to recycle their appliance with Ameren Illinois was due to the incentive payment they received. Another 24% of respondents indicated the convenience of the program was the reason they went with the Ameren Illinois program over other options. Other reasons for participating in the program included its

benefit for the environment, the free pick-up, and recommendations from friends or family members.

Table 29. PY2 Main Reason for Choosing Program over Other Disposal Options

Reason Cited	Refrigerator		Freezer		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Cash	60	44%	7	32%	67	42%
Convenient	32	23%	6	27%	38	24%
Good for environment	16	12%	1	5%	17	11%
Free pick-up	12	9%	4	18%	16	10%
Only program known	1	1%	0	0%	1	1%
Recommendation	2	1%	0	0%	2	1%
Other	14	10%	4	18%	18	11%
Total	137	100.0%	22	100.0%	159	100.0%

Notably, in PY1, the free pick-up was mentioned above all other options as the main reason for participation (over 48%), even more than the program incentive (27.5%). In PY2, respondents were asked if they still would have participated in the program had the \$35 per appliance incentive not been available. Seventy-six percent of respondents claimed they would have participated in the program had the rebate amount been less, and 61% indicated they still would have participated in the program without the incentive altogether.

These results suggest that the cash incentive was not a primary motivator for program participation. The fact that nearly three-quarters of participants would have participated in the program regardless of the incentive begs the question of whether the incentive was necessary. Alternatively, 44% of refrigerator respondents indicated that “cash” was the main reason for choosing the recycling program over other disposal options. The convenience of the program clearly stood out significantly for respondents. They saw this service as a benefit, as many would have had to find a way to dispose of their appliance had the program not existed. This is illustrated by the fact that 70% of respondents would still have disposed of their appliance in some way had the program not been available, and 82% of that group would have disposed of it within a year of program participation.¹⁵ It should be noted, however, that a monetary incentive is often necessary to capture some respondents’ attention and that a modest incentive is common practice in appliance recycling programs.

Customers seem to be interested in taking steps to save money and reduce energy use in their homes. In fact, 73% of respondents said that they have installed new equipment or technologies to save money and energy, and 65% have read their energy bills to understand how energy use relates to the amount on their energy bill. Table 30 shows different actions respondents have taken to reduce their energy use (multiple responses possible).

¹⁵ The customers’ intention to dispose of their appliance(s) should not be confused with freeridership. As explained in the section on Determination of Net Savings above, only customers who would have disposed of the appliance in a way that would permanently remove it from use are considered freeriders.

Table 30. PY2 Actions Taken to Reduce Energy Bills

Action Taken	Refrigerator		Freezer		Total	
	n	Percent Responding	n	Percent Responding	n	Percent Responding
Installed new equipment or technologies	98	72%	18	82%	116	73%
Read energy bill	90	66%	14	64%	104	65%
Research equipment or technologies	82	60%	14	64%	96	60%
Research ideas on saving energy	72	53%	13	59%	85	53%

Stakeholder Interview Findings

Interviews with Ameren Illinois' Appliance Recycling Program stakeholders further illuminated the functioning of the program in PY2. The findings of these interviews are summarized here.

Program Design. As presented in the program description in Chapter 2, Ameren Illinois' program design is similar to that employed by many utilities nationwide. The program's eligibility requirements limit participation to units being used as secondary appliances. Stakeholders pointed out this requirement during interviews as a distinguishing characteristic of the Ameren Illinois program compared to other programs around the country.

The program implementer, ARCA, accepts incoming calls from prospective customers who have heard of the program through various marketing channels. ARCA then schedules the pick-up appointment, picks up the appliance, recycles the appliance following environmental protocols, and provides the customer with an incentive on behalf of Ameren Illinois.

CSG performs all the program marketing, collects participation data from ARCA every month, and conducts quality assurance. CSG is responsible for reporting and billing to Ameren Illinois, as well as budget tracking for the program. CSG also holds similar responsibilities for all of Ameren Illinois' residential DSM programs.

Changes during Implementation. All stakeholders recognized an unforeseen change that affected the program during PY2. The State of Illinois used funding from the American Recovery and Reinvestment Act of 2009 to support an appliance rebate program that allowed Ameren Illinois customers to collect a second incentive on top of that which the utility already offered. This caused participation in the Residential Heating and Cooling Program to increase greatly, and the program surpassed its incentive budget by roughly 500%. Ameren Illinois and CSG decided to reduce the budget of the appliance recycling program substantially in April 2010, transferring the funds to the appliance rebate program to help support the unexpectedly high participation. This decision, coupled with an intentional reduction in program marketing, caused decreased refrigerator and freezer pick-ups from an anticipated 1,500 per month to only about 700 per month for the last two months of the program year. Because of this change in budget allocations, the program participation goals had to be reevaluated and lowered. The CSG contact is confident that they have successfully considered this type of situation for PY3 planning.

PY2 added small commercial customers to the program, as opposed to offering the program to residential customers only.

Going forward into PY3, Ameren Illinois and its subcontractors have made a change to appliance recycling requirements, altering the minimum appliance manufacture date from 1993 to 2001. This change will allow newer but still less-efficient units to be recycled, since federal appliance standards enacted in 2001 made significant improvements to refrigerator and freezer efficiency.

Stakeholders also mentioned that the inclusion of primary units in addition to secondary units had been considered but rejected for PY3 because net savings associated with recycling primary units are likely to be lower. It is still a possibility for future program years.

Regular Communication. All stakeholders said communications between the three parties (Ameren Illinois, CSG, and ARCA) were regular and effective. Formal meetings changed from weekly in PY1 to biweekly in PY2, in addition to frequent phone and email communication. These meetings include discussion of marketing concepts, participation numbers, goals, issues, and transportation. Once a week, the Energy Efficiency Advisor from Ameren Illinois visits CSG to discuss all residential efficiency programs. There is a monthly meeting for CSG to present portfolio-wide progress reports to Ameren Illinois, which keeps everyone apprised of budget and direct expense status. ARCA reports to CSG on the effectiveness of the marketing campaigns, and CSG has access to a Website that ARCA maintains to track the number of units picked up every day. All stakeholders stated that there is no lack of communication between the three parties.

Marketing Efforts. CSG manages all program marketing efforts. When ARCA schedules customers for pickups, they ask how customers learned of the program, and then provide feedback to CSG on which marketing efforts are most effective. That feedback is then incorporated into CSG's marketing strategy.

Marketing includes bill inserts, billboards, television, newspaper, and radio advertisements. These generally serve as the first line of communication to prospective customers. Bill inserts are delivered to 1.2 million customers four times a year, and television ads are targeted to larger metropolitan areas. Ameren Illinois held a media event advertising the 10,000th pickup, and Act on Energy branding was used to make customers more aware of the program.

Program marketing can be challenging in Ameren Illinois' service territory because it spans approximately 44,000 square miles, a significant portion of which is agricultural land. Some rural customers remain difficult to reach through media outlets. Additionally, some areas are close to state borders, making radio and television marketing inadvisable because stations broadcast across state lines. The most notable area where this is problematic is East St. Louis, where the primary media outlets are based in Missouri. Ameren Illinois is using bill inserts and local newspapers to advertise the program to customers in this territory.

Quality Control. ARCA performs on-the-ground quality assurance. During the recruiting process, ARCA staff is trained to follow the telephone script provided. Information collected over the phone is uploaded into a PDA for field staff. ARCA staff also is trained to recognize qualifying units (age, working condition, etc.), and all this information is uploaded into the database. All units go through an auditing and invoicing process at corporate headquarters. If a unit doesn't qualify upon arrival at a location, field staff explains the situation to the customer and either leaves the unit at the house or disposes of it without charging Ameren Illinois or providing an incentive to the customer.

CSG performs quality control. They compare the invoice amount to the data online provided by ARCA to make sure savings and units are being reported properly. Both CSG and Ameren Illinois representatives visit the recycling facility to make sure everything is in order and to communicate with facility staff about the program.

Customer Communication. Stakeholders indicated that their communication with customers is generally positive. Very few customer complaints have been recorded. The complaints that do occur tend to be about scheduling problems, especially when customers have ineligible units and do not understand the eligibility requirements. Some customers would like their primary unit to be picked up and have complained that primary units do not qualify. ARCA keeps a complaint log, which they use to keep track of escalation. If the customer service lead cannot resolve the issue, the complaint goes to the supervisor, then to second-level management, and finally to ARCA's vice president. Customer complaints have escalated only a handful of times over the life of the program.

Implementation Barriers. As discussed above, Ameren Illinois and implementation staff stated that it can be difficult to conduct marketing to a 44,000 square mile territory. This area includes 22 zones where ARCA performs pick-ups, so a substantial number of media outlets are involved.

Multiple interviewees mentioned that the demographic characteristics of customers in the service territory present barriers to participation. The two examples given were the substantial number of hunters in Illinois who use old freezers to store meat and are reluctant to dispose of them, and empty nesters (people whose children have grown up and left home), who often keep secondary refrigerators and tend not to participate in the program. Ameren Illinois developed its current marketing campaign to appeal to the empty-nester population.

Market Actor Interview Findings

The findings of the market actor interviews were used to inform the NTG analysis. They also are informative from a process perspective, as they provide insight into the function of the appliance recycling market that exists beyond Ameren Illinois' program. The results are presented here, first of the interviews with appliance retailers, and then of the interviews with appliance haulers. The units they pick up, recycle and resell are all outside of the Ameren Illinois program.

Interview Results: Appliance Retailers

Six appliance retailers were interviewed to find out what services they offer with respect to used appliances, and whether Ameren Illinois' program has impacted their participation numbers.

The first set of questions focused on the sales process and offerings.

- Only two of the six retailers offered trade-ins on appliance purchases.
- Five of the six retailers provide removal services only when the customer purchases a new unit.
 - Only one of the five charges a fee for the removal, of \$45.
 - One of the five retailers contracts out the removal service to a hauling company.
 - The average number of refrigerators picked up annually was 80, with the minimum at 25 and the maximum at 175.

- The average number of freezers picked up annually is 33, with the minimum at 10 and the maximum at 100.
- Two out of the five retailers resell the units they pick up. One of the retailers resells every unit regardless of working condition or age, and the other retailer only resells units that are in good working condition. When asked what age they would estimate to be the oldest an appliance could be and still be considered for resale, one answered 25 years, and the other 30 years.
- When asked to estimate the percent of refrigerators and freezers their company (or contractor on behalf of the company) picks up each year that are resold either directly to customers or to other companies for resale, one of the retailers responded with 75%, and the other responded with 70%.

The next set of questions focused on the pickup and removal services.

- Three of the five retailers that offer pickup services claim that they never inspect the unit to verify that it is in working condition. One of the remaining two said that they always check, and the other explained that the removal service they contract with verifies the conditions.
- When asked where the working units are taken once they are removed, two retailers bring them back to the store for resale; two bring all units to a recycling center; and the one that contracts out the removals did not know where the units were taken.
- When asked where the non-working units are taken after removal, one brings them back to the store for resale, one brings them to the junk yard, two take them to a recycling center, and the one that contracts out the removals did not know where the units were taken.
- The retailer that resells both working and non-working units typically takes all non-working units that can't be resold to the junk yard.
- Only two respondents were aware of what happens to hazardous waste after removal, and both claimed that all hazardous chemicals are removed and disposed of properly.

The respondents were then asked about their awareness of the Ameren Illinois Appliance Recycling Program.

- All six respondents are aware of the program.
 - Two could not recall how they had heard of it.
 - Two heard about it from their boss.
 - One claimed to have heard about it through word-of-mouth.
 - One had heard about it from an advertisement.
- When asked if they think the program will help the sales of new appliances, three responded no, one did not know, and two responded yes.
 - One of the respondents who answered yes said *“If it's easy for someone to get rid of an old appliance and they get paid for it, they will be more likely to buy a new one.”*

- The second respondent who answered yes claimed that ENERGY STAR[®] appliances had been selling better since the program started.
- When asked if the program has had any impact on the used appliance market, four responded no, and two said they didn't know.
- All six respondents said they thought Ameren Illinois' marketing of its appliance recycling program has been effective.

The retailers, with one exception, took ownership of all delivery and removal services. Given the size of the operations, the people who took part in the interview were knowledgeable.

Two retailers said that the refrigerators they pick up are taken to recycling centers regardless of working condition, one resells units at their store regardless of working condition, and only one respondent distinguishes working from nonworking and deals with them differently, by reselling working units and taking nonworking units to the junkyard.

Interview Results: Appliance Haulers

Four appliance haulers were interviewed to find out services they provide in appliance removal and whether their market has been impacted by Ameren Illinois' program.

The first set of questions focused on the pickup and removal services.

- All four interviewed haulers pick up both refrigerators and freezers.
- None of the respondents have any arrangements with new or used appliance retailers to pick up and haul away old appliances.
- The average number of refrigerators picked up annually is 106, with the minimum at 75 and the maximum at 150.
- The average number of freezers picked up is 83, with the minimum at 20 and the maximum at 150.
- When asked what percentage of the refrigerators they pick-up do they estimate were replaced with newly purchased models, two did not know, one said 50%, and one said 60%.
- All four companies pick up both working and non-working units.
 - Two said the working units are resold, and the other two recycle the working units.
 - All four recycle the non-working units. Two mentioned the hazardous chemicals are disposed of properly.
 - One company resells their units directly to a used appliance store to be fixed and resold, and one resells units they pick up directly to customers. The other two do not resell the units to customers or other companies.
 - One respondent who resells the units makes sure the units are in working condition, and claims that the oldest a unit should be for resale is 15 years. She also claimed that only 10% of refrigerators and freezers they pick up are considered for resale.
- None of the haulers bring units to a junkyard or dump.

- None of the haulers dismantle the units for parts.

The final set of questions asked about the respondents' awareness of Ameren Illinois' Appliance Recycling Program.

- All four respondents had heard of the program.
 - Two heard about it from an advertisement, one could not remember, and the final respondent heard of it through word-of-mouth.
- When asked if they think the program will reduce the number of appliance pick-ups for their company, two said no and two said yes.
 - One "yes" respondent said "*People might start using other haulers besides us, since they will be getting money from them to pick up their appliances, and we don't offer to pay anyone.*"
- None of the haulers believe the program has had any impact on the used appliance market.
- All four respondents believe Ameren Illinois' marketing of its appliance recycling program has been effective.

One retailer did not know what happened to units because they hire a third-party hauler to pick up and dispose of units. Given that all haulers interviewed claim to recycle and properly dispose of hazardous waste, an assumption can be made that the third-party hauler mentioned by the retailer also recycles and properly disposes of waste.

Market Actor Interview Findings

The information gathered from market actors, while anecdotal in nature, clearly shows that the Ameren Illinois appliance recycling program is a known actor within the used appliance market: all ten interviewees were familiar with the program. Less than 50% of the interviewed market actors thought the program would impact their business, however. This lack of perceived impact is not surprising, given that the program is still new, and market transformation happens slowly.

Further, the interviews found that two out of the five appliance dealers who provide removal services for used appliances resell the second-hand units. This finding, in addition to informing the NTG calculations as described in the section on Determination of Net Savings, indicates that some appliances removed by appliance dealers likely get reused by another Ameren Illinois customer.

5. Conclusions and Recommendations

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

Conclusions

- ***Program Design Did Not Impede Participation in PY2.*** Despite some skepticism expressed by program staff regarding the program's limitation to secondary appliances only, the program saw high levels of participation in the early part of PY2, indicating that it could continue to meet participation goals with its current design.
- ***Spring Participation in PY2 Slowed due to Funding Changes.*** As staff reported, and as the program data reflects, a reduction in funding available for the Appliance Recycling Program occurring in April 2010 caused lower than anticipated participation in the last two months of the program year because Ameren Illinois reduced program funding to increase funding to meet the greater than anticipated demand for the Residential Heating and Cooling program.
- ***Participants may be Recycling Primary Units.*** The survey data indicate that a significant portion (27%) of units recycled through the program had been kept in the kitchen. Because unit location is a strong indicator of whether the unit is a primary or secondary appliance, this may signify that some of these appliances were in fact primary units. The contractor does ask the appliance owner to confirm the appliance is secondary, however. Further, 28% of surveyed participants stated that they had considered having their appliance removed by the dealer who sold them a replacement appliance. This may be another indicator that some appliances were primary.
- ***Small Commercial Participation was Limited.*** Ameren Illinois followed the PY1 recommendation to open up participation to small commercial customers; however, only 26 appliances were recycled by small commercial customers during PY2, representing less than 1% of total participation.
- ***The Program Team has Continued to Work Well Together.*** Based on feedback from interviewed staff, satisfaction levels expressed by surveyed participants, and the observed program participation level, it appears the program's management and implementation team have continued to administer the program successfully in PY2.
- ***Market Actors in the Used Appliance Market are Aware of the Program.*** The interviewed market actors did not indicate that the program had a large impact on their businesses, but were aware that it was operating in their service area. As the program matures, there may be more significant interaction between the Appliance Recycling Program and the used appliance market as a whole.

Recommendations

- ***Reexamine Procedures and Definitions Regarding Secondary Units.*** The survey's finding that 27% of units were located in the kitchen prior to recycling is cause for a reexamination of the procedures the implementer uses to determine a unit's primary or secondary status. It may be necessary to revise definitions or procedures to ensure that customers are not replacing their primary unit and then considering the replaced unit to be secondary. Alternatively, as described in the next recommendation, Ameren Illinois could evaluate the cost effectiveness of allowing for primary unit recycling.
- ***Explore the Possibility of Broadening Eligibility for Increased Participation.*** While the current rate of participation appears to be robust, allowing customers to recycle primary units would increase the number of eligible units substantially, and eliminate some concerns over eligibility noted in the previous recommendation. If increased participation is desired in future program years, Ameren Illinois should consider eliminating the restriction on primary units from their program design. Because savings are considered at the system level rather than the household level, unit replacement does not reduce per-unit savings (i.e. a household replacing a primary unit may be disposing it through a dealer who resells the unit to another household). This change would likely cause lower NTG ratios in future years, but with a significant enough increase in participation, the net effect could be increased savings.

Appendix A. Participant Survey Instrument

Ameren Illinois Utilities Residential Appliance Recycling Program

Participant Survey

May 2010

Hello, my name is _____ from PA Consulting. I'm calling on behalf of Ameren Illinois Utilities, which includes CIPS [pronounced "Sips"], CILCO ["Silco"], IP [say the letters separately, "I" - "P"] and Metro East.

I am calling to ask you some questions about your participation in their Appliance Recycling Program. Please be assured this is not a sales call. My questions are for research purposes only. Your opinions are important in helping us improve our programs, and understand how to assist customers in saving money on their utility bills. Your responses will be used by Ameren Illinois Utilities to evaluate energy-efficiency programs.

[If respondent asks how long, say "About 20 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 Ameren Illinois Utilities about the program.
- Respondent is not a utility employee.
- The appliance was removed from a residence where Ameren Illinois Utilities is the electric utility.

1. According to our records, your household participated in Ameren Illinois Utilities' program to recycle refrigerators and freezers. Would you be the person in your home that knows the most about participating in this program?
 1. Yes [**Go to Q2**]
 2. No
 98. Don't know
 99. Refused

[If Q1="No", ask to speak to that person. If Q1="Not a convenient time," arrange a more convenient time for us to call them at home. Emphasize that "It is important for Ameren Illinois Utilities to include your opinions in this study to better serve your needs."]

2. Are you an employee of Ameren Illinois Utilities?
 1. Yes [**Terminate**]
 2. No
 98. Don't know [**Terminate**]
 99. Refused [**Terminate**]

3. Which power company provides electric power to the home from which the appliance was removed?
1. Ameren Illinois Utilities/CIPS/CILCO/IP/Metro East
 2. Other **[Terminate]**
 98. Don't know
 99. Refused

VERIFICATION**IF [REF_QTY] >=1;**

4. Our program records indicate you received an incentive for having **[REF_QTY]** refrigerator(s), recycled by Ameren Illinois Utilities' program around **[Pickup_Date]**. Is this the correct quantity you recall being picked up by the recycling program?
1. Yes
 2. No
 98. Don't know
 99. Refused

[ASK IF Q4=2]

5. How many refrigerators did you have recycled through Ameren's program?
1. _____ **[Record Quantity of Refrigerators]**
 98. Don't know
 99. Refused

IF [FRE_QTY] >=1;

6. Our Program records indicate you received an incentive for having **[FRE_QTY]** freezer(s) recycled by Ameren Illinois Utilities' program around **[Pickup_Date]**. Is this the correct quantity you recall being picked up by the recycling program?
1. Yes
 2. No
 98. Don't know
 99. Refused

[ASK IF Q6=2]

7. How many freezers did you have recycled through Ameren's program?
1. _____ **[Record Quantity of Freezers]**
 98. Don't know
 99. Refused

AWARENESS AND PURCHASE INFORMATION

8. How did you first learn about Ameren's appliance pick-up and recycling program? **[Do not read, prompt if necessary. Check all that apply and record verbatim.]**
1. Newspaper/magazine/print media
 2. Bill inserts/contact
 3. Ameren Illinois Utilities Web site
 4. Other Web site **[Which Web site?]** _____
 5. Internet advertising/ online ad
 6. Family/friends/word-of-mouth
 7. Ameren Illinois Utilities Representative
 8. Radio
 9. TV
 10. Billboard/outdoor ad

11. Direct mail brochure
 12. Realtor
 13. Home builders
 14. Other newsletter
 15. Retailer/store [e.g. Sears, Best Buy, Ace Hardware]
 16. Sporting event
 17. Home shows/trade shows
 18. Appliance recycling contractor
 19. Other [**Specify**]_____.
 98. Don't know
 99. Refused
9. On a scale from 0 to 10 where 0 means you are not at all knowledgeable and 10 means you are very knowledgeable, how would you rate your current knowledge of energy efficient technologies?
1. _____ [**Record Rating 0-10**]
 98. Don't know
 99. Refused
10. Have you taken any of the following actions to reduce your energy bills? [**Mark all that apply**]
1. Researched ideas on saving energy
 2. Read your energy bills to understand how your energy use relates to the amount of your energy bill
 3. Researched specific equipment or technologies that save energy
 4. Installed new equipment or technologies to save energy
 98. Don't know
 99. Refused

PROGRAM SATISFACTION

“Now I have some questions about your satisfaction with your participation in the program.”

11. Did you feel that the program’s requirements and process were adequately explained to you?
1. Yes [**Skip to Q13**]
 2. No
 98. Don’t know [**Skip to Q13**]
 99. Refused [**Skip to Q13**]
12. What was the problem that you encountered? [**Do not read; mark all that apply**]
1. I had to call the program to get clarification.
 2. It was unclear where the appliance should be located prior to pickup
 3. It was unclear why I had to plug the appliance in
 4. Contractor never showed up/showed up late.
 5. Difficult to get an appointment time that was convenient for me.
 6. Other [**Record Response**] _____
 98. Don’t know
 99. Refused
13. From the time you first contacted the program about your [**refrigerator, freezer**], about how many days did it take before the appliance was picked up?
_____ [**Record Response**]
14. Do you think this was a reasonable amount of time?
1. Yes
 2. No
 3. Don’t know
 4. Refused
15. Did you get a phone call to confirm your pick-up date and time?
1. Yes
 2. No
 98. Don’t know
 99. Refused
16. On the day of the pick-up, did you receive a call to tell you someone would arrive soon?
1. Yes
 2. No
 98. Don’t know
 99. Refused
17. Did the technicians who removed your [**refrigerator, freezer**] behave in a professional manner?
1. Yes [**Go to Q19**]
 2. No
 98. Don’t know [**Go to Q19**]
 99. Refused [**Go to Q19**]

18. In what way were they unprofessional?
_____ **[Record Response]**
19. On a scale of 0 to 10, with 0 being extremely dissatisfied and 10 being extremely satisfied, how satisfied were you with the time it took to receive your \$35 incentive check for participating?
1. _____ **[Record Rating 0-10; if > 5, Go to Q21]**
98. Don't know
99. Refused
20. For what reasons do you give that rating? **[Do not read; mark all that apply]**
_____ **[Record Response—Use below for code]**
1. I never received an incentive.
 2. It took longer than I was told it would take.
 3. The incentive was mailed to the wrong address.
 4. Other **[Record Response]** _____
 98. Don't know
 99. Refused
21. On a scale of 0 to 10, with 0 being extremely dissatisfied and 10 being extremely satisfied, how satisfied are you overall with the Ameren Illinois Utilities Appliance Recycling Program?
1. _____ **[Record Rating 0-10; if > 5, Go to Q23]**
98. Don't know
99. Refused
22. For what reasons do you give it that rating? **[Do not read; mark all that apply]**
_____ **[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. Took too long for them to remove our **[refrigerator, freezer]**
 7. Other **[Record Response]** _____
 98. Don't know
 99. Refused
23. Would you recommend Ameren's Appliance Recycling Program to friends or family members?
1. Yes
2. No
98. Don't know
99. Refused
24. Is there anything you would suggest to improve Ameren's Appliance Recycling Program?
[Record response]

APPLIANCE DESCRIPTION

- 25. IF [TOT_QTY] = 1:** Now I'm going to ask you some specific questions about the [refrigerator, freezer] that was picked up and recycled by Ameren Illinois Utilities. **[Go to Q26]**

IF [TOT_QTY] > 1: For the rest of the survey, I'd like to focus on just one of the appliances you recycled through Ameren's program. It does not matter which appliance you choose, just that you respond only with that appliance in mind for the rest of the survey. Can you tell me which appliance you've selected to tell me about?

1. ____ Refrigerator
 2. ____ Freezer
- 26.** How old was your [refrigerator, freezer]? **[Record response in years, enter "00" if less than one year]?**
1. _____ **[Record years]**
 98. Don't know
 99. Refused
- 27.** For the majority of 2009, where within your home was the [refrigerator, freezer] located?
1. Kitchen **[Go to Q30]**
 2. ..Garage
 3. ..Porch/patio
 4. ..Basement
 5. Other **[Specify]** _____
 98. Don't know
 99. Refused
- 28.** Thinking about the year prior to recycling the [refrigerator, freezer], was it plugged in and running ... **[Read all]**
1. ..All the time **[Go to Q30]**
 2. ..For special occasions only
 3. ..During certain months of the year only, or
 4. ..Never plugged in or running **[Go to Q55]**
 98. Don't know
 99. Refused
- 29.** If you were to add up the total amount of time it was running in the year prior to being picked up, how many months would that be? Your best estimate is okay. **[Get nearest month]**
1. .. ____ **[Record number of months 1-11]**
 2. ..All the time
 98. Don't know
 99. Refused
- 30.** Was the location of [refrigerator, freezer] heated?

1. ..Yes
 2. ..No
 98. Don't know
 99. Refused
- 31.** Was the location of **[refrigerator, freezer]** air-conditioned?
1. ..Yes
 2. ..No
 98. Don't know
 99. Refused
- 32.** How would you describe the condition of the **[refrigerator, freezer]** you got rid of? Would you say ...? **[Read, record one response only.]**
1. ..It worked and was in good physical condition.
 2. ..It worked but needed minor repairs **[Example: door seal or handle].**
 3. ..It worked but had some problems **[Example: it wouldn't defrost].**
 4. ..It didn't work
 98. Don't know
 99. Refused
- 33.** Had you already considered disposing of the **[refrigerator, freezer]** before you heard about Ameren's appliance recycling program? By dispose of, I mean getting the appliance out of your home by any means including selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.
1. ..Yes
 2. ..No
 98. Don't know
 99. Refused
- 34.** Did you replace the **[refrigerator/freezer]** that you recycled through Ameren's Program?
1. ..Yes
 2. ..No **[Go to Q39]**
 98. Don't know **[Go to Q39]**
 99. Refused **[Go to Q39]**
- 35.** Did you replace the **[refrigerator/freezer]** with a new or used appliance?
1. ..New **[Go to Q37]**
 2. ..Used
 98. Don't know **[Go to Q39]**
 99. Refused **[Go to Q39]**
- 36.** What would you estimate the age of your replacement appliance to be? **[NOTE: IN YEARS, ENTER 00 IF LESS THAN ONE YEAR]**
1. Years _____
 98. Don't know
 99. Refused
- 37.** Was the replacement **[refrigerator/freezer]** ENERGY STAR rated?

1. ..Yes
 2. ..No
 98. Don't know
 99. Refused
- 38.** Did you buy your replacement appliance from a national retailer, a local retailer or an individual? **[if necessary, explain that “By national retailer, we mean a chain or big-box store like Best Buy or Sears, and by local retailer, we mean an independently owned or “mom & pop” store.]**
1. National Retailer
 2. ..Local Retailer
 3. ..Individual
 98. Don't know
 99. Refused
- 39.** Had Ameren's appliance recycling program not been available, what would you most likely have done with your old **[refrigerator, freezer]**? Would you have...? **[Read]**
- 1. Disposed of it (in any manner) [Go to Q42]**
 2. Kept it
 98. Don't know **[Go to Q42]**
 99. Refused **[Go to Q42]**
- 40.** If the program had not been available and you had kept the **[refrigerator, freezer]**, would you have kept it in the same location you mentioned earlier? That is would it have been located in **[READ IN ANSWER FROM Q27]**?
1. Yes **[Go to Q42]**
 2. No
 98. Don't know **[Go to Q42]**
 99. Refused **[Go to Q42]**
- 41.** Where would this **[refrigerator/freezer]** been located had you kept it? **[Prompt if necessary]**
1. Kitchen
 2. ..Garage
 3. ..Porch/patio
 4. ..Basement
 5. Other **[Specify]** _____
 98. Don't know
 99. Refused

[SKIP TO Q54 IF Q39=2]

- 42.** If Ameren's program had not been available, how soon do you think you would 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?
1. ..Within a year of when the program took it
 2. ..More than a year later
 98. Don't know
 99. Refused

CONSIDERATION OF ALTERNATIVES

43. Now I am going to read you a list of alternative ways that you could have disposed of this **[refrigerator/freezer]** if the Ameren Illinois Utilities appliance recycling program hadn't been available. For each, please tell me if this is a method you had *seriously* considered prior to participating in the program.

[Programmer Notes: Include Alternative 3 only if Q38 = 1 or 2]

1. Selling it
2. Giving it away for free
3. Having it removed by the dealer you got your new or replacement **[refrigerator/freezer]** from
4. Taking it to a dump or recycling center
5. Hiring someone to take it to a dump or recycling center
6. Getting rid of it in some other way that I haven't mentioned

For each alternative:

1. Yes – considered
2. No – did not consider or did not know about
98. Don't know
99. Refused

[ASK IF Q=43_1 = 1]

44. You mentioned that you seriously considered selling your **[refrigerator/freezer]** prior to participating in Ameren's program. Did you consider selling this **[refrigerator/freezer]** to a private party, to a used appliance dealer or to someone else?
1. ..Private party
 2. ..Used appliance dealer
 3. ..Someone else **[Specify _____]**
 98. Don't know
 99. Refused

[IF Q44=2 AND Q26=16+ YEARS OLD]

45. Market research studies suggest that used appliance dealers rarely purchase a **[refrigerator, freezer]** more than 15 years old. Earlier you said that your **[refrigerator, freezer]** was more than 15 years old. Was that the reason why you ended up not selling your **[refrigerator, freezer]** to a used appliance dealer?
1. ..Yes
 2. ..No
 98. Don't know
 99. Refused

[SKIP IF Q45=1]

46. Why did you not sell the **[refrigerator, freezer]**? **[Do not read]**

1. ..Couldn't find an interested dealer/non-dealer at the price I wanted.
2. ..Couldn't find an interested dealer/non-dealer because of the unit's condition.
3. ..Decided recycling unit was more important than selling it.
4. ..Too time consuming
5. ..Other [**Specify**_____]
98. Don't know
99. Refused

[ASK IF Q43_2=1]

47. You mentioned that you seriously considered giving your [**refrigerator/freezer**] away prior to participating in Ameren's program. Which of the following did you consider most seriously? [**Read list, Allow only one response**]
1. ..Giving it away to a private party, such as a friend or a neighbor
 2. ..Giving it away to a charity organization, such as Goodwill Industries or a church
 3. ..Putting it on a curb with a "Free" sign on it
 4. ..Or something else [**Specify**_____]
 98. Don't know
 99. Refused

[ASK IF Q47=1, 2]

48. You mentioned that you seriously 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?
1. ..Yes
 2. ..No
 98. Don't know
 99. Refused

[ASK IF Q43_3 =1]

49. You mentioned earlier that you seriously considered having your [**refrigerator/freezer**] removed by the dealer you got your new [**refrigerator/freezer**] from. If an appliance dealer were to take it away, how much, if anything, do you think you would have had to pay for this service?
1. ..Nothing/free service
 2. ..Dollars _____ [**\$1 - \$200**]
 98. Don't know
 99. Refused

[ASK IF Q43_4 =1]

50. 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. Did 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?
1. ..Yes, could have done it myself
 2. ..Would have needed assistance
 98. Don't know

99. Refused

[ASK IF Q43_4 =1]

51. Most garbage dumps and recycling centers 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 you would have to pay a fee of at least \$25 at the dump or recycling center?
1. ..Yes
 2. ..No
 98. Don't know
 99. Refused

[ASK IF Q43_5=1]

52. You mentioned earlier that you seriously considered hiring someone to take your **[refrigerator/freezer]** to a dump or recycling center. 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?
1. ..Nothing/free service
 2. ..Dollars _____ **[\$1 - \$200]**
 98. Don't know
 99. Refused
53. Now that we have discussed some of the alternative ways your **[refrigerator/freezer]** could be recycled, as well as the additional factors involved with each, what would you have most likely done with the **[refrigerator, freezer]** had you not disposed of it through Ameren Illinois Utilities 's program?

[Read list unless respondent indicates choice without reading the list]

1. ..Sold it to a private party
2. ..Sold it to a used appliance dealer
3. ..Given it away to a private party, such as a friend or a neighbor
4. ..Given it away to a charity organization, such as Goodwill Industries or a church
5. ..Put it on a curb with a "Free" sign on it
6. ..Had it removed by the dealer you got your new or replacement refrigerator from
7. ..Taken it to a dump or recycling center
8. ..Hired someone to take it to a dump or recycling center
9. ..Gotten rid of it some other way [**Specify**]_____
10. Kept it
98. Don't know
99. Refused

[IF Q53=10]

54. Since you would have kept the **[refrigerator, freezer]** had you not gone through Ameren's program, would you have kept it plugged in or stored unplugged indefinitely?

1. ..Kept plugged in
 2. ..Stored unplugged indefinitely
 98. Don't know
 99. Refused
55. What is the MAIN reason you chose to get rid of your [refrigerator, freezer] through Ameren's program 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/freezer," respond "Yes, but why did you choose to discard it through Ameren's program rather than through another method?"]

1. ..Cash/incentive payment
 2. ..Free pick-up service/others don't pick up/don't have to take it myself
 3. ..Environmentally safe disposal/recycled/good for environment
 4. ..Recommendation of a friend/relative
 5. ..Recommendation of retailer/dealer
 6. ..Utility sponsorship of the program
 7. ..Easy way/convenient
 8. ..Never heard of any others/only one I know of
 9. ..Other [Specify]
 98. Don't know
 99. Refused
56. Would you have participated in the program if the amount of the rebate had been less?
1. Yes
 2. No [Go to Q58]
 3. Maybe
 98. Don't know
 99. Refused
57. Would you have participated in the program with no rebate check altogether?
1. Yes
 2. No
 98. Don't know
 99. Refused

SILLOVER AND MARKET IMPACT

58. Since participating in the appliance pick-up and recycling program, have you participated in any other energy efficiency programs offered by Ameren Illinois Utilities?
1. Yes
 2. No [Go to Q61]
 98. Don't know [Go to Q61]
 99. Refused [Go to Q61]
59. Which programs did you participate in? [Record]

98. Don't know

99. Refused
60. On a scale from 0-10, where 0 is not at all influential and 10 is extremely influential, how influential was your participation in the recycling program in your decision to participate in another Ameren energy-efficiency program?
 _____ **[Record Rating 0-10]**
98. Don't know
 99. Refused
61. 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 organizations since participating in the appliance recycling program?
1. Yes
 2. No **[Go to Q64]**
 98. Don't know **[Go to Q64]**
 99. Refused **[Go to Q64]**
62. What actions did you take? **[Do not prompt, allow multiple responses]**
1. Installed a high-efficiency dishwasher
 2. Installed a high-efficiency washer
 3. Installed a high-efficiency dryer
 4. Installed a high-efficiency refrigerator
 5. Installed a high-efficiency water heater
 6. Installed CFLs **[Compact Fluorescent Light bulbs or curly bulbs]**
 7. Other, **[Record Response]** _____
 98. Don't know
 99. Refused
63. On a scale from 0-10, where 0 is not at all influential and 10 is extremely influential, how influential was your participation in the recycling program on your decision to take this energy-efficiency action?
 _____ **[Record Rating 0-10]**
98. Don't know
 99. Refused

DEMOGRAPHICS

“Now I have just a few final questions about your home and energy use.”

64. Which one of the following best describes the type of home in which you live?
1. A single-family detached **[no common walls]**
 2. A single-family attached **[at least one common wall with the surrounding swellings, such as a town home, patio home, or condo]**
 3. Multi-family home, such as an apartment **[requires a different family living above or below, such as an apartment]**
 4. A mobile home or trailer
 5. Other **[SPECIFY]** _____

65. What is the approximate age of your home?

_____ [record years]

98. Don't know

99. Refused

66. About how large is your home in square feet, excluding your garage and/or patio?

1. Under 1,000 square feet

2. 1,000 – 1,500 square feet

3. 1,501 – 2,000 square feet

4. 2,001 – 2,500 square feet

5. 2,501 – 3,000 square feet

6. More than 3,000 square feet [SPECIFY] _____ square feet

98. Don't know

99. Refused

67. Is your home...

1. All electric

2. Gas and electric

3. Some other combination of energy sources

98. Don't know

99. Refused

68. In 2009, which of the following categories best describes your total annual household income before taxes? [READ LIST]

1. Less than \$15,000

2. \$15,000 to \$24,999

3. \$25,000 to \$34,999

4. \$35,000 to \$49,999

5. \$50,000 to \$74,999

6. \$75,000 to \$99,999

7. \$100,000 to \$149,999

8. \$150,000 or more

98. Don't know

99. Refused

69. What is your average Ameren Illinois Utilities bill in the summer?

_____ Dollars

70. What is your average Ameren Illinois Utilities bill in the winter?

_____ Dollars

71. Which of the following best describes your age?

1. Less than 18 years old
2. 18-24 years old
3. 25-34 years old
4. 35-44 years old
5. 45-54 years old
6. 55-64 years old
7. 65 or older
98. Don't know
99. Refused

72. RECORD GENDER OF RESPONDENT [DO NOT ASK]

1. Male
2. Female
98. Don't know

This completes the survey. Ameren Illinois appreciates your participation. Thanks for your time. Have a good evening.

Appendix B. Nonparticipant Survey Module

ARP Non-participant Screening

Now I have a few questions about appliances that will help Ameren improve their other energy conservation programs.

Have you gotten rid of an operating refrigerator or freezer **in your home** over the past year -- since April 2009?

1. Yes, refrigerator(s)
2. Yes, freezer(s)
3. Yes, both appliances
4. No **[SKIP TO Error! Reference source not found.]**
98. 98. DON'T KNOW **[SKIP TO Error! Reference source not found.]**
99. 99. REFUSED **[SKIP TO Error! Reference source not found.]**

Did the appliance(s) work?

1. Yes
2. No **[SKIP TO Error! Reference source not found.]**
3. Not all appliances worked, but some did **[SKIP TO Error! Reference source not found.]**
98. 98. DON'T KNOW
99. 99. REFUSED **[SKIP TO Error! Reference source not found.]**

Did you have the [refrigerator(s), freezer(s)] picked up through the Ameren Illinois Utilities program where a contractor for Ameren picks up and recycles old, operating refrigerators and freezers and you received \$30 for your participation?

1. Yes **[SKIP TO Error! Reference source not found.]**
2. No
3. Not all appliances were recycled through the program, but some were
98. DON'T KNOW **[SKIP TO Error! Reference source not found.]**
99. REFUSED **[SKIP TO Error! Reference source not found.]**

Appliance Characteristics

IF ONE APPLIANCE DISCARDED: Now I'm going to ask you some specific questions about the [refrigerator, freezer] you got rid of. **[Go to 0]**

IF MORE THAN ONE APPLIANCE DISCARDED: Was the most recent **working** appliance you got rid of a refrigerator or a freezer?

1. Refrigerator
2. Freezer
98. Don't know **[SKIP TO Error! Reference source not found.]**
99. REFUSED **[SKIP TO Error! Reference source not found.]**

Thank you. Please answer the following questions with only that [refrigerator, freezer] in mind.

At the time you discarded it, approximately how old was the [refrigerator, freezer]?

1. YEARS _____

98. 98.Don't know
 99. 99. Refused

For most of 2009, where did you have the [refrigerator, freezer] in your home? **[READ LIST]**

1. Kitchen
2. Garage
3. Porch/patio
4. Basement
5. Other [Specify] _____
98. Don't know
99. Refused

How would you describe the condition of the [refrigerator, freezer] you got rid of?

Would you say ...? **[Read, record one response only.]**

1. It worked and was in good physical condition.
2. It worked but needed repairs or had some problems **[Example: it wouldn't defrost].**
98. Don't know
99. Refused

Did you replace the [refrigerator, freezer]?

1. Yes
2. No **[SKIP TO 0]**
98. Don't know **[SKIP TO 0]**
99. Refused **[SKIP TO 0]**

What did you replace it with?

1. A brand new ENERGY STAR **[refrigerator, freezer]**
2. A brand new non-ENERGY STAR **[refrigerator, freezer]**
3. A used **[refrigerator, freezer]** to replace it.
98. Don't Know **[SKIP TO 0]**
99. Refused **[SKIP TO 0]**

Did you buy your replacement appliance from ...? **[READ LIST]**

1. A National Retailer or big box store, such as Sears, Home Depot, or Best Buy
2. A locally-owned appliance dealership or store
3. Individual
98. 98. DON'T KNOW
99. 99. REFUSED

[IF Q0= 03, THEN ASK 0]

What would you estimate the age of your replacement appliance to be?

1. YEARS _____
98. DON'T KNOW

99. REFUSED

How did you get rid of your old [refrigerator, freezer]?

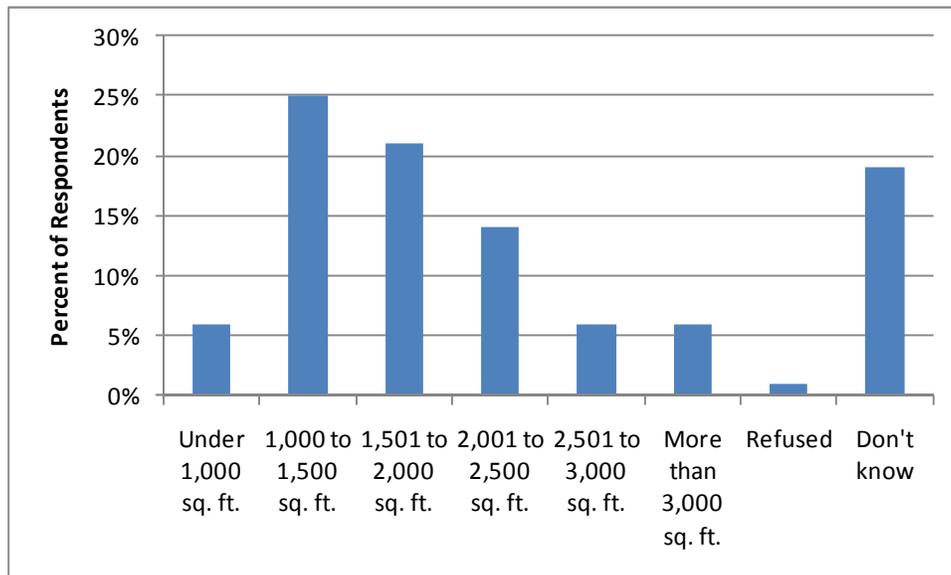
[Don't read, but prompt if needed: Did you give it away or sell it?]

1. Took it to a recycler or scrap dealer.
2. Took it to the dump or threw it away.
3. Sold it to a friend, acquaintance or relative.
4. Sold it to a used refrigerator/freezer dealer.
5. Sold it via garage sale, estate sale, or newspaper ad.
6. Sold it when you moved to new occupant.
7. Gave it away to a friend or family member.
8. Left it out on the curb with a "free" sign on it.
9. Hired someone to pick it up (for junking or dumping).
10. Dealer I bought a new one from took it away.
11. Left it behind when moved (for new occupant).
12. Other (SPECIFY: ___)
98. Don't know
99. Refused

Appendix C. Participant Demographics

The participant survey asked a number of questions regarding the demographic characteristics of the respondents. 93% of participants reported that they live in a single-family detached home. The majority of respondents (87%) stated that their home is powered by both electricity and gas. Respondents estimated that their average monthly bill from Ameren Illinois was approximately \$174 in the summer and \$183 in the winter. Figure C-1 summarizes the participants' description of the size of their home.

Figure C-1. Estimated Home Size in Square Feet, Excluding Garage and Patio (n=159)



Participants reported their age, as summarized in Figure C-2. There is a clear pattern in participant age with nearly 60% of participants reporting their age as over 55. This is a potentially important finding for future program planning and marketing. However, it should be noted that retired people have a tendency to be easier to reach via telephone, as they are more often home during the day. Thus it is possible that this finding is biased.

Figure C-2. Participant Age (n=159)

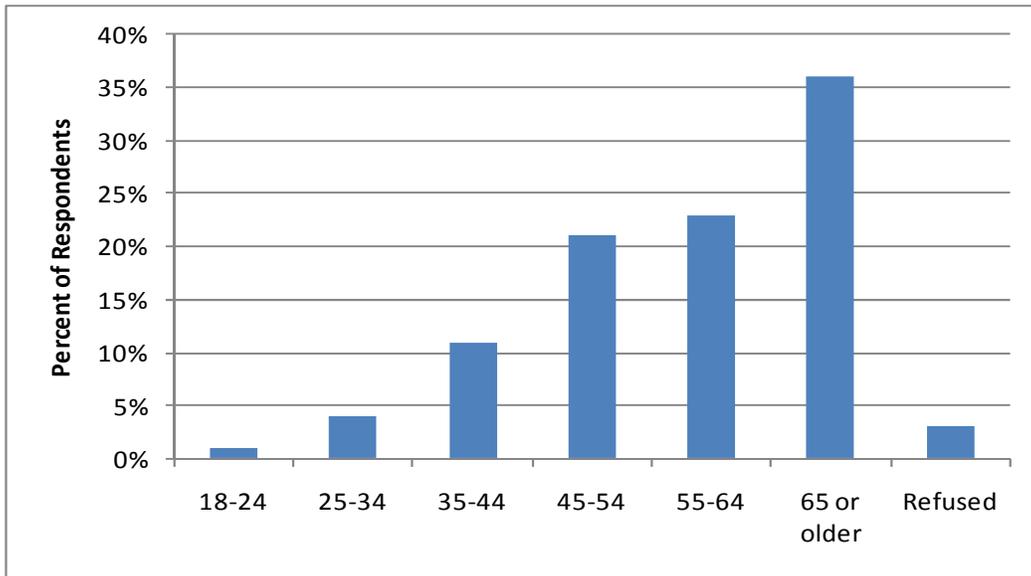
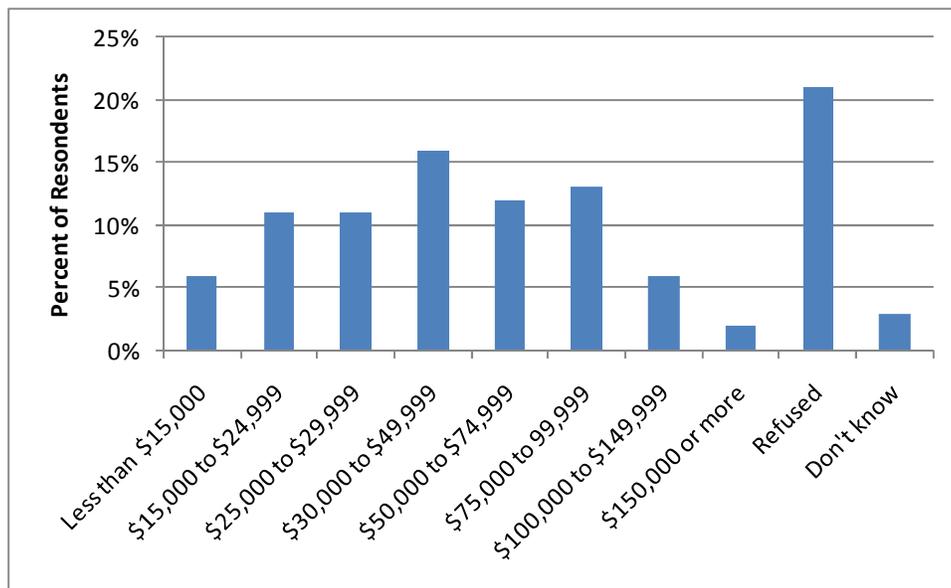


Figure C-3 summarizes participants’ estimates of their annual household income before taxes. Participants appear to have a rather wide range of income levels, centered around \$30,000 to \$50,000 annually. This puts them slightly below the State of Illinois median income, which the U.S. Census Bureau reported as \$68,958 for 2008.¹⁶

Figure C-3. Participant Pre-tax Annual Household Income (n=159)



¹⁶ <http://www.census.gov/hhes/www/income/statemedfaminc.html>