Rocky Mountain Power
Wyoming
See ya later, refrigerator®:
Program Evaluation Report
2013–2014

April 27, 2016

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The Cadmus Group, Inc.
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Glossary of Terms

Analysis of Covariance (ANCOVA)
An ANCOVA model is an ANOVA model with a continuous variable added.

Analysis of Variance (ANOVA)
An ANOVA model explains the variation in the independent variable, based on a series of characteristics (expressed as binary variables with values of either zero or one, indicating the absence or presence of the characteristics).

Coefficient of Determination (R^2)
The R^2 indicates the proportion of variance in a dependent variable explained by a regression equation, and takes values between zero and one. An R^2 of zero indicates that the independent variables have no explanatory power. An R^2 of one indicates that 100% of the variability in the dependent variable is explained by changes in the independent variables.

Evaluated Gross Savings
Evaluated gross savings are the total savings resulting from a program, before adjusting for freeridership or spillover. They are most often calculated for a given measure, 'i,' as:

$$Evaluated\ Gross\ Savings_i = Verified\ Participation_i * Unit\ Consumption_i$$

Evaluated Net Savings
Evaluated net savings are the total savings resulting from a program, net of what would have occurred in the program's absence. These savings can be attributed to the program and are calculated as:

$$Net\ Savings = Evaluated\ Gross\ Savings * Net - to - Gross$$

Freeridership
Freeridership in energy-efficiency programs represents participants who would have adopted the energy-efficient measure in the program's absence. This is often expressed as the freeridership rate, or the proportion of evaluated gross savings that can be classified as freeridership.

Gross Unit Energy Savings
For the SYLR program, gross unit energy savings are the evaluated *in situ* unit energy consumption for the recycled unit, adjusted for part-use.

In-Service Rate (ISR)
The ISR (also called the installation rate) is the proportion of incented measures actually installed.

Net-to-Gross (NTG) Ratio
The NTG ratio is a ratio of net savings to gross savings. Analytically, NTG is defined as:

$$NTG\ ratio = \frac{Net\ savings}{Gross\ savings}$$

Realization Rate

The realization rate is a comparison of evaluated gross savings to reported savings.

P-Value

A p-value indicates the probability that a statistical finding might be due to chance. A p-value less than 0.10 indicates that, with 90% confidence, the finding is statistically significant.

Part-Use Factor

The part-use factor is the portion of the year that equipment operates. That is, if a given measure has a part-use factor of 0.5, it operates for six months out of the year, on average.

Spillover

Spillover is the adoption of an energy efficiency measure induced by the program's presence, but not directly funded by the program. As with freeridership, the spillover rate is expressed as a proportion of evaluated gross savings.

T-Test

The t-test is a general statistical test of difference. In regression analysis, a t-test is applied to determine whether the estimated coefficient differs significantly from zero. A t-test with a p-value less than 0.10 indicates a 90% probability that the estimated coefficient is different from zero.

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Executive Summary

Rocky Mountain Power contracted with Cadmus to conduct an impact and process evaluation of its See ya later, refrigerator® (SYLR) Program for the 2013 and 2014 program years. To evaluate program gross and net energy savings for the impact evaluation, Cadmus used secondary meter data analysis, surveys of program participants, and a review of the program tracking data. In evaluating the effectiveness of program processes, Cadmus conducted in-depth interviews with program staff involved in different aspects of the program.

The evaluation data consisted of the following:

- Telephone surveys with 120 participating Wyoming customers;
- Reviews of Wyoming program materials; and
- In-depth interviews with program management and program administrator staff.

At the time of this report submission, the program implementer JACO Environmental had ceased operations, and Rocky Mountain Power subsequently canceled the program in April 2016.

Key Impact Findings

The impact evaluation produced the following key findings:

- In 2013, the SYLR Program recycled 779 refrigerators and freezers; in 2014, participation increased slightly to 792. Over those two years, the program distributed 1,468 kits. In total, the program achieved 1,700,919 kWh in evaluated gross savings over the two-year period, or 94% of the 1,807,021 kWh reported gross savings.
- The part-use factor (i.e., the portion of the year that the equipment operated) fell within expected ranges: 0.91 for refrigerators and 0.94 for freezers. This part-use factor served as a component of the gross per-unit savings calculation.
- After adjusting for part-use, gross per-unit savings were 1,080 kWh for refrigerators (down from 1,130 in 2011–2012) and 849 kWh for freezers (down from 944 in 2011–2012). Neither gross savings estimate statistically differed from the 2011–2012 evaluation estimates.
- Net per-unit savings were 354 kWh for refrigerators and 213 kWh for freezers—lower values than the evaluated per-unit savings for 2011–2012.[1] This decline primarily occurred due to a larger proportion (roughly 58%) of survey respondents indicating that, absent the program, they would have disposed of their appliance in a way that would have permanently removed it from the grid (compared to 41% in 2011–2012).

[1] Evaluated per-unit net savings in the 2011–2012 evaluation were 443 kWh for refrigerators and 447 kWh for freezers, with NTGs of 39% and 51%, respectively.

- Evaluated savings for energy savings kits slightly declined, primarily to a decrease in hours of use. Over the two years, the kits achieved 70,832 kWh in evaluated net savings and 97% of the 73,401 reported gross savings.
- Overall net-to-gross (NTG), including energy savings kits, increased from 34% in the 2011–2012 evaluation to 43%. The program evaluation found high freeridership levels due to 58% of respondents claiming they would have disposed of their unit without the program.

Table 1 summarizes evaluated program participation, reported net savings, and evaluated gross and net savings for 2013 and 2014.[2] Evaluated total net savings for the program were lower than reported total savings due to the lower NTG ratio. Table 2 and Table 3 show the 2013 and 2014 program information, respectively.

Table 1. 2013 and 2014 Program Savings by Measure

Measure	Evaluated Units	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Realization Rate
Refrigerator Recycling	1,282	1,466,832	1,384,778	453,828	31%
Freezer Recycling	289	266,788	245,309	61,557	23%
Energy-Savings Kit	1,468	73,401	70,832	70,832	97%
Total	**3,039**	**1,807,021**	**1,700,919**	**586,217**	**32%**

Table 2. 2013 Program Savings by Measure

Measure	Evaluated Units	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Realization Rate
Refrigerator Recycling	643	744,594	694,549	227,622	31%
Freezer Recycling	136	122,400	115,440	28,968	24%
Energy-Savings Kit	726	46,464	42,636	42,636	92%
Total	**1,505**	**913,458**	**852,625**	**299,226**	**33%**

[2] Throughout this report, table totals may not sum due to rounding. The report expresses precision estimates for means and totals (such as savings) in relative terms, but expresses estimates for proportions and ratios (such as NTG) in absolute terms.

Table 3. 2014 Program Savings by Measure

Measure	Evaluated Units	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Realization Rate
Refrigerator Recycling	639	722,238	690,229	226,206	31%
Freezer Recycling	153	144,388	129,869	32,589	23%
Energy-Savings Kit	742	26,937	28,196	28,196	105%
Total	**1,534**	**893,563**	**848,294**	**286,991**	**32%**

Key Process Findings

The process evaluation produced the following key findings:

- Collaboration between Rocky Mountain Power and the program administrator proved effective due to a longstanding working relationship. Program staff reported effective communication and smooth implementation.
- Participant satisfaction remained high during the 2013 and 2014 program years: 97% of surveyed participants reported being very satisfied or somewhat satisfied with the program, and 100% of surveyed participants also expressed satisfaction with the contractor who picked up their units for recycling. The survey did not reveal notable customer complaints.
- Participants learned of the program through various channels, with the following sources most common: bill inserts, word-of-mouth, retailers, and television. The source of awareness with the largest increase from the previous evaluation was the utility website (6%, up from 2%), and the percentage of participants enrolling online also increased (23% in 2014, up from 18% in 2013).
- The program implementer improved tracking of the energy savings kits delivered through the program, tracking orders at multiple phases and ultimately recording which customers received kits and which refused the kits. This increased the verified delivery rate from the 2011–2012 evaluation period.

Cost-Effectiveness Results

As shown in Table 4, the program did not prove cost-effective across the evaluation period for four of the primary cost-effectiveness test perspectives: PacifiCorp Total Resource Cost (PTRC) test; Total Resource Cost (TRC) test; Utility Cost Test (UCT); and Ratepayer Impact Measure test (RIM). The Participant Cost Test (PCT) benefit/cost ratio could not be calculated because no costs were associated with this test perspective.

The 2013–2014 program was not-cost effective from the TRC test perspective, with a benefit/cost ratio of 0.90. Evaluated net savings for 2013 and 2014 were approximately 19% and 25% lower than net

savings used in the annual report analyses. This resulted in a reduction in the benefit-cost ratios from the 2013 and 2014 annual reports of 1.18 and 1.14, respectively, for the TRC test.

Table 4. 2013 and 2014 Net Evaluated Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + Conservation Adder)	$0.078	$268,856	$267,505	($1,352)	0.99
TRC No Adder	$0.078	$268,856	$243,186	($25,670)	0.90
UCT	$0.078	$268,856	$243,186	($25,670)	0.90
RIM		$616,153	$243,186	($372,967)	0.39
PCT		$0	$1,076,464	$1,076,464	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000005742
Discounted Participant Payback (years)					N/A

Table 5 and Table 6 show the program's cost-effectiveness results for the 2013 and 2014 program years, respectively.

Table 5. 2013 Net Evaluated Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC + Conservation Adder	$0.073	$133,237	$138,673	$5,436	1.04
TRC No Adder	$0.073	$133,237	$126,066	($7,171)	0.95
UCT	$0.073	$133,237	$126,066	($7,171)	0.95
RIM		$312,440	$126,066	($186,374)	0.40
PCT		$0	$546,870	$546,870	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000003202
Discounted Participant Payback (years)					N/A

Table 6. 2014 Net Evaluated Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC + Conservation Adder	$0.083	$144,953	$137,698	($7,255)	0.95
TRC No Adder	$0.083	$144,953	$125,180	($19,773)	0.86
UCT	$0.083	$144,953	$125,180	($19,773)	0.86
RIM		$324,614	$125,180	($199,434)	0.39
PCT		$0	$566,041	$566,041	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000003371
Discounted Participant Payback (years)					N/A

Summary and Recommendations[3]

Although participation fell slightly for both 2013 and 2014, the SYLR Program ran smoothly, did not encounter major implementation issues, and experienced high customer satisfaction rates. The program achieved net savings of 586,217 kWh over the two-year period in a nearly cost-effective manner, despite an increase in freeridership rates.

Based on the evaluation results, Cadmus offers the following recommendations if the program were to be reinstated in the future:

- Rocky Mountain Power should consider adjusting its expected per-unit savings to reflect evaluated per-unit gross savings values of 1,080 kWh for refrigerators, 849 kWh for freezers, and 48 kWh for kits across both years (as found in this evaluation).
- For future cost-effectiveness calculations, Cadmus recommends that Rocky Mountain Power update measure lives to align with values adopted in most recent Regional Technical Forum (RTF)[4] measure workbooks as follows: 6.4 years for refrigerator recycling, 5.2 years freezer recycling,[5] and 7.4 years for the CFLs in the kit measures.[6]

[3] Effective April 15, 2016, the WY Commission approved the suspension of the SYLR program in Docket No. 20000-490-ET-16.

[4] The RTF is an advisory committee in the northwest that develops standards to verify and evaluate conservation savings.

[5] http://rtf.nwcouncil.org/measures/res/ResFridgeFreezeDecommissioning_v4.xlsm

[6] http://rtf.nwcouncil.org//measures/res/ResLighting_Bulbs_v4_2.xlsm

Program Description and Overview

The Wyoming See ya later, refrigerator® (SYLR) customer refrigerator and freezer recycling program served as part of Rocky Mountain Power's ongoing demand-side management (DSM) resource acquisition strategy.[7] Rocky Mountain Power's overarching objective for the program was to decrease electricity usage (kWh) by removing and recycling inefficient freezers and refrigerators. In addition to reducing energy consumption and lowering participants' electricity consumption, participating appliances were recycled in an environmentally sound manner.[8]

In operation since 2009, the Wyoming SYLR program provided residential customers with a $40 incentive for each qualified recycled appliance. Participants received an incentive for up to two refrigerators or freezers per year. Renters who own their appliances could participate, and apartment complex owners or managers who provide tenants with appliances were eligible. Participants also received a free energy-saving kit, which included: two 13-watt CFLs, a refrigerator/freezer thermometer card, energy-savings educational materials, and information on other Rocky Mountain Power efficiency programs. Appendix D presents the program logic model. Starting September 1, 2014, business customers also could recycle qualifying units through the program, as well as participating retailer pickups.

Qualifying refrigerators and freezers had to be in working condition when picked up and between 10–32 cubic feet in size, utilizing inside measurements. Rocky Mountain Power contracted with JACO Environmental, Inc., (the program administrator) to implement the program in Wyoming and the rest of Rocky Mountain Power's territory. The program administrator disabled and removed the appliances, and recycled at least 95% of the materials, including the refrigerant.

Program Participation

Participation in appliance recycling programs (ARPs) tends to be seasonal, with the highest participation occurring during summer and declining into winter. As shown in Figure 1, participation (presented as units) in the SYLR Program began to pick up in spring, peaked in late summer and early fall, then fell going into winter for both the 2013 and 2014 program years. This trend is typical of appliance recycling programs as winter weather makes scheduling pick-ups more difficult.

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[7] See ya later, refrigerator® has been registered to PacifiCorp through the U.S. Patent and Trademark Office since April 6, 2010, under registration number 3770705.

[8] Environmentally-sound disposal of this equipment includes: proper disposal of oils, polychlorinated biphenyls (PCBs), mercury, and chlorofluorocarbon-11 (CFC-11) from foam; and recycling of CFC-12, hydrofluorocarbon-134a (HFC-134a), plastic, glass, steel, and aluminum.

Figure 1. Program Participation by Month and Year

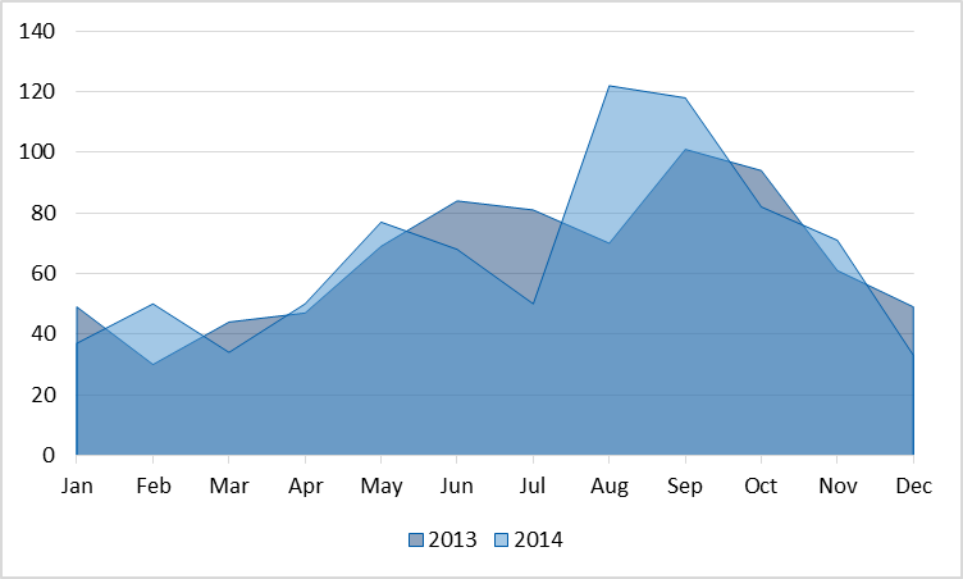
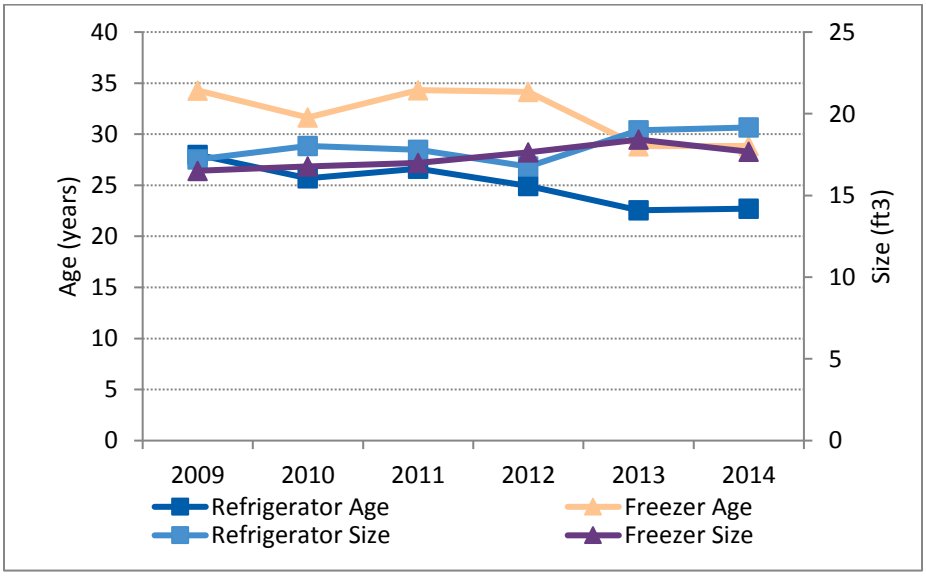


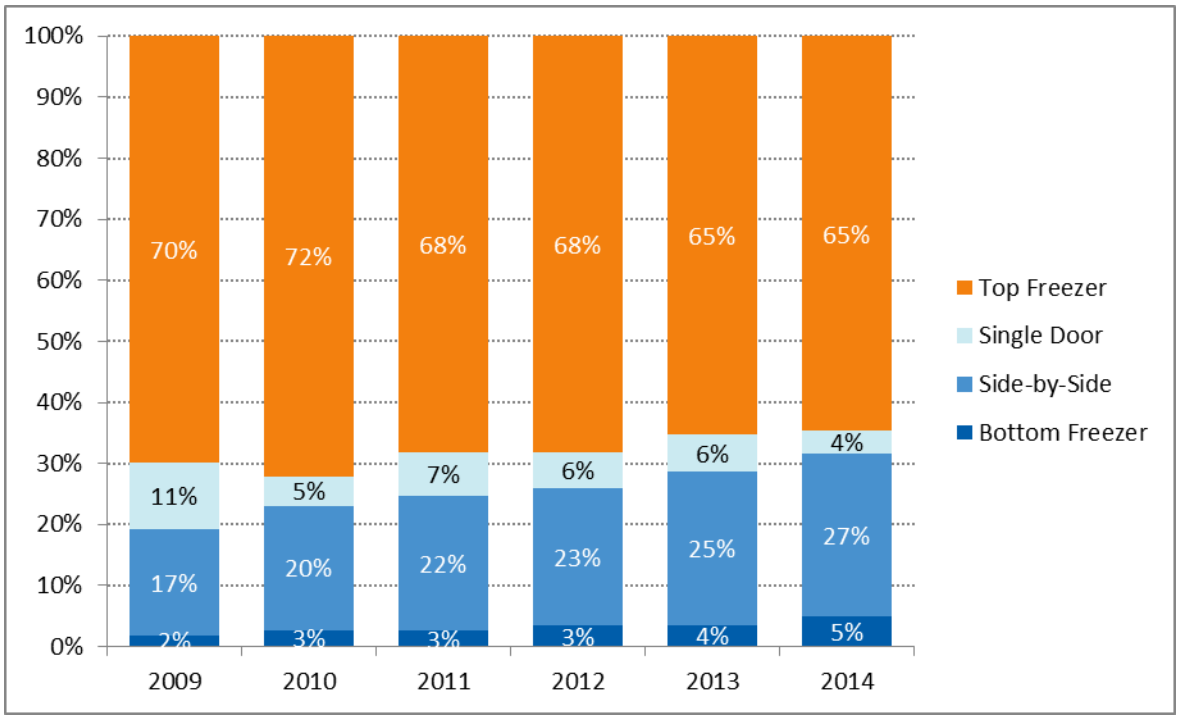
Figure 2 shows the program's seven-year trends in program unit age and size. During this period, average size for both appliances types increased over time and average ages for both appliance types decreased.

Figure 2. Average Unit Age and Size by Year



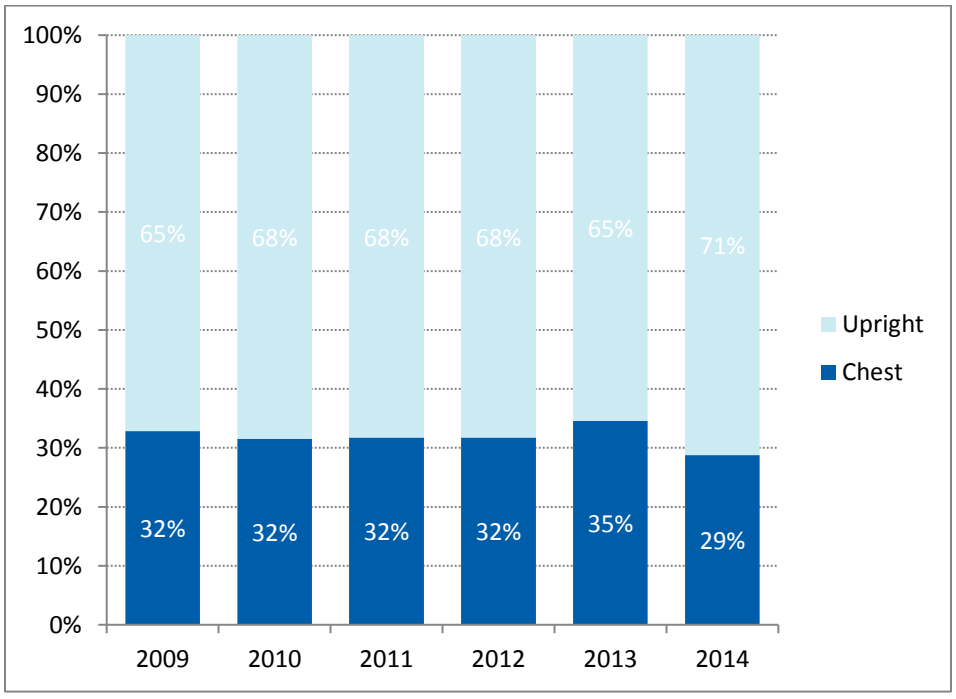
As the program matured, the refrigerator configurations of program units also changed (i.e., fewer top freezer units and more side-by-sides), as shown in Figure 3.

Figure 3. Refrigerator Configuration by Year



As shown in Figure 4, freezer configurations did not exhibit a discernable trend.

Figure 4. Freezer Configuration by Year



These trends generally remained consistent with Cadmus' observations of other recycling programs. As recycling programs mature, the composition of recycled appliances tends to change. In their infancy, the programs recycle a greater number of older, secondary appliances (particularly those in use for only a portion of the year). Such units tend to be smaller and located in unconditioned spaces, such as garages or basements. They also tend to operate less efficiently. The average age of appliances also tends to decrease as programs mature.

Impact Evaluation

Methodology

This report presents two types of evaluated savings: evaluated gross savings; and evaluated net savings. To determine these values, Cadmus applied the four steps shown in Table 7. The evaluation defined reported savings as electricity savings (kWh) that Rocky Mountain Power included in its 2013 and 2014 annual reports.

Table 7. Impact Estimation Steps

Saving Estimate	Step	Action
Evaluated Gross Savings	1	Verify accuracy of data in program database
	2	Perform statistical/engineering analysis to evaluate per-unit savings
	3	Adjust evaluated gross savings with installation rate/part-use factor
Evaluated Net Savings	4	Apply NTG adjustments

- **Step one** (verifying the accuracy of data in the program database) included reviewing the program tracking database to ensure reported participation and savings matched the 2013 and 2014 annual reports.
- **Step two** (performing a statistical/engineering analysis to evaluate per-unit savings) estimated refrigerator, freezer, and CFL savings.
- **Step three** (adjusting the evaluated gross savings with the installation rate/part-use factor) determined the mean proportion of the year in which recycled appliances were used as well as the number of CFLs program participants installed. Using a telephone survey, Cadmus collected information to estimate an installation rate and a part-use factor, which Cadmus then used to calculate evaluated gross savings.
- **Step four** (applying NTG adjustments) determined the net savings. Through participant telephone surveys, Cadmus estimated freeridership, secondary market effects (i.e., the program's impact on the availability of used appliances), spillover, and induced replacement.[9]

Sampling Approach

Cadmus developed survey samples of randomly selected program participants, seeking precision of ±10% at the 90% confidence level for the measure level. The evaluation determined sample sizes, assuming a 0.5 coefficient of variation. Cadmus applied a finite population correction to determine the necessary sample size. Table 8 shows planned and achieved sample sizes by target group.

[9] This report's *Net-to-Gross* section provides a detailed description of Cadmus' process for estimating these parameters.

Table 8. Sample Sizes by Target Group

Target Group	Population	Target Sample Size	Achieved Sample Size
Refrigerators	1,192	65	65
Freezers	285	55	55
Total	**1,477**	**120**	**120**

*Because fewer participants recycled freezers than refrigerators, if a participant recycled both a refrigerator and a freezer, they were only included in the freezer sample to avoid contacting the same participant more than once.

Cadmus randomly completed 120 participant surveys from the population of 1,477 unique participants. Participant surveys were conducted in one round during summer 2015.

Uniform Methods Project

This evaluation followed the methodology described in the Uniform Methods Project (UMP) refrigerator recycling protocol. The Department of Energy's website[10] provides more information about the UMP.

Kit Savings Algorithm and Assumptions

With each pick-up ordered, participants had the option to receive an energy-saving kit, which contained the following:

- Two 13-watt CFLs
- One refrigerator thermometer
- Energy-savings educational materials and other program references

Cadmus used the following algorithm to estimate CFL savings:

$$Evaluated\ Per\ Unit\ Savings\ (kWh\ per\ unit) = \frac{\Delta Watts * ISR * HOU * WHF * 365.25}{1{,}000}$$

Where:

ΔWatts = Wattage of baseline bulb - Wattage of kit CFL

ISR = In-service rate or the percentage of CFLs installed

HOU = Hours of use; per day

WHF = Waste heat factor, an adjustment to account for lighting impacts on HVAC consumption

365.25 = Constant; days per year

1,000 = Constant; conversion of watts to kilowatts

[10] National Renewable Energy Laboratory. *Chapter 7: Refrigerator Recycling Evaluation Protocol.* Last modified April 2013. Accessed September 17, 2015 at: http://energy.gov/sites/prod/files/2013/11/f5/53827-7.pdf

The ISR captured CFLs installed, removed, and replaced by other energy-efficient light bulbs:[11]

$$CFL\ In-Service\ Rate\ (ISR\ \%) = \frac{Installed - Removed\ or\ Replaced}{Reported}$$

Cadmus used the lumens equivalence method to determine delta watts consistent with the methodology prescribed by the UMP. Delta watts represent the wattage difference between a baseline bulb and an equivalent CFL. Cadmus estimated the baseline wattage for kit bulbs by mapping bulbs to the ENERGY STAR bulb database to determine the bulb's lumens output.

Cadmus assumed the bulb light output landed the bulb in the 800–1,099 lumens bin, leading to the 2013 baseline of 60 watts in the column "Baseline (Exempt Bulbs) (c)" and the 2014 baselines of 43 watts from the column "Baseline (Post-EISA) (d)" in the UMP guidelines.[12]

Cadmus calculated average hours of use (HOU) using analysis of covariance **(**ANCOVA)[13] model coefficients, estimated from a combined multistate, multiyear database of light logger data, compiled by recent Cadmus CFL HOU studies. This model expressed average HOU as a function of room type. Appendix G provides a more detailed exploration of the impact methodology used to estimate CFL HOU.

Evaluated Gross Savings

Gross Annual Unit Energy Consumption

Cadmus used the UMP-specified regression model to estimate unit energy consumption (UEC) for refrigerators, and used a similar model, developed outside of UMP, to estimate freezer UEC. The coefficient of each independent variable indicated the influence of that variable on daily consumption. Holding all other variables constant:

- A positive coefficient indicated an upward influence on consumption.
- A negative coefficient indicated a downward effect on consumption.

The value of the coefficient indicated the marginal impact of a one-point increase in the independent variable on the UEC. For example, a 1-cubic foot increase in refrigerator size resulted in a 0.059 kWh increase in daily consumption.

For dummy variables, the value of the coefficient represented the difference in consumption if the given condition was true. For example, in Cadmus' refrigerator model, the coefficient for the variable

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[11] Cadmus did not adjust the installation rate to account for lamps that burnt out as the failure rate is accounted for in the measure life assumptions.

[12] See Table 2 on page 6-12 for 60 watt baselines: http://www.nrel.gov/extranet/ump/pdfs/20140514_ump_res_lighting_draft.pdf

[13] ANCOVA refers to a type of statistical modeling.

indicating whether a refrigerator was a primary unit equaled 0.560, meaning, all else being equal, a primary refrigerator consumed 0.560 kWh more per day than a secondary unit.

Refrigerator Regression Model

Table 9 shows the UMP model specification Cadmus used to estimate annual energy consumption of refrigerators recycled in 2013 and 2014, along with the model's estimated coefficients.

Table 9. Refrigerator UEC Regression Model Estimates
(Dependent Variable = Average Daily kWh, R-square = 0.30)

Independent Variables	Coefficient	p-Value
Intercept	0.805	0.166
Age (years)	0.021	0.152
Dummy: Manufactured Pre-1990	1.036	<.0001
Size ($ft.^3$)	0.059	0.044
Dummy: Single Door	-1.751	<.0001
Dummy: Side-by-Side	1.120	<.0001
Dummy: Primary	0.560	0.008
Interaction: Unconditioned Space x HDDs*	-0.040	0.001
Interaction: Unconditioned Space x CDDs**	0.026	0.188

*Heating degree day (HDD).
**Cooling degree day (CDD).

Freezer Regression Model

Table 10 details the final model specifications Cadmus used to estimate energy consumption of participating freezers recycled, along with the results.

Table 10. Freezer UEC Regression Model Estimates
(Dependent Variable = Average Daily kWh, R-square = 0.38)

Independent Variables	Coefficient	p-Value
Intercept	-0.955	0.237
Age (years)	0.045	0.001
Dummy: Manufactured Pre-1990	0.543	0.108
Size ($ft.^3$)	0.120	0.002
Dummy: Chest Freezer	0.298	0.292
Interaction: Unconditioned Space x HDDs	-0.031	<.0001
Interaction: Unconditioned Space x CDDs	0.082	0.028

Extrapolation

After estimating the final regression models, Cadmus analyzed the corresponding characteristics (i.e., the independent variables) for participating appliances (as captured in the program administrator's

program database). Table 11 summarizes program averages or proportions for each independent variable.

Table 11. 2013–2014 Participant Mean Explanatory Variables

Appliance	Independent Variables	Participant Population Mean Value
Refrigerator	Age (years)	22.64
	Dummy: Manufactured Pre-1990	0.39
	Size (ft.^{3})	19.08
	Dummy: Single Door	0.05
	Dummy: Side-by-Side	0.26
	Dummy: Primary	0.77
	Interaction: Unconditioned Space x HDDs*	4.96
	Interaction: Unconditioned Space x CDDs*	0.17
Freezer	Age (years)	28.84
	Dummy: Manufactured Pre-1990	0.62
	Size (ft.^{3})	18.03
	Dummy: Chest Freezer	0.31
	Interaction: Unconditioned Space x HDDs*	16.56
	Interaction: Unconditioned Space x CDDs*	0.60

*CDDs and HDDs derive from the weighted average from Typical Meteorological Year (TMY3) data for weather stations that Cadmus mapped to participating appliance zip codes. TMY3 uses median daily values for a variety of weather data collected from 1991–2005.

To estimate the average annual UEC, Cadmus applied the model coefficients to the independent variables. For example, using values from Table 10 and Table 11, the estimated annual UEC for freezers could be calculated as:

$$Freezer\ UEC = 365.25\ days$$
$$* (-0.955 + 0.045 * [28.84\ years\ old] + 0.543$$
$$* [62\%\ units\ manufactured\ pre - 1990] + 0.12 * [18.03\ ft.^3\ ] + 0.298$$
$$* [31\%\ units\ that\ are\ chest\ freezers] - 0.031 * [16.56\ HDDs] + 0.082$$
$$* [0.60\ CDD]) = 903\ kWh$$

Kit Savings

Table 12 shows final inputs and gross savings estimated for CFLs distributed in the energy-saving kits.

Table 12. Unadjusted CFL Savings (Not Including Adjustment for In-Service Rate)

Year	Incandescent Watts	CFL Watts	HOU	Waste Heat Factor	Gross Annual kWh (per bulb)	Gross Annual kWh (per kit)
2013	60	13	2.06	0.96	34	68
2014	43	13	2.06	0.96	22	44

The lower HOU value of 2.06 for CFLs in 2013–2014 (compared to 2.3 in 2011–2012) likely occurred due to increased saturation of efficient bulbs. As the efficient lighting market matures and saturation increased within the average home, efficient lamps were installed not just in high-use sockets but in lower-use sockets, whether in rooms with lower usage or supplemental lighting (e.g., desk lamps).

The waste heat factor (WHF), however, increased slightly, and overall kit savings were 97% of reported savings.

UEC Summary

Table 13 reports: the evaluated average annual UEC for refrigerators and freezers recycled through the SYLR Program during 2013 and 2014; and annual savings for energy-saving kits weighted by the number of kits distributed per year.

The section following the table describes adjustments Cadmus made to these estimates to determine gross per-unit savings estimates for participant refrigerators and freezers.

Table 13. Estimates of Per-Unit Annual Energy Consumption

Appliance	*Ex Post* Annual UEC (kWh/year)	Relative Precision(90% confidence)
Refrigerators	1,187	9%
Freezers	903	25%*
Energy-Savings Kits**	56**	7%

*The metered sample of freezers was much smaller than the refrigerator sample used to estimate UECs as freezers accounted for a smaller proportion of program units. Therefore the freezer UEC estimates were not as precise.

**Kit savings, a weighted average of 2013 and 2014, do not represent consumption, but are shown here as savings without adjustments for installation rates.

In-Service Rates

Appliance Part-Use Factor

An adjustment factor specific to appliance recycling, "part-use" has been used to convert the UEC into an average per-unit gross savings value. The UEC itself did not equal to gross savings value, per the following:

- The UEC model yielded an estimate of annual consumption; and
- Not all recycled refrigerators would have operated year-round, had they not been decommissioned through the program.

The part-use methodology relied on information from surveyed customers regarding pre-program usage patterns, that is: how many months of the year prior to recycling was the appliance plugged in and running.

The final estimate of part-use reflected how appliances would likely operate had they not been recycled (rather than how they previously operated). For example, a primary refrigerator, operated year-round, could have become a secondary appliance and operated part-time.

The methodology accounted for such potential shifts in usage types. Specifically, part-use was calculated using a weighted average of the following prospective part-use categories and factors:

- Appliances that would have run full-time (part-use = 1.0)
- Appliances that would not have run at all (part-use = 0.0)
- Appliances that would have operated a portion of the year (part-use was between 0.0 and 1.0)

Cadmus calculated a weighted average part-use factor, representing the three participant usage categories defined by the appliance's operational status during the year before recycling. For example, Cadmus assigned participants who did not use their appliance at all during the year prior to its recycling a part-use factor of zero, as no immediate savings would be generated by the appliance's retirement.

Using information gathered through participant surveys, Cadmus took the following steps to determine part-use:

1. Cadmus determined whether recycled refrigerators were primary or secondary units (treating all stand-alone freezers as secondary units).
2. Cadmus asked participants who indicated they had recycled a secondary refrigerator or freezer if the appliance had operated year-round, operated for a portion of the preceding year, or was unplugged and not operated. Cadmus assumed all primary units operated year-round.
3. Cadmus asked participants who indicated they operated their secondary refrigerator or freezer for only a portion of the preceding year to estimate the total number of months that the appliance remained plugged in. This allowed calculation of the portion of the year in which the appliance remained in use. Cadmus determined the average refrigerator, operating part-time, had a part-use factor of 0.35 (i.e., just more than four months). The average freezer operating part time had a part use factor of 0.31(i.e., just under four months).

These three steps resulted in information about how refrigerators and freezers operated prior to recycling, as shown in Table 14.

Table 14. Historical Part-Use Factors by Category

Usage Type and Part-Use Category	Refrigerators			Freezers		
	Percent of Recycled Units	Part-Use Factor	Per-Unit Energy Savings (kWh/year)	Percent of Recycled Units	Part-Use Factor	Per-Unit Energy Savings (kWh/year)
Secondary Units Only	**n=20**					
Not in Use	14%	0.00	0			
Used Part Time	29%	0.35	420			
Used Full Time	57%	1.00	1,187			
Weighted Average	**100%**	**0.67**	**798**			
All Units (Primary and Secondary)	**n=64**			**n=55**		
Not in Use	3%	0.00	-	2%	0.00	-
Used Part Time	6%	0.35	420	5%	0.31	276
Used Full Time	91%	1.00	1,187	93%	1.00	903
Weighted Average	**100%**	**0.93**	**1,102**	**100%**	**0.94**	**852**

In many cases, the way an appliance was used historically (prior to recycling) did not indicate how the appliance would have been used, had it not been recycled. To account for this, Cadmus asked surveyed participants how they would have (likely) operated their appliances, had these not been recycled through SYLR. For example, if surveyed participants indicated they would have kept a primary refrigerator in SYLR's absence, Cadmus asked if they would have continued to use the appliance as their primary refrigerator or would have relocated it, using it as a secondary refrigerator.

Participants who said they would have discarded their appliance independent of the program were not asked about future usage of that appliance, as that would be determined by another customer. As the future use classification of discarded refrigerators remained unknown, Cadmus applied the weighted part-use average of all units (0.93) for all refrigerators that would have been discarded independently of the program. By using this approach, Cadmus acknowledged discarded appliances might be used as primary or secondary units in a would-be recipient's home.

Cadmus then combined the part-use factors shown in Table 14 with participants' self-reported actions had the program *not* been available. This resulted in the distribution of likely future usage scenarios and corresponding part-use estimates.

The weighted average of these future scenarios, shown in Table 15, produced SYLR's 2013–2014 part-use factor for refrigerators (0.91, up from 0.90 in 2011–2012) and freezers (0.94, up from 0.86 in 2011–2012).[14]

Table 15. Part-Use Factors by Appliance Type

Use Prior to Recycling	Likely Use Independent of Recycling	Refrigerator		Freezer	
		Part-Use Factor	Percent of Participants	Part-Use Factor	Percent of Participants
Primary	Kept (as primary unit)	1.00	10%		
	Kept (as secondary unit)	0.67	2%		
	Discarded	0.93	65%		
Secondary	Kept	0.67	6%	0.94	31%
	Discarded	0.93	18%	0.94	69%
	Overall	**0.91**	**100%**	**0.94**	**100%**

Applying the part-use factors shown in Table 15 to the modeled annual consumption from Table 13 yielded the average, gross, per-unit energy savings. Table 16 shows the average, gross savings for refrigerators as 1,080 kWh and savings for freezers as 849 kWh.

Table 16. Per-Unit Gross Energy Savings by Measure

Appliance	Average Per-Unit Annual Energy Consumption (kWh/Year)	Part-Use Factor	Adjusted Per-Unit Gross Energy Savings (kWh/Yr)	Precision at 90% Confidence*
Refrigerators	1,187	0.91	1,080	11%
Freezers	903	0.94	849	20%

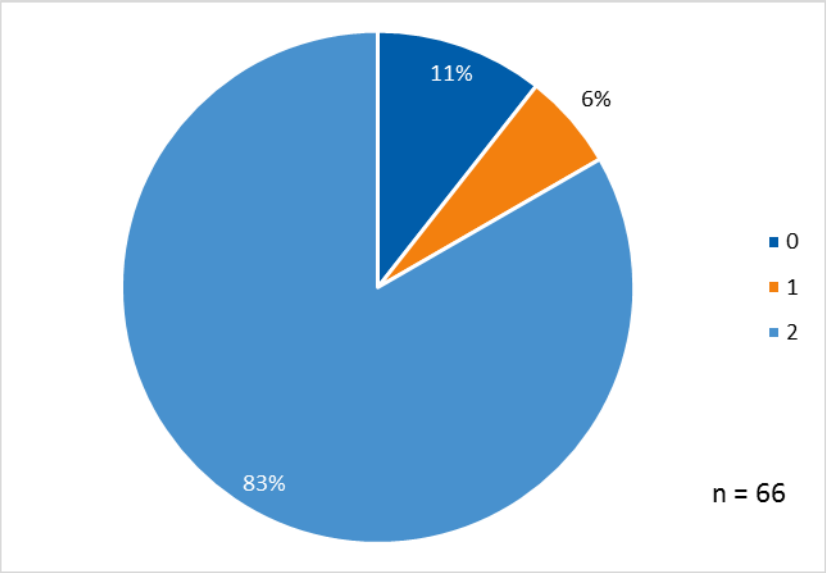
CFL Installation Rate

As part of the participant survey, Cadmus asked respondents how many bulbs they installed from those included in the energy savings kits. Overall, 83% of respondents installed both bulbs, while 11% did not install either; 6% installed only one bulb.

On average, participants initially installed 1.73 of the two bulbs received, resulting in an 86% installation rate—slightly above the 80% found in the 2011–2012 evaluation. Figure 5 shows the proportion of participants installing zero, one, or two bulbs.

[14] As future usage of discarded refrigerators would remain unknown, Cadmus applied the weighted average part-use value (0.91) for all refrigerators slated to be discarded in the program's absence. This approach acknowledged the next owner of the discarded appliances could use them as primary or secondary units.

Figure 5. Number of Bulbs Installed



Five respondents indicated they did not install the CFLs, offering a variety of reasons for not doing so. Four of the five intended to install them later as they did not need them at that time or already had CFLs installed. One respondent did not install them as the bulbs were not bright enough.

Tracking Database Review and Verification

The program administrator tracked and provided Cadmus with two types of program data:

1. Data on recycled appliances (stored in a "Units" database).
2. Information about pick-ups (stored in an "Orders" database).

These integrated databases allowed the program administrator to record information collected via the call center or website, along with on-site data collected during pick-ups and post-pick-up data recorded during recycling. The program administrator's client web portal provided the Rocky Mountain Power program manager with real-time access to collected data and other program results.

Cadmus reviewed the program administrator's databases and compared participation recorded therein with participation reported in Rocky Mountain Power's annual reports. Reported quantities matched the database, as shown in Table 17 (below).

Verification of Kit Recipients

During the 2011–2012 evaluation, Cadmus discovered the program administrator's database did not include records for reported energy-savings kits, and Cadmus had to rely on participant surveys to verify the receipt of kits. This resulted in a difference between the total number of kits reported and the number that participants recalled having been delivered. Following identification of this issue, the Rocky Mountain Power program manager and the program administrator began tracking deliveries to each participant in 2013, and the tracking process improved.

For the 2013–2014 evaluation, Cadmus followed up on this through the program administrator interview by requesting kit delivery records and detailed descriptions of the tracking process.

JACO field technicians used personal digital assistant (PDA) devices to track appliance pick-ups and energy-savings kit deliveries. Customers signed the PDAs to confirm pick-ups of their appliances and deliveries of kits. Field techs assigned each pick-up one of the following codes:

- Delivered Kit
- Left Behind Kit
- Manual Delivery Record Logged Kit Delivery (when PDA inoperable)
- Mailed Kit
- Customer Refused Kit
- Customer Ineligible for Kit
- Kits Unavailable, Customer Unavailable, Customer Service Representative (CSR) to follow up
- Kits Unavailable, Customer Requested Mailed Replacement
- Kits Unavailable, Customer Refuses Mailed Replacement

When kits were unavailable, CSRs attempted to contact a customer twice to offer a mail replacement. If the CSR could not contact the customer, the record was marked as a refusal unless the customer contacted the call center to request a kit.

For the 2013–2014 program years, only three customers were marked as a refusal. Table 17 outlines reported and verified measure quantities.

Table 17. 2013 and 2014 Reported and Verified Measure Quantities

Measure	2013		2014		Total		Difference in Totals	
	Reported	Verified	Reported	Verified	Reported	Verified	Nominal	Proportion
Refrigerators	643	643	639	639	1,282	1,282	0	0%
Freezers	136	136	153	153	289	289	0	0%
Energy-Savings Kits	726	726	742	742	1,468	1,468	0	0%

Net-to-Gross

Cadmus used the following formula to estimate net savings for recycled refrigerators:

$$Net\ savings = Gross\ Savings - Freeridership\ and\ Secondary\ Market\ Impacts - Induced\ Replacement + Spillover$$

Where:

Evaluated Gross Savings	=	The evaluated *in situ* UEC for the recycled unit, adjusted for part-use;
Freeridership and Secondary Market Impacts	=	Program savings that would have occurred in the program's absence;
Induced Replacement	=	Average additional energy consumed by replacement units purchased due to the program;
Spillover	=	Non-programmatic savings induced by the program.

Secondary market impacts required a decision-tree approach for calculating and presenting net program savings. The decision tree—populated by the responses of surveyed participants—presented savings under all possible scenarios concerning participants' actions regarding recycled equipment. Through these scenarios, Cadmus used a weighted average of savings to calculate net savings attributable to the program.

This chapter includes specific portions of the decision tree to highlight specific aspects of the net savings analysis. Appendix E (refrigerators) and Appendix F (freezers) present the entire decision trees.

Freeridership

Cadmus' freeridership analysis first asked participants if they had considered discarding the participating appliance prior to learning of the program. If the participant did not previously consider appliance disposal, Cadmus categorized respondents as a non-freerider and excluded them from subsequent freeridership analysis.

Next, Cadmus asked all remaining participants (i.e., those who considered discarding their existing appliance before learning about SYLR) a series of questions to determine, in the program's absence, the distribution of participating units likely to have been kept or discarded. Actions independent of program intervention followed three scenarios:

1. Unit was discarded and transferred to someone else.
2. Unit was discarded and destroyed.
3. Unit was kept in the home.

To determine the percentage of participants following each scenario, Cadmus asked surveyed participants about the likely fate of their recycled appliance, had it not been decommissioned through the SYLR Program. Cadmus categorized their responses as follows:

- Kept the appliance.
- Sold the appliance to a private party (i.e., via an acquaintance or through a posted advertisement).
- Sold or gave the appliance to a used appliance dealer.
- Gave the appliance to a private party, such as a friend or neighbor.

- Gave the appliance to a charity organization.
- Left the appliance on the curb with a "free" sign.
- Had the appliance removed by the dealer that provided the new or replacement appliance.
- Hauled the appliance to a landfill or recycling center.
- Had the appliance picked up by a local waste management company.

Once Cadmus determined the final assessments of participants' actions independent of SYLR, calculations could determine the percentage of refrigerators and freezers kept or discarded; Table 18 shows the results.

Table 18. Final Distribution of Kept and Discarded Appliance

Stated Action Absent Program	Indicative of Freeridership	Refrigerators (n=63)	Freezers (n=54)
Kept	No	22%	20%
Discarded	Varies by Discard Method	78%	80%
Total		**100%**	**100%**

As shown, 78% of respondents would not have kept their refrigerators. Of those, 58% would have discarded it as follows:

- Taking their appliance to the dump;
- Hiring someone to take the appliance to the dump; or
- Having a retailer pick up their appliance.

Having the retailer pick up the appliance did not necessarily indicate freeridership. This depended on the retailer's decision whether or not to resell the unit. Not all appliances would be viable for resale. Cadmus used age as a proxy for secondary market viability and assumed any appliance over 10 years old would unlikely be resold by a retailer. All respondents indicating they would have had their appliances picked up by a retailer recycled appliances over 10 years old. Together, these actions resulted in a 58% reduction in gross savings due to freeridership for refrigerators.[15]

Freezer recyclers exhibited nearly identical freeridership levels. Of the 80% of respondents who would not have kept their freezer, 73% would have taken one of the three actions above, which would have led to the appliance being removed from the grid. Thus, freeridership for freezers was 58%.

Secondary Market Impacts

If, in the program's absence, a participant would have directly or indirectly (through a market actor) transferred the program-recycled unit to another Rocky Mountain Power customer, Cadmus estimated

[15] 78% of respondents not keeping their appliance * 75% of respondents who reported one of the three actions leading to freeridership = 58% freeridership. For freezers, 80% * 73% = 58%.

what actions the would-be acquirer might have taken, given the unit would have been unavailable without the program.

Some would-be acquirers in the market for a refrigerator or freezer would find another unit. Others would not (only taking the unit opportunistically). Difficulties arose in trying to quantify the change in the total number of refrigerators and freezers (overall and used) in use before and after program implementation and what effect the program had on the total.

Without such information, the UMP recommends evaluators assume one-half of would-be acquirers would find an alternate unit. Without information to the contrary, Cadmus applied the UMP recommendation to the evaluation.

Cadmus then determined whether the alternate unit would likely be another used appliance (similar to those recycled through the program) or a new standard-efficiency unit (presuming that fewer used appliances would be available due to program activity).[16]

As discussed, definitively estimating this distribution proves difficult. The UMP recommends adopting a midpoint approach when primary research is unavailable: evaluators should assume one-half of the would-be acquirers (who would have acquired an alternate unit) would find a similar, used appliance, and one-half would acquire a new, standard-efficiency unit.

Cadmus used the ENERGY STAR website[17] to determine energy consumption for new, standard-efficiency appliances. Specifically, Cadmus averaged the reported energy consumption of new, standard-efficiency appliances with sizes and configurations comparable to the program units.

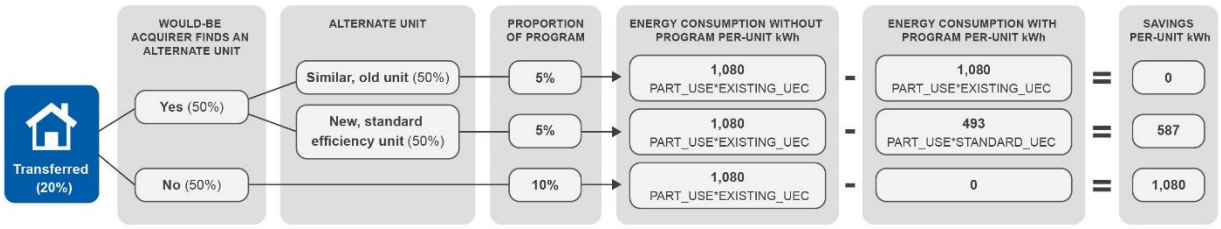
Figure 6 details Cadmus' methodology for assessing the program's impact on the secondary refrigerator market and for applying the recommended midpoint assumptions when primary data prove unavailable (Appendix F provides a freezer-specific diagram). Accounting for market effects results in three savings scenarios:

- Full per-unit gross savings;
- No savings; and
- Partial savings (i.e., the difference between energy consumption of the program unit and the new, standard-efficiency appliance acquired alternatively).

[16] Though a would-be acquirer also could select a new ENERGY STAR unit, Cadmus assumed most customers in the market for a used appliance would upgrade to the next-lowest price point (i.e., a baseline, standard-efficiency unit).

[17] Energy consumption of a new, standard-efficiency appliance was calculated using the ENERGY STAR Website (http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator), taking the average energy consumption of new, comparably sized, standard-efficiency appliances with similar configurations as program units.

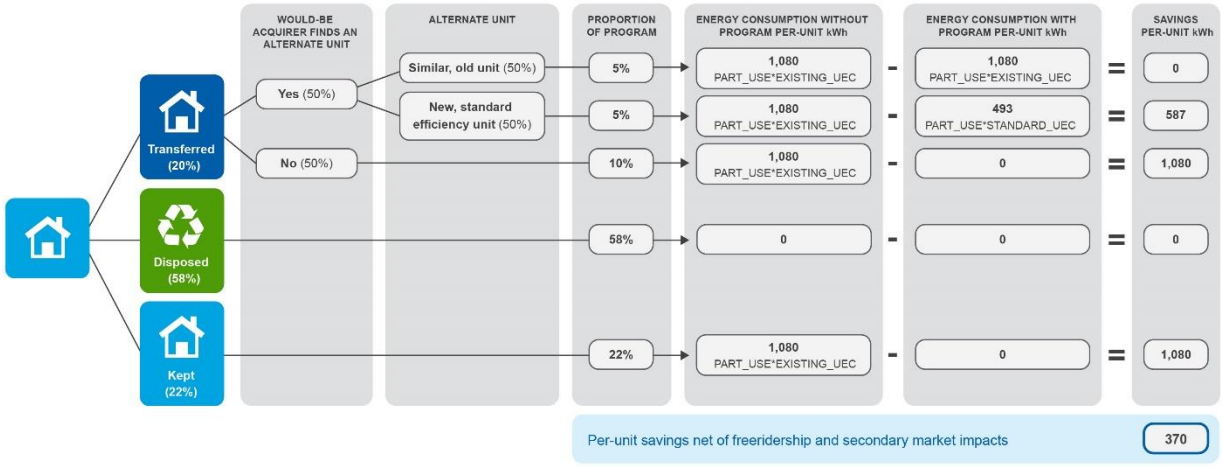
Figure 6. Secondary Market Impacts—Refrigerators



Integration of Freeridership and Secondary Market Impacts

After estimating the parameters of freeridership and secondary market impacts, Cadmus used the UMP decision tree to calculate average per-unit program savings, net of their combined effect. Figure 7 shows how Cadmus integrated these values into an estimate of savings net of freeridership and secondary market impacts. Final savings, net of freeridership and secondary market impacts, were calculated as the weighted average of savings for each of the decision-tree categories.

Figure 7. Savings Net of Freeridership and Secondary Market Impacts—Refrigerators



Induced Replacement

The UMP states that evaluators must account for the energy consumption of replacement units *only* when the program induced that replacement (i.e., when the participant would *not* have purchased the replacement refrigerator in the recycling program's absence). For non-induced replacements, energy consumption of a replacement appliance does not prove germane to the savings analysis, as that appliance would have been purchased or acquired regardless of the program. Acquisition of another appliance in conjunction with SYLR participation did not necessarily indicate induced replacement. Again, this method was consistent with those outlined in the UMP.

Cadmus used participant survey results to determine which replacement refrigerators and freezers were acquired by SYLR participants due to the program. The results indicated SYLR reduced the total number

of used appliances operating within Rocky Mountain Power's service territory and raised the average efficiency of active appliance stock. Across both appliance types, roughly 80% of participants replaced their recycled appliances. Additionally, of respondents replacing their appliances, 90% reported replacing their appliance with an ENERGY STAR-rated appliance.

Cadmus used participant survey results to estimate the proportion of replacements induced by the customer's participation in SYLR. Specifically, Cadmus asked each participant that replaced the participating appliance: "*Were you planning to replace your appliance before you decided to recycle it through the See Ya Later, Refrigerator program?*"

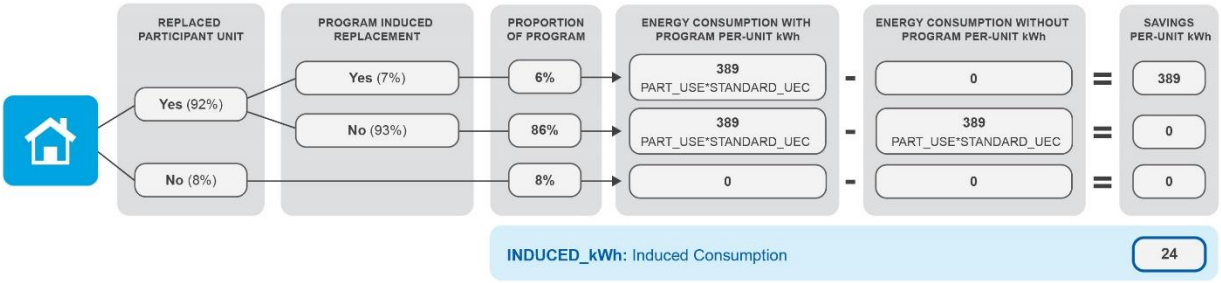
As it would be unlikely that a $30 incentive would provide sufficient motivation for most participants to purchase an otherwise unplanned replacement unit (costing from $500 to $2,000), Cadmus asked a follow-up question of participants who responded "*No*." Intended to confirm the participant's assertion that the program alone caused them to replace their appliance, the question asked: "*Let me make sure I understand: you would not have replaced your appliance with a different appliance without the See Ya Later, Refrigerator program? Is that correct?*"

To further increase the reliability of these self-reported actions, induced replacement analysis considered the following:

- Whether the refrigerator was a primary unit.
- The participant's stated intentions in the program's absence.

For example, if a participant would have discarded a primary refrigerator independent of the program, the replacement unit could not be induced (i.e., the participant very likely would not forego use of a primary refrigerator). For all other usage types and stated intention combinations, however, induced replacement offered a viable response.

Figure 8. Induced Replacement—Refrigerators



The final induced replacement rate was the product of the proportion of respondents who replaced their appliances and the proportion of those who were induced to do so. As expected—and shown in Table 19, only a portion of total replacements could be considered induced, with the program inducing 6% and 11% of refrigerator and freezer participants, respectively, to acquire a replacement unit.

Table 19. 2013–2014 Induced Replacement Rates

Appliance	Induced Replacement Rates
Refrigerator	6%
Freezer	11%

For 2013–2014, the induced replacement rate was higher than for the 2011–2012 evaluation.[18] This could have partly resulted from the program marketing methods.

Marketing targeted zip codes where retailer market data suggested new appliances were purchased, seeking to target households that, after making a new purchase, could have an extra appliance. This marketing method, however, also may have targeted areas where customers were more likely to purchase a new appliance, and program marketing spurred their decisions.

While induced replacement rates increased between the 2011–2012 evaluation and the 2013–2014 cycle, refrigerator results fell within the range of other evaluation findings from the same time period. Freezers results were higher and more similar to refrigerator results than those identified in other recent findings for freezers.

Table 20. Benchmarking Induced Replacement Rates

Program	Induced Replacement: Refrigerators	Induced Replacement: Freezers
SYLR Wyoming (2013–2014)	**6%**	**11%**
SYLR Wyoming (2011–2012)	2%	5%
Mid-Atlantic Utility 1 (2014–2015)	7%	4%
Mid-Atlantic Utility 2 (2013)	10%	7%
Midwest Utility 1 (2013)	11%	N/A
Midwest Utility 2 (2014)	7%	2%

Spillover

Spillover refers to additional savings generated by program participants due to their program participation, but not captured by program records. Spillover occurs when participants choose to purchase energy-efficient measures or adopt energy-efficient practices due to the influence of program or marketing activities, but participants do not apply for an incentive, and therefore are not captured through an energy efficiency program. In contrast with freeridership impacts, which reduce net program savings, spillover impacts increase net program savings.

[18] In the 2011–2012 evaluation, induced replacement rates were 2% and 5% for refrigerators and freezers, respectively.

Evaluators can estimate spillover from program participants' adoption of additional measures due to their participation. A small effect revealed by a survey may translate into a large effect for the population as survey results would be applied to the population of eligible participants.

For the SYLR program, Cadmus measured spillover by asking participants who completed the telephone survey if, due to the program, they installed another efficient measure or undertook other energy efficiency activities. If so, respondents were asked to rate the relative influence of the SYLR program and incentive on their decisions to pursue additional savings.

Specifically, SYLR program participants were asked if they installed the following measures (which had recent, evaluated savings):

- High-efficiency dishwashers
- High-efficiency clothes washers
- High-efficiency refrigerators or freezers
- High-efficiency water heaters

If the participant installed one or more of these measures, Cadmus asked additional questions about which year they purchased the measure, and whether they received an incentive for the measure. If applicable, participants were asked much the SYLR program influenced their purchasing decisions (participants could answer not at all, not very, somewhat, or very influential).

Though 7% of surveyed participants (n=8) claimed to have installed energy-efficient measures or changed their behaviors after participating in the SYLR program, Cadmus did not quantify savings for all measures, only for the following:

- Energy-efficient refrigerators
- Clothes washers
- Air conditioners
- Dishwashers

This reduced the proportion of respondents with quantifiable savings to four participants. As other measures (e.g., weatherization, water heaters, HVAC) proved difficult to quantify accurately based on survey data, the spillover analysis did not include these measures. In addition, the analysis did not count the commonly mentioned CFLs or LEDs due to the high likelihood of double-counting savings claimed by the Home Energy Savings program through upstream CFL or LED sales.

Cadmus calculated participant spillover by estimating savings attributable to additional measures installed and incorporating whether respondents stated they found Rocky Mountain Power greatly influenced their decisions. Cadmus counted measures if they were eligible for program incentives but incentives had not been requested.

For calculating spillover savings, Cadmus used a top-down approach. The analysis began using a subset that only contained survey respondents who indicated they installed additional energy-savings measures after participating in the SYLR program, despite not receiving incentives for these. From this subset, Cadmus removed participants who indicated the program did not prove very influential on their decisions to purchase additional measures.

For remaining participants with spillover savings, Cadmus applied estimated energy savings from the 2011–2012 Home Energy Savings evaluation[19] for additional measures installed. The Cadmus-calculated savings values were matched to additional measures installed by survey participants, as shown in Table 21.

Table 21. Spillover Measures and Savings

Spillover Measure Installed	Quantity	Electric Savings Per Unit (kWh)	Total Savings (kWh)
Air conditioner	1	182	182
High-efficiency dishwasher	1	22	22
High-efficiency refrigerator	1	115	115
High-efficiency clothes washing machine	1	173	173
Total	**4**		**492**

Table 22 summarizes participant survey spillover responses. The sum of spillover savings for the each measure's participant sample (e.g., refrigerator and freezer) was divided by total program savings for each sample.[20] Total spillover savings represented 0.7% of refrigerator savings. Respondents in the freezer sample did not report spillover measures.

Table 22. Program Spillover in 2013 and 2014

Measure	Total Spillover Savings	Surveyed Participant Population Savings	Spillover Percent
Refrigerators	492	70,200	0.70%
Freezers	0	46,695	0.00%

Final Net-to-Gross

As summarized in Table 23, Cadmus determined final net savings as evaluated, gross, per-unit savings, less per-unit freeridership, secondary market impacts, induced replacement kWh, and spillover.

[19] The 2013–2014 Home Energy Savings evaluation was not completed at the time of analysis; so Cadmus applied evaluated savings from the most recent evaluation (2011 –2012).

[20] The refrigerator sample size was 65, with gross per-unit savings of 1,080 for a total of 70,200 kWh. Freezer respondents did not report spillover measures.

Table 23. 2013 and 2014 NTG Ratios

Scenario	Evaluated Gross Per-Unit Savings	Freeridership and Secondary Market Impacts (kWh)	Induced Replacement (kWh)	Spillover (kWh)	Net Savings (kWh)	NTG
Refrigerator	1,080	- 710	- 24	+ 8	354	33%
Freezer	849	- 577	- 59	+ 0	213	25%

*Energy-savings kits were assumed to have a 100% NTG as they were free, unsolicited, add-on measures.

Summary of Impact Findings

Table 25, Table 26, and Table 24 summarize evaluated savings, using the UMP methodology for calculating net savings (by program year and over the two-year evaluation period). Overall, evaluated gross savings were very close to reported gross savings, with the program achieving 1,700,919 of the reported 1,807,021 kWh savings, resulting in a 94% gross realization rate. For both years, evaluated net savings were lower than reported savings. Overall, the program achieved around one-third of reported savings, achieving a 32% net realization rate over the two-year period—as shown in Table 24.

Table 24. 2013 and 2014 Program Savings by Measure

Measure	Evaluated Measure Counts	Evaluated Gross Savings (kWh)	Gross Precision at 90% Confidence	Reported Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Precision at 90% Confidence	Net Realization Rate
Refrigerator Recycling	1,282	1,384,778	11%	1,466,832	453,828	85%	31%
Freezer Recycling	289	245,309	24%	266,788	61,557	162%	23%
Energy-Savings Kit	1,468	70,832	12%	73,401	70,832	12%	97%
Total	**3,039**	**1,700,919**	**16%**	**1,807,021**	**586,217**	**68%**	**32%**

*Precision for refrigerators and freezers exceeded 10% due to multiple estimated parameters outlined in the UMP, two separate gross savings parameters, and three net savings parameters, each with associated statistical error bounds. The sample was designed to achieve 90/10 confidence and precision for individual parameters. However, the combined error (after combining all parameters to determine final net per-unit savings) was unlikely to achieve 10% precision at the 90% confidence level. While these methods—which this report describes in detail—used higher variances than previous approaches, they produced more accurate, unbiased results.

Table 25. 2013 Program Savings by Measure*

Measure	Evaluated Measure Counts	Evaluated Gross Savings (kWh)	Gross Precision at 90% Confidence	Reported Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Precision at 90% Confidence	Net Realization Rate
Refrigerator Recycling	643	694,549	11%	744,594	227,622	85%	31%
Freezer Recycling	136	115,440	24%	122,400	28,968	162%	24%
Energy-Savings Kit	726	42,636	12%	46,464	42,636	12%	92%
Total	**1,505**	**852,625**	**16%**	**913,458**	**299,226**	**66%**	**33%**

*Precision for refrigerators and freezers exceeded 10% due to multiple estimated parameters outlined in the UMP, two separate gross savings parameters, and three net savings parameters, each with associated statistical error bounds. The sample was designed to achieve 90/10 confidence and precision for individual parameters. However, the combined error (after combining all parameters to determine final net per-unit savings) was unlikely to achieve 10% precision at the 90% confidence level. While these methods—which this report describes in detail—used higher variances than previous approaches, they produced more accurate, unbiased results.

Table 26. 2014 Program Savings by Measure

Measure	Evaluated Measure Counts	Evaluated Gross Savings (kWh)	Gross Precision at 90% Confidence	Reported Gross Savings (kWh)	Evaluated Net Savings (kWh)	Net Precision at 90% Confidence	Net Realization Rate
Refrigerator Recycling	639	690,229	11%	722,238	226,206	85%	31%
Freezer Recycling	153	129,869	24%	144,388	32,589	162%	23%
Energy-Savings Kit	742	28,196	12%	26,937	28,196	12%	105%
Total	**1,534**	**848,294**	**16%**	**893,563**	**286,991**	**69%**	**32%**

*Precision for refrigerators and freezers exceeded 10% due to multiple estimated parameters outlined in the UMP, two separate gross savings parameters, and three net savings parameters, each with associated statistical error bounds. The sample was designed to achieve 90/10 confidence and precision for individual parameters. However, the combined error (after combining all parameters to determine final net per-unit savings) was unlikely to achieve 10% precision at the 90% confidence level. While these methods—which this report describes in detail—used higher variances than previous approaches, they produced more accurate, unbiased results.

Process Evaluation

This section presents detailed staff interview findings and participant survey results. Focus areas include the following:

- Effectiveness of the delivery structure and implementation strategy
- Marketing approaches
- Customer satisfaction
- Internal and external communications

Methodology

Cadmus conducted the following process evaluation research:

- Document reviews, including:
  - Past evaluations
  - Logic models
  - The program website
- Utility staff and administrator interviews
- Participant surveys

Cadmus developed stakeholder interview guides and performed interviews with program management staff to collect information about key topics. Stakeholder interviews included program managers at Rocky Mountain Power and JACO. Issues discussed through interviews included the following:

- Process flow
- Program design and implementation
- Changes in implementation and program marketing
- Strengths and areas for improvement

Cadmus conducted interviews by phone, following up with interviewees via e-mail regarding questions and clarifications.

The evaluation included telephone surveys conducted with participating customers. Cadmus designed survey instruments to collect data on the following topics:

- ***Customer information.*** Demographic information and household statistics.
- ***Program process.*** Details to inform the following performance indicators:
  - What were the participation motivations and barriers?
  - Were program incentives set correctly?
  - Was the program process effective?

- How satisfied were customers with the program?
- What were the program's strengths and possible areas for improvements?

Program Implementation and Delivery

Drawing on stakeholder interviews and participant survey response data, this section discusses SYLR program implementation and delivery.

Program History and Program Management

According to the program administrator, Rocky Mountain Power and the program administrator established 2013–2014 program goals based on prior program performance and harvest rates[21] and on remaining potential identified through Rocky Mountain Power's conservation potentials assessment.

In 2013, Rocky Mountain Power issued a new request for proposals, designing the contract so the program administrator would incur a financial penalty if the SYLR program did not meet its participation goals. Additionally, 2013 participation goals aligned more closely with recent program performance. Rocky Mountain Power received a monthly invoice and report from the program administrator; this included the number of pick-ups kits delivered, a two-hour appointment metric, call center response times, reasons for rejecting units, and times required for mailing incentive checks.

In 2011, Rocky Mountain Power staff reported that they found inconsistencies between monthly reports and invoices; so, in 2012, they began comparing monthly reports, invoices, and the dashboard to ensure consistency. Improved monitoring appeared to resolve inconsistencies, and this evaluation verified that reported unit counts remained consistent with the program administrator's databases.

Though on September 1, 2014, program qualifications expanded to include nonresidential customers with qualifying units and participating retailers picking up units for recycling, businesses or retailers did not participate during the evaluation period.

Program Staffing and Training

In 2013–2014, JACO Environmental implemented the SYLR Program for Rocky Mountain Power (having been the implementer since the program's inception). Program staff included:

- A Rocky Mountain Power program manager
- Portland Energy Conservation, Inc. (PECI) as a marketing contractor[22]
- Appliance Distribution, Inc., as a subcontractor to JACO

[21] The harvest rate equaled the number of units recycled through a program in a given year, divided by the total number of residential customer accounts in a service territory.

[22] On October 10, 2014, PECI merged with CLEAResult.

Rocky Mountain Power and JACO Environmental reported adequate staffing levels and effective working relationships among parties involved in program implementation.

Delivery Structure and Processes

Rocky Mountain Power and the program administrator reported designing a program similarly to ARPs operating in other states. Program development followed four main delivery steps:

1. Marketing
2. Sign-Up/Scheduling
3. Appliance Pick-Up
4. Incentive Payment

Although the program did not include minimum equipment age requirements for qualifying appliances, PECI's marketing tailored messages to appeal to owners of older and secondary refrigerators.

Rocky Mountain Power's Wyoming customers who exhibited interest in disposing of an eligible appliance could obtain information or sign up to participate through Rocky Mountain Power's website or by calling the program administrator toll-free. During 2014, 23% (n=737) of customers enrolled online—an increase from 18% (n=729) enrolling online in 2013. When participants signed up, the program administrator collected details about how the customers learned of the program, verified their eligibility, and scheduled pick-up times. Customers received a two-hour time window for appliance pick-ups on a specific day; they were required to have the appliance plugged in and running upon pick-up.

In 2013–2014, customer wait times decreased from those during 2011–2012, with the time between scheduling and pick-ups averaging eight days in 2013 and 2014 (an improvement from the average 11-day wait time during 2011 and 2012). The program administrator noted that pick-up wait times tended to be shortest in urban areas, while customers in outlying areas experienced longer waits.

At the scheduled time, the contractor picked up and verified that the appliance was in working condition, and collected data about the appliance age, size, configuration, and features. Since 2011, the pick-up crew used hand-held computer devices to perform a variety of quality assurance and quality control (QA/QC) functions and to enable the pick-up process. The contractor photographed the unit and recorded its model and unit numbers. Customers signed the hand-held device upon completion of the pick-up. During appliance pick-up, the contractor provided participants with an energy-saving kit.

Purchased and distributed by JACO, kit contents were based on specifications provided by Rocky Mountain Power. Since 2013, kit delivery was tracked for each customer. On the hand-held device, participants indicated whether or not they received a kit at the time of their pick-up. For customers participating in the program through a retailer (e.g., Sears), JACO shipped the kits by mail after pick-up rather than providing them at the time of pick-up.

The program administrator brought appliances to Appliance Distribution's facility in Salt Lake City for decommissioning and recycling, and then mailed incentive checks to participants.

Forms and Incentives

The SYLR Program required minimal paperwork for participating customers. The sign-up process could be completed by phone or online, and it did not require customers to fill out lengthy forms. Customers who signed up by phone provided information—including their address and the unit's location—and answered a few screening questions. Customers who signed up online responded to these questions through a brief, one-page online form.

Customers expressed high satisfaction levels with the program:

- 97% (n=118) of surveyed participants reported they were very or somewhat satisfied with their overall program experience.
- 100% (n=117) reported were very or somewhat satisfied with JACO's appliance pick-up.

Marketing

Beginning in 2012, the program administrator selected PECI (the program administrator for the Home Energy Savings program) as the marketing subcontractor. During 2013 and 2014, PECI provided marketing collateral for the program and launched an outreach campaign to increase retailer involvement. This relationship ended at the close of 2014.

Approach

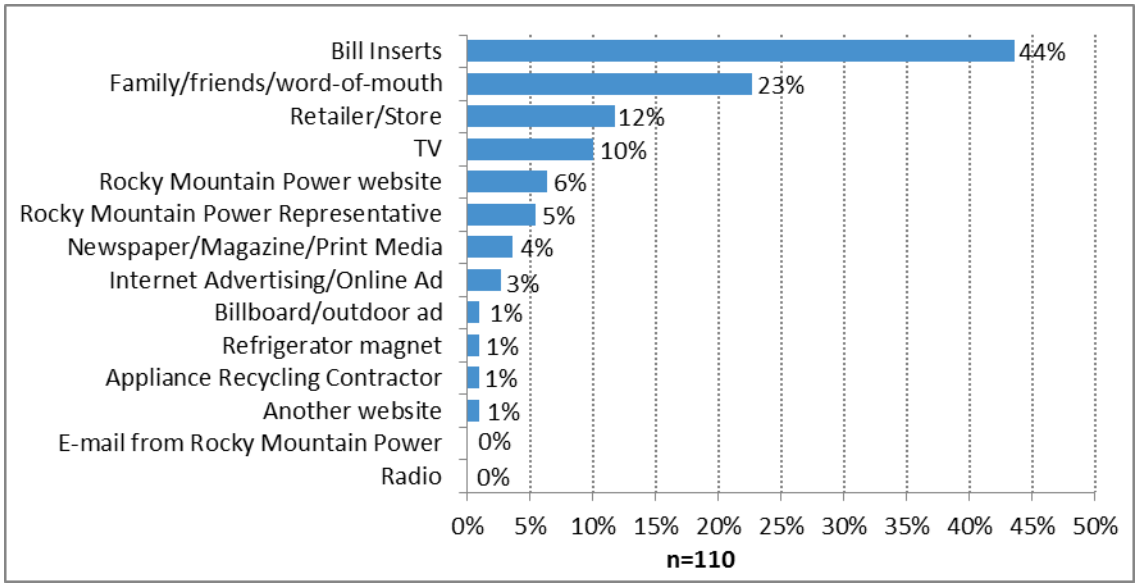
Program marketing slightly changed focus during 2013 and 2014: marketing contractor PECI made an effort to contact retailers in Rocky Mountain Power's territory, urging them to help promote the program (including training sessions with retailers). PECI maintained preexisting relationships with these retailers due to its administration of Rocky Mountain Power's Home Energy Savings program (which provides customers with rebates for installing energy-efficient equipment—including refrigerators and freezers). Previously utilized advertising marketing channels continued, though, to fund retailer outreach activities, advertising channel budgets decreased somewhat from 2011–2012 levels

As shown in

Figure 9, participants learned of the program through a variety of methods, with the following cited most commonly:

- Bill inserts
- Word-of-mouth
- Retailers
- Television media

Figure 9. How Participants Learned About the Program



In a separate question, 60% of participants cited bill inserts as the best way for Rocky Mountain Power to communicate about energy efficiency opportunities, while 15% cited e-mail, and fewer than 10% cited all other communication methods. E-mail exhibited the largest gap between actual sources of awareness and preferred information sources; in Wyoming, email accounted for 0% of program awareness for SYLR participants. Since the 2011–2012 evaluation, the most significant changes in awareness sources included fewer mentions of television (down from 21%, n=216) and more mentions of Rocky Mountain Power's website (up from 2%, n=216).[23]

According to the program manager and program administrator staff, JACO closely examined past pick-up trends to inform and develop marketing plans. Observations about the program's seasonality—with participation rising in the spring and summer and peaking in the fall—led program administrator staff to recommend aligning advertising and bill inserts with this seasonal behavior. Consequently, during 2013 and 2014, the highest advertising expenditures occurred in April-May and August-September.

Targeting

Program and administrator staff reported that they did not target customers for the SYLR program based on demographic or market characteristics; rather, they targeted customers that might have a second refrigerator or freezer. During the evaluation period, PECI sent mailings to customers who participated in the Home Energy Savings program and received rebates for new appliances. These customers could have extra units available for recycling. PECI also targeted zip codes where retailer market data indicated the highest new unit purchase rates.

[23] The differences between evaluations were significant at p<.05 for television and at p<.10 for the website using binomial t-tests.

Compared to customers in the general population, SYLR program participants were more likely to own their single-family residences, with 2013–2014 demographic results consistent with previous evaluations. Table 27 shows average demographics for surveyed participants.

Table 27. Participant Demographics

Characteristic	Participants 2009–2010	Participants 2011–2012	Participants 2013–2014
Average Head of Household Age	57.4	59.6	57.0
Homeownership	95%	92%	97%
Average Household Size (number of people)	2.6	2.9	2.7

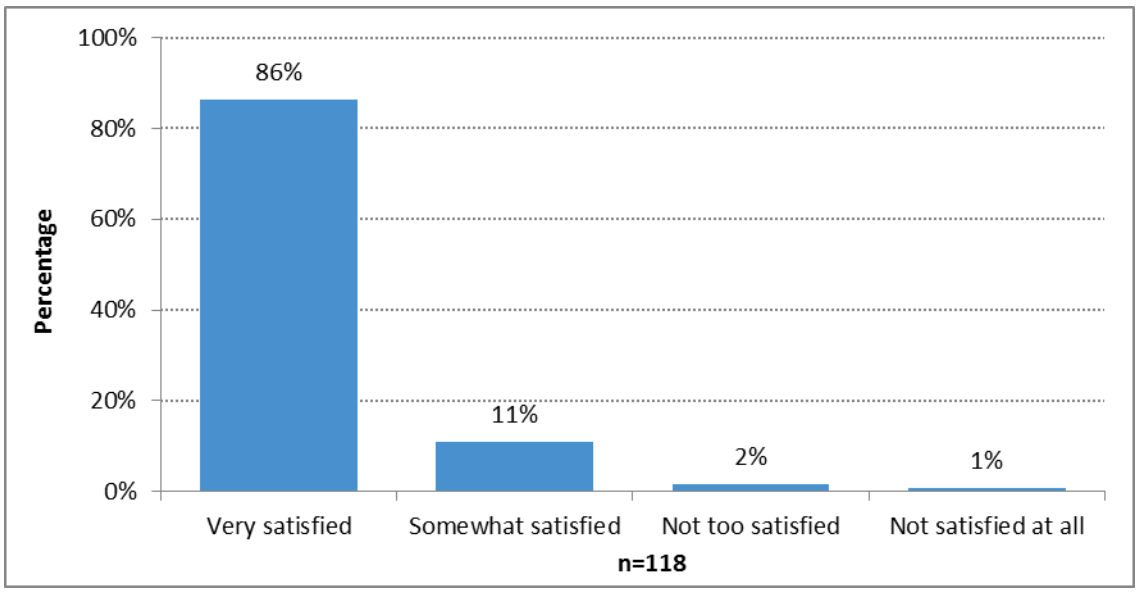
The majority of 2013 and 2014 participants (90%) lived in single-family, detached residences (10% lived in multifamily, attached, mobile, or manufactured homes): data similar to the 2011–2012 survey, where 8% of participants lived in multifamily or manufactured homes. Given self-reported (i.e., landlines or cell phones) participant contact information, the survey less likely experienced bias for respondents with landlines (often produced through random-digit-dial surveys).

Customer Response

Satisfaction

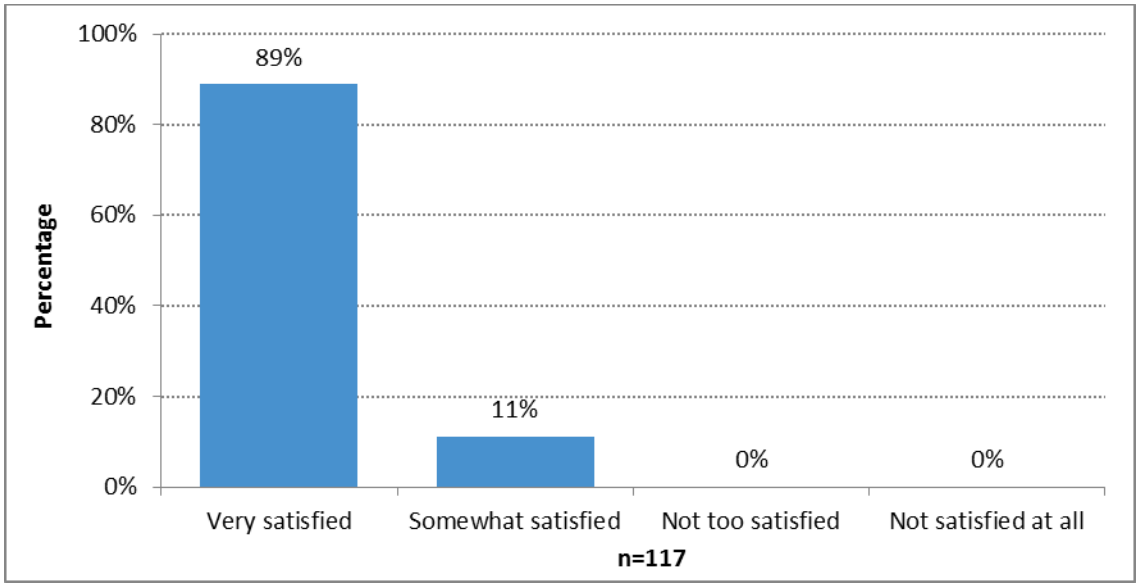
As shown in Figure 10, participants experienced high overall satisfaction rates with the program: 86% of participants reported being very satisfied with the program, and only 3% reported dissatisfaction. Utility ARP programs commonly report such high customer satisfaction levels due to the nature of participation: the customer pays no out-of-pocket costs and very rarely indicates regret about disposed of an old appliance.

Figure 10. Overall Program Satisfaction



As shown in Figure 11, participants also reported high satisfaction levels with JACO contractors (picked up units for recycling), with 89% saying they were "very satisfied" and none reporting dissatisfaction.

Figure 11. Satisfaction with JACO Contractor

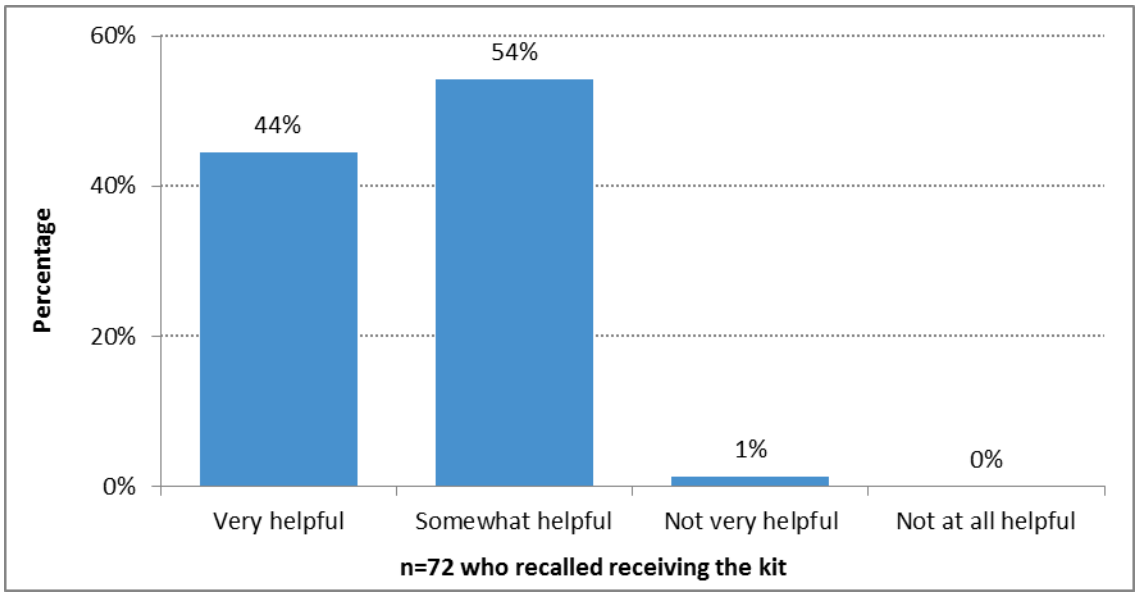


Program and administrator staff noted that the SYLR Program rarely received customer complaints. The pick-up staff's use of hand-held computers allowed them to communicate quickly with JACO's call center, enabling all involved parties to communicate efficiently and knowledgeably with the customer if problems arose (e.g., locating the home, picking up the unit).

As shown in Figure 12, nearly all participants (99%, n=72) who recalled receiving the program-supplied energy efficiency kit found the included information helpful. About one-third of the customers who recalled the informational booklet included with the kit reported they followed advice provided by the booklet (35%, n=49), with actions taken by participants including the following:

- Adjusting thermostats and temperature settings on water heaters, refrigerators, and freezers;
- Adding insulation and sealing leaks;
- Upgrading to efficient lighting (CFLs and LEDs); and
- Turning off and unplugging electronic items when not in use.

Figure 12. Helpfulness of Energy Information Included with Kits

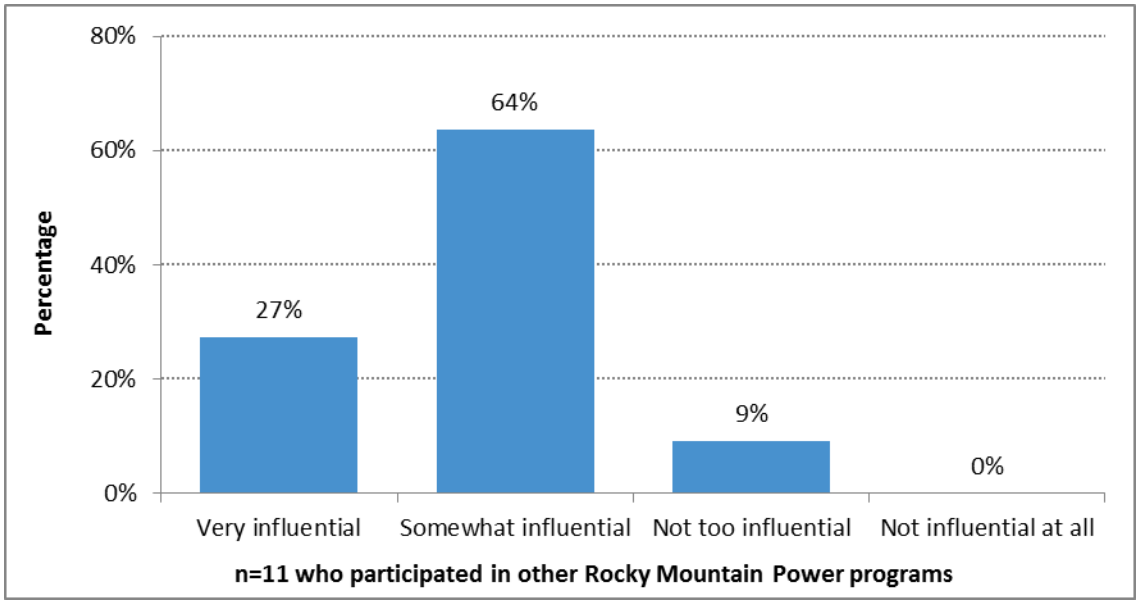


Influence on Participation in Other Programs and Actions

The survey asked participants if they had participated in other Rocky Mountain Power energy efficiency incentive programs since participating in SYLR, and how much their SYLR participation influenced their decision to participate in other programs. Ten percent (n=117) of SYLR participants reported participating in another Rocky Mountain Power program.

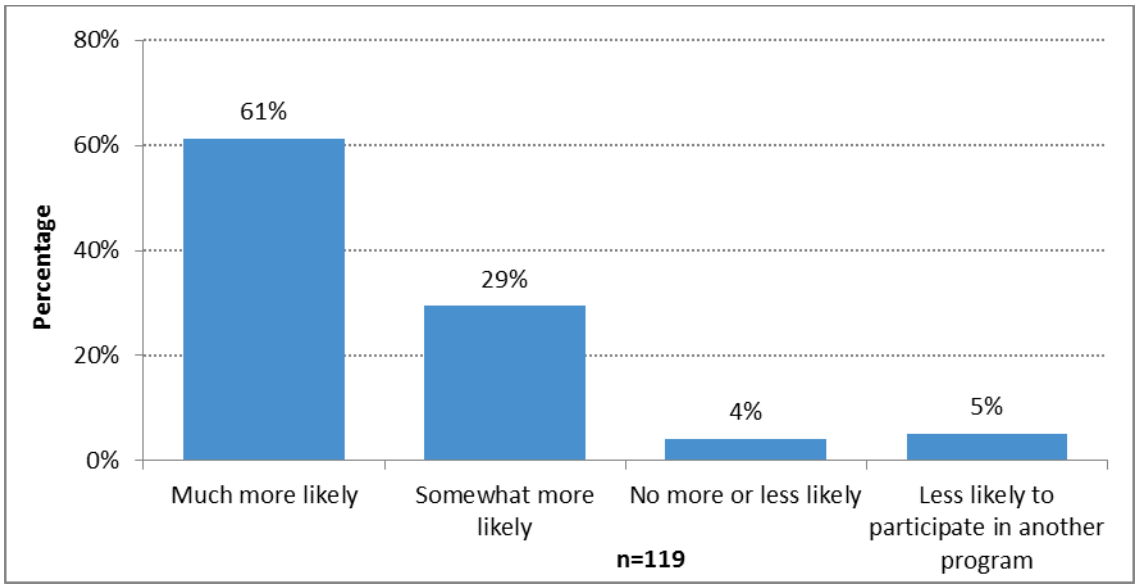
Error! Not a valid bookmark self-reference. shows that 91% (n=11) of those participating in other programs said their SYLR participation was “very” or “somewhat influential” on their decisions to participate in other Rocky Mountain Power programs, while only 9% said their participation in SYLR was “not too influential”; none found SYLR “not influential at all.” These participants also reported they received weatherization, insulation, and rebates for efficient appliances, and they purchased renewable energy through the Blue Sky program.

Figure 13. Influence of SYLR Program on Participation in Other Rocky Mountain Power Programs



The survey asked how likely participants would be to participate in other energy efficiency programs, based on their experience participating in the SYLR program. As shown in Figure 14, a majority (61%, n=119) said they would be much more likely to participate in other programs, while 5% said they would be less likely to participate, and 4% said they would be neither more nor less likely to participate in other programs.

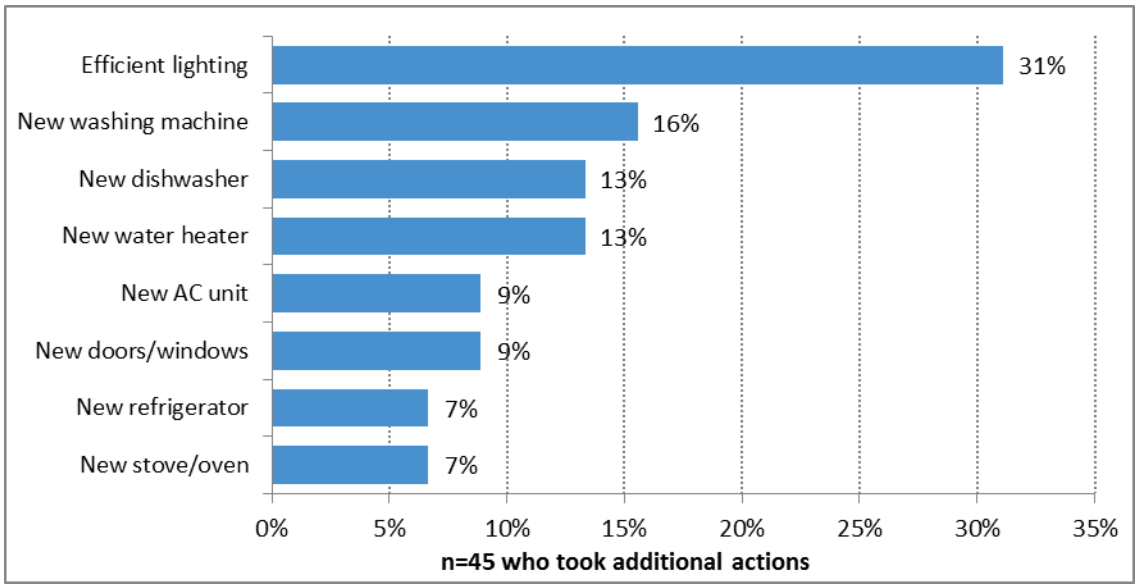
Figure 14. Likelihood of Participating in Other Energy Efficiency Programs



The survey asked participants if they took any additional energy-saving actions outside of participating in Rocky Mountain Power programs, and how influential their SYLR participation was in taking these

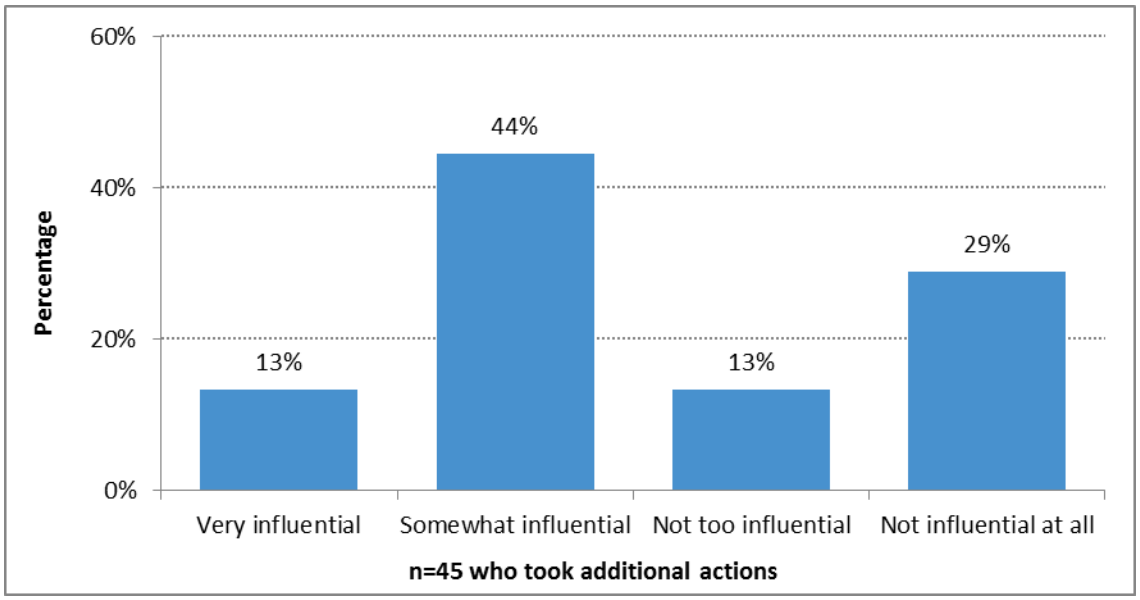
additional actions. More than one-third of surveyed customers reported taking additional energy-saving actions on their own, aside from participating in utility-sponsored incentive programs (38%, n=119). Of participants taking additional actions, only 9% (n=43) stated that they received Rocky Mountain Power incentive rebates for items they purchased. As shown in Figure 15, participants who reported taking action outside of incentive programs most commonly conducted lighting upgrades (31%, n=45).

Figure 15. Additional Actions Taken by Program Participants



A majority of surveyed participants (58%, n=45) reported their participation in SYLR was "very" or "somewhat influential" on their decision to take additional actions, as shown in Figure 16.

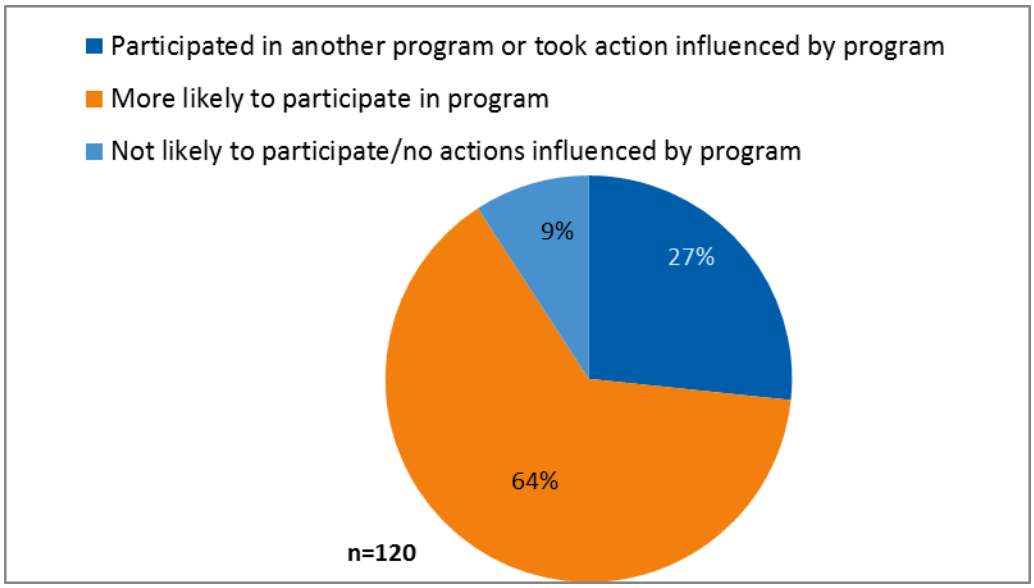
Figure 16. Influence of SYLR Program on Additional Actions



, combining responses from the previous questions about energy efficiency actions taken through utility programs or on the customer's own initiative, shows one-quarter of SYLR participants (27%, n=120) had already participated in other energy efficiency programs or had taken actions on their own which were influenced by the SYLR Program. Another 64% of participants had not taken additional actions influenced by the SYLR Program or participated in other energy efficiency programs, but they said they were more likely to participate in energy efficiency programs due to their experiences with the program; the remaining 9% of participants did not take actions influenced by the program and were unlikely to participate in other energy efficiency programs.

Figure 17, combining responses from the previous questions about energy efficiency actions taken through utility programs or on the customer's own initiative, shows one-quarter of SYLR participants (27%, n=120) had already participated in other energy efficiency programs or had taken actions on their own which were influenced by the SYLR Program. Another 64% of participants had not taken additional actions influenced by the SYLR Program or participated in other energy efficiency programs, but they said they were more likely to participate in energy efficiency programs due to their experiences with the program; the remaining 9% of participants did not take actions influenced by the program and were unlikely to participate in other energy efficiency programs.

Figure 17. Summary of Program Influence



Incentive Payments

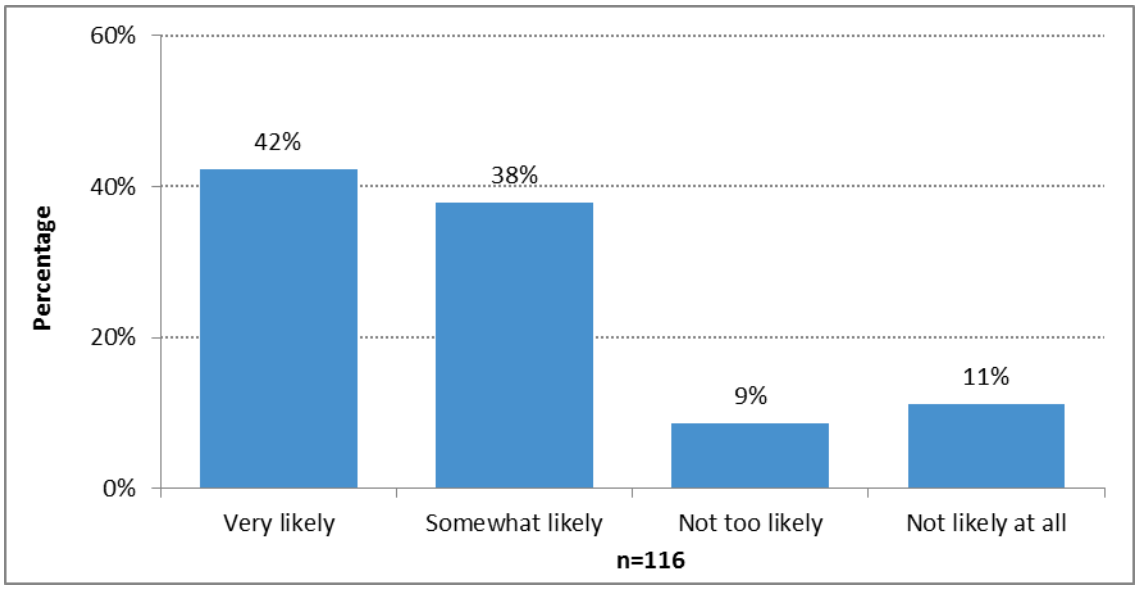
Only 5% of participants reported waiting longer than six weeks to receive their incentive payments, while a majority (55%) received their payments within four weeks (n=87). The remainder received payments within four to six weeks. Participants were asked if they recommended the SYLR Program to their friends, relatives, and colleagues; 67% (n=114) reported that they recommended the program.

When asked if they would have participated in the SYLR program had it not offered a monetary incentive, a large majority (77%, n=111) indicated they would have.

However, Cadmus has evaluated several other programs where incentive levels varied and found participation responds to changes in incentives. In a recent evaluation for California, Cadmus noted that after Southern California Edison decreased its per-unit incentive for refrigerators from $50 to $35, participation dropped by 17%. Additionally, looking at average annual participation at the two incentive levels, participation averaged 27% lower at $35 that at $50 per unit.[24]

The survey asked: "How likely would you be to participate if you could give your incentive to charity?" As shown in Figure 18, 20% of participants indicated they likely would not participate in the program if their rebates went to charity, while 42% said they would still be "very likely" to participate, and 38% said they would be somewhat likely.

Figure 18. Participation if Incentive Could be Donated to Charity



Barriers

Overall, surveyed participants did not report notable complaints or issues, and, based on the overall process evaluation, Cadmus noted no significant barriers to participation. Responses from program participants indicated that the program functioned smoothly, likely due to its longevity in the Wyoming market and the program administrator's experience.

[24] Cadmus. *Appliance Recycling Program Process Evaluation and Market Characterization Volume 1*. September 18, 2013. Available at: http://www.calmac.org/publications/SCE_PGE_ARP_Final_Report_Vol.1_09-18-13.pdf

Quality Assurance/Quality Control

The SYLR Program used multiple QA/QC checkpoints to facilitate quality delivery and accurate data tracking. During the current evaluation period, handheld devices were used to record pick-ups.

When a pick-up crew arrived at a customer's home, they verified the unit was in working condition and fit the size criteria. If the unit passed those two tests (and therefore met the program criteria), the crew entered the model number, unit number, size, and age into the handheld device, and photographed the unit from a specific angle. If the unit did not meet the program's criteria, the crew still took the picture and recorded why the unit was not accepted. The pick-up crew also indicated if they caused any damage during their visit. Information uploaded to the handheld device reached the program administrator's database within five minutes, becoming available to all authorized program users.

When the unit arrived at the warehouse, warehouse staff scanned the unit, and the appliance picture taken by the pick-up staff appeared. This served as verification that the correct unit arrived at the warehouse and would be processed for recycling.

In addition to QA/QC performed by the program administrator, an independent contractor hired by Rocky Mountain Power performed follow-up inspections for a random sample of 5% of participant homes. These inspections ensured that pick-up procedures were followed and that any issues were reported to Rocky Mountain Power and the program administrator.

Cost-Effectiveness

In assessing cost-effectiveness, Cadmus analyzed program costs and benefits from five different perspectives, using Cadmus' DSM Portfolio Pro[25] model. *The California Standard Practice Manual* for assessing DSM program cost-effectiveness describes the benefit/cost ratios Cadmus used for the following five tests:

- **PacifiCorp Total Resource Cost (PTRC) Test:** This test examined program benefits and costs from the combined perspectives of Rocky Mountain Power and of Rocky Mountain Power customers. On the benefit side, it included avoided energy costs, capacity costs, and line losses, plus a 10% adder to reflect non-quantified benefits. On the cost side, it included costs incurred by both the utility and participants.
- **Total Resource Cost (TRC) Test:** This test also examined program benefits and costs from Rocky Mountain Power's and Rocky Mountain Power customers' perspectives, combined. On the benefit side, it included avoided energy costs, capacity costs, and line losses. On the cost side, it included costs incurred by both the utility and participants.
- **Utility Cost Test (UCT):** This test examined program benefits and costs solely from Rocky Mountain Power's perspective. The benefits included avoided energy, capacity costs, and line losses. The costs included program administration, implementation, and incentive costs associated with program funding.
- **Ratepayer Impact Measure (RIM) Test:** All ratepayers (participants and nonparticipants) may experience rate increases designed to recover lost revenues. The benefits included avoided energy costs, capacity costs, and line losses. This test included all Rocky Mountain Power program costs and lost revenues.
- **Participant Cost Test (PCT):** From this perspective, program benefits included bill reductions and incentives received. Costs included a measure's incremental cost (compared to the baseline measures), plus installation costs incurred by the customer.

Table 28 summarizes the five tests' components.

[25] DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and a number of regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

Table 28. Benefits and Costs Included in Various Tests

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs* with 10% adder for non-quantified benefits	Program administrative and marketing costs, and costs incurred by participants**
TRC	Present value of avoided energy and capacity costs*	Program administrative and marketing costs, and costs incurred by participants**
UCT	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive costs
RIM	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive costs, plus the present value of lost revenues
PCT	Present value of bill savings and incentives received	Incremental measure and installation costs

*Includes avoided line losses.

**Incentive costs typically are excluded from the TRC as transfer payments. For ARPs such as SYLR, however, participants do not incur costs. Therefore, the incentive cost is treated differently from incentives in typical DSM programs, and is not excluded from the TRC; rather, it is treated as an administrative cost as it does not offset participant costs. Consequently, for SYLR, the UCT and the TRC costs equaled.

Table 29 provides cost-effectiveness analysis inputs, including evaluated energy savings for each year, discount rates, line losses, and program costs. Rocky Mountain Power provided these values, except evaluated energy savings and evaluated participation. Cadmus derived the discount and inflation rates from Rocky Mountain Power's 2013 Integrated Resource Plan. Measure lives used (shown in Table 29) were derived from annual report data provided by Rocky Mountain Power and were based on Cadmus' recommendations from the 2011–2012 SYLR program evaluation. Maintaining consistency with annual reports allowed more direct comparisons of reported and evaluated results. For all analyses, Cadmus used avoided costs associated with PacifiCorp's 2013 IRP *East Residential Whole House 35%* and *Residential Lighting 48% Load Factor Decrements*.[26]

Table 29. Selected Cost-Effectiveness Analysis Inputs

Input Description	2013	2014	Total
Units			
Refrigerators	643	639	1,282
Freezers	136	153	289
Energy-Savings Kits	726	742	1,468
Measure Lives			
Refrigerators	7	7	N/A
Freezers	5	5	N/A
Energy-Savings Kits	6	6	N/A

[26] The IRP decrements are detailed in Appendix N of PacifiCorp's *2013 Integrated Resource Plan*: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol2-Appendices_4-30-13.pdf

Input Description	2013	2014	Total
Evaluated Net Savings (kWh/year)*	**299,226**	**286,991**	**586,217**
Discount Rate	6.88%	6.88%	N/A
Line Loss	9.51%	9.51%	N/A
Residential Energy Rate ($/kWh)	$0.1042	$0.1071	N/A
Inflation Rate**	1.90%	1.90%	N/A
Total Program Costs	**$133,237**	**$144,954**	**$278,191**

*Savings occur at the meter, while benefits account for line loss.
**Future retail rates determined using a 1.9% annual escalator.

Cost-Effectiveness Results

Table 30 presents the program cost-effectiveness analysis results, including the evaluated NTG[27] for all program measures during the evaluation period (2013–2014), but does not account for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC test). A benefit/cost ratio greater than 1.0 is considered cost-effective. From the PTRC, TRC, UCT, and RIM test perspectives the cost-effectiveness analysis results indicate the combined 2013–2014 program performed suboptimally with benefit/cost ratios less than 1.0; the PTRC test was most cost-effective with a benefit/cost ratio of 0.99.

Table 30. Net Evaluated 2013 and 2014 Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.078	$268,856	$267,505	($1,352)	0.99
TRC No Adder	$0.078	$268,856	$243,186	($25,670)	0.90
UCT	$0.078	$268,856	$243,186	($25,670)	0.90
RIM		$616,153	$243,186	($372,967)	0.39
PCT		$0	$1,076,464	$1,076,464	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000005742
Discounted Participant Payback (years)					N/A

The 2013-2014 program cycle was less effective than the 2011-2012 evaluation period with a TRC benefit-cost ratio of 0.9 (whereas the 2011-2012 TRC benefit-cost ratio was 1.56). The 2013-2014 program achieved an evaluated NTG of 32.8% for refrigerators and 25.1% for freezers compared to 57.0% for refrigerators and freezers for the 2011-2012 program. The 2013-2014 program achieved net savings of 586,217 kWh compared to over 1.02 million for 2011-2012. The 2011-2012 costs were also about 24% more than those in the subsequent 2013-2014 evaluation period.

The 2013 program was cost-effective from the PTRC perspective, with a benefit-cost ratio of 1.04. The cost effectiveness threshold of 1.0 falls within the margin of error for the savings estimates, however.

[27] Evaluated NTG was 32.8% for refrigerators and 25.1% for freezers.

The PCT benefit/cost ratio could not be calculated as no costs were associated with this test perspective. Table 31 and Table 32 show the program's evaluated cost-effectiveness for the 2013 and 2014 program years, respectively.

Table 31. Net Evaluated 2013 Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.073	$133,237	$138,673	$5,436	1.04
TRC No Adder	$0.073	$133,237	$126,066	($7,171)	0.95
UCT	$0.073	$133,237	$126,066	($7,171)	0.95
RIM		$312,440	$126,066	($186,374)	0.40
PCT		$0	$546,870	$546,870	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000003202
Discounted Participant Payback (years)					N/A

Table 32. Net Evaluated 2014 Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.083	$144,953	$137,698	($7,255)	0.95
TRC No Adder	$0.083	$144,953	$125,180	($19,773)	0.86
UCT	$0.083	$144,953	$125,180	($19,773)	0.86
RIM		$324,614	$125,180	($199,434)	0.39
PCT		$0	$566,041	$566,041	N/A
Lifecycle Revenue Impacts ($/kWh)					$0.000003371
Discounted Participant Payback (years)					N/A

Appendix A. Survey Respondent Demographics

Table 33. Home Type Characteristics

Home Characteristics	Percent of Respondents	Precision at 90% Confidence*
Home Type (n=113)		
Single-family Home	90%	4.6%
Townhome or duplex	1%	1.5%
Manufactured home, mobile home, or trailer	6%	3.8%
Apartment building with 4 or more units	3%	2.5%
Own or Rent (n=115)		
Own	97%	2.8%
Rent	3%	2.8%
How long have you lived at that location? (n=114)		
Less than one year	9%	4.4%
Two to five years	16%	5.7%
More than five years	75%	6.7%

*Absolute precision (the confidence interval is the percent of respondents, plus or minus precision).

Table 34. Household Characteristics

Household Characteristics	Mean	Standard Deviation	Precision at 90% Confidence *
Participant Age (n=115)	57.0	16.0	4.3%
Number of Residents (n=135)	2.7	1.4	8.1%

*Relative precision (the confidence interval is the mean, plus or minus the mean multiplied by precision).

Figure 19. Distributions of Household Sizes

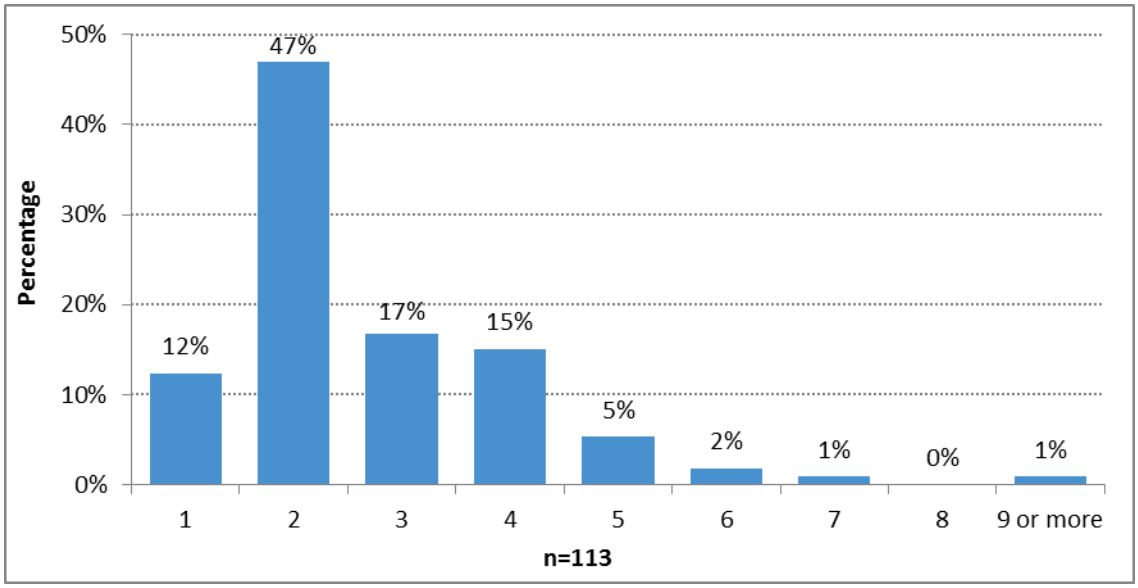


Figure 20. Distributions of Participant Ages

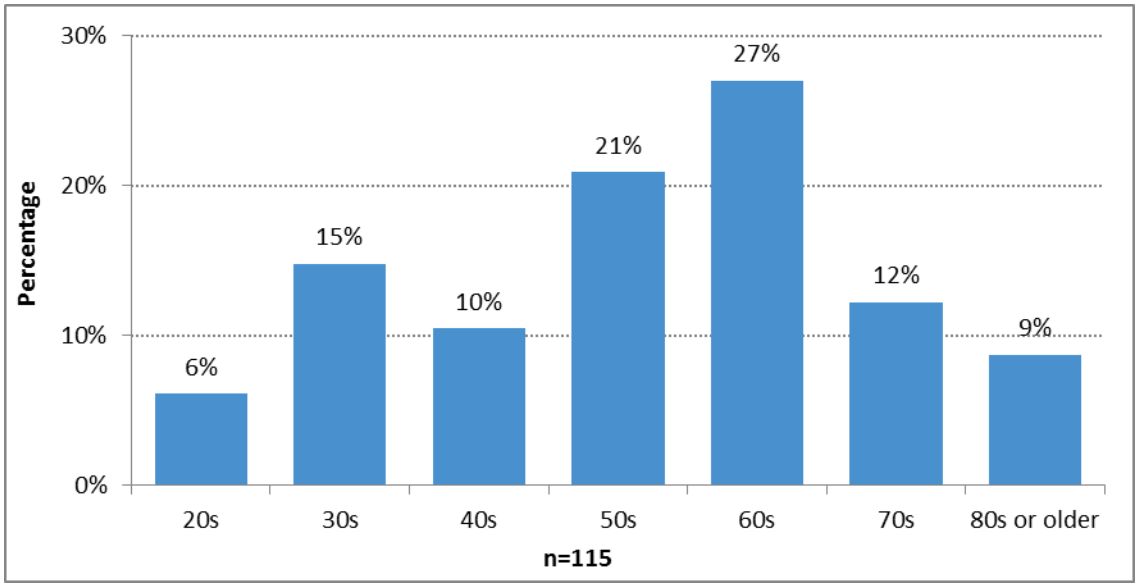
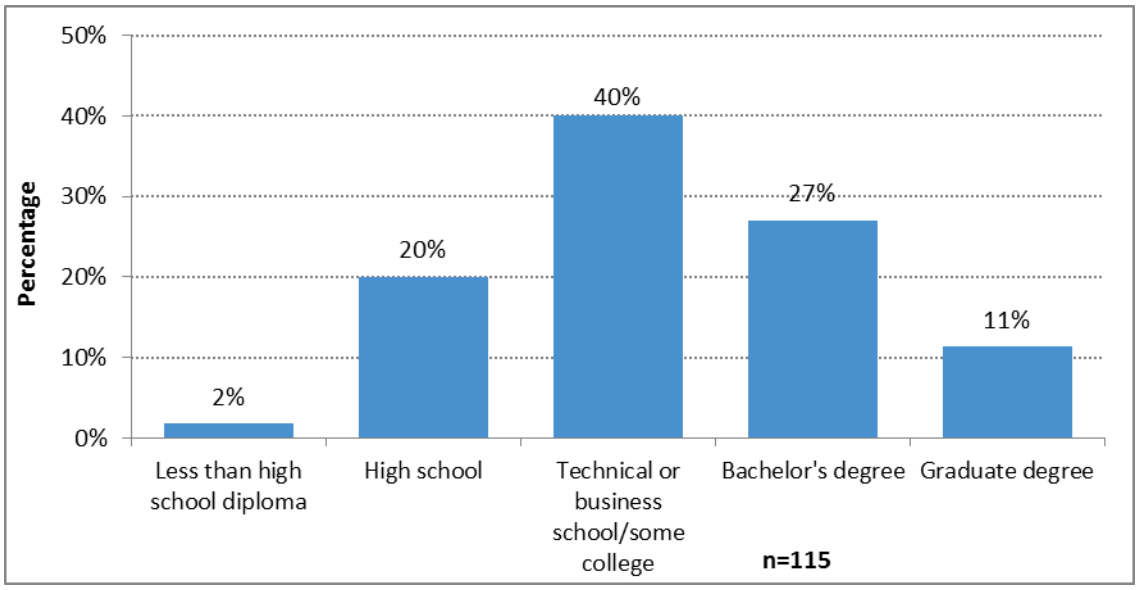


Figure 21. Distribution of Participant Education Levels



Appendix B. Precision Calculations

To determine the savings results' uncertainty level, Cadmus considered the sampling error's effect on all estimates presented in the report. Sampling error refers to uncertainty introduced by use of sampled data to infer characteristics of the overall population. These data include survey results, meter data, and data from secondary sources. Cadmus used sampled data to estimate the parameters of per-unit savings calculations (such as installation rates) and to estimate the consumption of specific equipment types (such as in billing analysis).

Sampling error was reflected in estimated confidence intervals. Unless otherwise noted, Cadmus estimated intervals at 90% confidence, indicating a 90% confidence that the true population value fell within the given interval. Cadmus calculated confidence intervals for means, proportions, regression estimates, and any calculated values using sample estimates as an input and the following standard formula for estimating uncertainty for proportions and means:

$$Confidence\ Interval_{mean} = mean \pm 1.645 * \sqrt{\frac{s^2}{n}}$$

Where:

1.645 = the z-score for a 90% confidence interval.

s^2 = the sample variance.

In some cases, the uncertainty of estimates derived from multiple sources. For example, for summed estimates (such as those for total program savings), Cadmus calculated the root of the sum of the squared standard errors to estimate the confidence interval:[28]

$$Confidence\ Interval_{\bar{X}+\bar{Y}} = (\bar{X} + \bar{Y}) \pm 1.645 * \sqrt{\left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right) + \left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right)}$$

In some cases, Cadmus multiplied estimates. For instance, net savings calculations involved combining gross estimates with an in-service rate and/or NTG ratio estimated from participant surveys. For these results, Cadmus calculated combined standard errors for the final estimates. Where the relationship was multiplicative, Cadmus used the following formula:[29]

$$Confidence\ Interval_{\bar{X}*\bar{Y}} = \bar{X} * \bar{Y} \pm 1.645 * \sqrt{\bar{Y}^2\left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right) + \bar{X}^2\left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right) + \left(\frac{s^2{}_{\bar{X}}}{n_{\bar{X}}}\right)\left(\frac{s^2{}_{\bar{Y}}}{n_{\bar{Y}}}\right)}$$

---

[28] This approach to aggregating errors follows methods outlined in: Schiller, Steven, et al. *National Action Plan for Energy Efficiency*. Appendix D. 2007. Available online: www.epa.gov/eeactionplan.

[29] Cadmus derived this formula from: Goodman, Leo. "The Variance of the Product of K Random Variables." Journal of the American Statistical Association. 1962.

To ensure transparency of the error aggregation process, Cadmus reported precision for individual and combined estimates, where relevant.

Appendix C. Participant Survey Instrument

A. *Introduction*

These questions ensure we are speaking to the person in the household who is the most knowledgeable about the program and the household's participation in the program.

A1. Hello, I'm [INSERT NAME] calling from VuPoint Research on behalf of [UTILITY]. We are not selling anything. May I speak with [CONTACT NAME]? OR [IF NO NAME] May I speak with the person who is most familiar with the [UTILITY] See Ya Later, Refrigerator program? [IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR NAME AND PHONE NUMBER AND START AGAIN] [IF NEEDED: THE SEE YA LATER, REFRIGERATOR PROGRAM PROVIDES AN INCENTIVE FOR [UTILITY] CUSTOMERS ALONG WITH FREE PICK UP AND RECYCLING FOR WORKING REFRIGERATORS, FREEZERS, AND ROOM AIR CONDITIONERS]

1. (Yes)
98. (DON'T KNOW) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
99. (REFUSED) [THANK AND TERMINATE]

A2. We are not selling anything. [UTILITY] Utilities is actively seeking your opinions about energy efficiency programs that could help customers save money on their electric bills. We are conducting an important study about [UTILITY]'s See Ya Later, Refrigerator program. Are you the best person to speak with? This call may be monitored or recorded for quality assurances purposes. [IF NEEDED: Your responses will be used as part of a study to improve [UTILITY] energy efficiency programs.] [IF NEEDED: The See Ya Later, Refrigerator program provides an incentive for [UTILITY] customers along with free pick up and recycling for working refrigerators, freezers, and room air conditioners.]

1. (Continue)

The next two questions determine whether the respondent can safely participate in the survey at this time.

A3. *Are you currently talking to me on a regular landline phone or a cell phone?

1. Regular landline phone
2. Cell Phone
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF A3 = 2]

A4. *Are you currently in a place where you can talk safely and answer my questions?

1. (Yes)
2. (No) [Schedule call back]
3. (No) (DO NOT CALL BACK. THANK AND TERMINATE)
98. (DON'T KNOW) [SCHEDULE CALL BACK]
99. (REFUSED) [SCHEDULE CALL BACK]

A5. Our records show that on **[DATE]** you had at least one **[MEASURE1]** removed by [UTILITY]**'s** See Ya Later, Refrigerator program. Is this correct? [INTERVIEWER NOTE: Please verify appliances are correct before selecting "yes."]

1. (Yes, both date and appliance are correct)
2. (Appliance is correct, date unknown)
3. (No, appliance incorrect) [THANK AND TERMINATE]
4. (No, didn't participate; didn't remove refrigerator or freezer) [THANK AND TERMINATE]

98. (DON'T KNOW) [ASK FOR THE PERSON WHO WOULD BE MOST FAMILIAR AND BEGIN AGAIN.]
99. (REFUSED) [THANK AND TERMINATE]

[THANK AND TERMINATE TEXT]
For this survey we are only including households that have recycled a [MEASURE]. We do appreciate you taking our call. Thank you and have a good [evening/day.]

If didn't recycle anything

[THANK AND TERMINATE TEXT]

For this survey we are only including households that have recycled a refrigerator or freezer in 2014. We do appreciate you taking our call. Thank you and have a good [evening/day.]

A6. *Have you ever been employed in the market research field?

1. Yes [THANK AND TERMINATE]
2. No [CONTINUE]

99. REFUSED [THANK AND TERMINATE]

A7. *Have you or anyone in your household, ever been employed by or affiliated with [UTILITY] Corporation, or any other utility?

1. Yes [THANK AND TERMINATE]
2. No [CONTINUE]

99. REFUSED [THANK AND TERMINATE]

[THANK AND TERMINATE TEXT]
For this survey we are only including households that have not been employed in the market research field or with [UTILITY]. We do appreciate you taking our call. Thank you and have a good [evening/day.]

Back-up information, not to be programmed:

[If "No – Not a convenient time," ask if Respondent would like to arrange a more convenient time for us to call them back or if you can leave a message for that person.]

[IF RESPONDENT ASKS HOW LONG, SAY: "APPROXIMATELY 10 MINUTES."]
[IF NEEDED:] This survey is for research purposes only and this is not a marketing call. This is the primary way for program participants to provide input into the rebate programs [UTILITY] offers. Your

participation in this study is important so that [UTILITY] can include your perspectives in how their energy efficiency programs are offered.

B. Quantity Verification

These questions are designed to verify that the quantities in the database are correct.

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

B7. Our program records indicate you received an incentive for recycling **[REF_QTY]** refrigerator(s), in **[UTILITY]'s** program in 2014. Is this correct?

1. (Yes, that is correct)
2. (No, quantity not correct)
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF B1 =2]

B8. How many refrigerators did you have recycled through **[UTILITY]'s** program in 2014?

1. [RECORD QUANTITY] [CREATE VARIABLE [**VREF_FL][**
98. (DON'T KNOW)
99. (REFUSED)

[IF **[FRZ_QTY]** >=1]

B9. Our program records indicate you received an incentive for recycling **[FRZ_QTY]** freezer(s), in **[UTILITY]'s** program in 2014. Is this correct?

1. (Yes, that is correct)
2. (No, quantity not correct)
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF B3 = 2]

B10. How many freezers did you have recycled through **[UTILITY]'s** program in 2014?

1. [RECORD QUANTITY] [CREATE VARIABLE [**VFRZ_FL]**
98. (DON'T KNOW)
99. (REFUSED)

C. Program Awareness

This section is for program participants. Questions in this section assess marketing channels along with whether the respondent would recommend the program.

C7. How did you learn about the See Ya Later, Refrigerator program? Was it from [UTILITY], from a contractor or retailer, from a friend or family member or some other way? [ASK THE APPROPRIATE FOLLOW-UP QUESTION TO GET MORE DETAIL ABOUT HOW THEY LEARNED ABOUT THE PROGRAM] [MULTIPLE RESPONSES; ALLOW UP TO 3; DO NOT READ LIST]

[UTILITY]: Was it from a bill insert, the newsletter, an email, social media , [UTILITY] website, [UTILITY] advertisement, or a [UTILITY] employee? [CODE BELOW]

[Utility]

1. Newspaper/Magazine/Print Media ([UTILITY] mailer)
2. Bill Inserts
3. Rocky Mountain Power/Pacific Power website
4. Rocky Mountain Power/Pacific Power Representative
5. E-mail from Rocky Mountain Power/Pacific Power

[Media]

6. Internet Advertising/Online Ad
7. Radio
8. TV
9. Billboard/outdoor ad
10. Other website

[Contractor]

11. Appliance Recycling Contractor

[Friend or Family]

12. Family/friends/word-of-mouth
13. [Shows/event]Retailer/Store
14. Sporting event
15. Home Shows/Trade Shows
16. Other [RECORD VERBATUM]
98. (DON'T KNOW) [SKIP TO NEXT SECTION (D1)]
99. (REFUSED) [SKIP TO NEXT SECTION (D1)]

[ASK C1 = 1 THROUGH 15]

C8. What are the best ways for [INSERT UTILITY] to inform you about energy-efficiency offerings like the appliance recycling program? [DO NOT READ. PROMPT IF NECESSARY. RECORD UP TO THREE RESPONSES]

[Utility]

1. Newspaper/Magazine/Print Media ([UTILITY] mailer)
2. Bill Inserts
3. Rocky Mountain Power/Pacific Power website
4. Rocky Mountain Power/Pacific Power Representative
5. E-mail from Rocky Mountain Power/Pacific Power

[Media]

6. Internet Advertising/Online Ad
7. Radio
8. TV

9. Billboard/outdoor ad
10. Other website

[Contractor]

11. Appliance Recycling Contractor

[Friend or Family]

12. Family/friends/word-of-mouth
13. [Shows/event]Retailer/Store
14. Sporting event
15. Home Shows/Trade Shows
16. Other [RECORD VERBATUM]
98. (DON'T KNOW)
99. (REFUSED)

C9. How would you rate your current understanding of energy-efficiency? Would you say you… [READ LIST. RECORD FIRST RESPONSE]

1. Have a very good understanding
2. Have a good understanding
3. Have a limited understanding
4. Have very little understanding of energy-efficiency
98. (DON'T KNOW)
99. (REFUSED)

D. *Refrigerator/Freezer Part-use*

This section determines the portion of the year the appliance was in use, whether it was a primary or secondary appliance, and whether the appliance was kept in a location that was subject to weather extremes.

[IF **VREF_FL**>1 FROM B1 or B2 AND **MEASURE1 = REF OR VFRZ_FL**>1 FROM B3 or B4 AND **MEASURE1 = FRZ THEN**]
[Ask only if the respondent recycled more than one of the same type of unit]

Now I am going to ask you some questions about the [CONFIGURATION] **[MEASURE1]** that you recycled, please answer all subsequent questions with this specific appliance in mind.

D7. Approximately how old was your **[MEASURE1]**? [INTERVIEWER: RECORD IN YEARS. ENTER "00" IF LESS THAN ONE YEAR OLD.]

1. [RECORD YEARS]
98. (DON'T KNOW)
99. (REFUSED)

D8. How would you describe the condition of the **[MEASURE1]** you recycled through the program? Would you say …? [READ LIST AND RECORD ONE RESPONSE. PROVIDE EXAMPLES IF NECESSARY]

1. It worked well and was in good physical condition.
2. It worked okay but had some problems [Example: it wouldn't defrost].
3. It didn't work (Example: turned on but did not cool or did not turn on)
98. (DON'T KNOW)
99. (REFUSED)

D9. In the last year, how much was the **[MEASURE1]** used? Was it…(READ LIST)?

1. Kept running all the time
2. Plugged in only for special occasions or certain months of the year
3. Never plugged in or running
4. (Other) [SPECIFY]
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF D3 = 2]

D10. During the last year, how many total months do you think it was plugged in and running? (USE "99" FOR DON'T KNOW AND "98" FOR REFUSED.)

1. [RECORD MONTHS] [RANGE 1-12;]
98. (DON'T KNOW)
99. (REFUSED)

D11. For the majority of the last year, where within your home was the **[MEASURE1]** located? [RECORD ONE RESPONSE; READ LIST IF NEEDED]

1. Kitchen
2. Garage
3. Porch/patio
4. Basement
5. (Other) [SPECIFY]
98. (DON'T KNOW)
99. (REFUSED)

D12. Was the location heated?

1. Yes
2. No
98. (DON'T KNOW)
99. (REFUSED)

D13. Was the location cooled?

1. Yes
2. No
98. (DON'T KNOW)
99. (REFUSED)

E. Replacement

This section verifies whether appliances were replaced after the prior units were recycled through the program. This section also determines whether replacements were naturally occurring or whether they were induced by the program and need to be accounted for in net savings.

E7. Did you replace the **[MEASURE1]** you recycled?

1. Yes
2. No [SKIP TO F1]
99. (DON'T KNOW) [SKIP TO F1]
98. (REFUSED) [SKIP TO F1]

[ASK IF E1 = 1]

E8. How did you acquire the replacement appliance? Did you… [READ LIST]

1. Buy it
2. Get it for no charge
99. (DON'T KNOW)
98. (REFUSED)

[ASK IF E1 = 1]

E9. Why did you decide to replace your **[MEASURE1]**? [READ LIST; SELECT ONE RESPONSE]

1. Wanted to upgrade (example: more space, new features)
2. Old appliance was not working well
3. Was planning to give previous **[MEASURE1]** away
4. (Other) [SPECIFY]
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF E1 = 1]

E10. Was the replacement **[MEASURE1]** new or used?

1. New
2. Used
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF E1 = 1]

E11. Was the replacement **[MEASURE1]** an ENERGY STAR or high-efficiency model?

1. Yes - ENERGY STAR or High efficiency
2. No - Standard efficiency
99. (DON'T KNOW)
98. (REFUSED)

[ASK IF E5 = 1]

E12. How influential was your participation in the program in your decision to purchase an ENERGY STAR model?

1. Very influential
2. Somewhat influential
3. Not too influential
4. Not influential at all
98. (DON'T KNOW)
99. (Refused)

[ASK IF E1 = 1]

E13. Were you planning to replace your **[MEASURE1]** before you decided to recycle it through **[UTILITY]'s See Ya Later, Refrigerator** program?

1. Yes
2. No
99. DON'T KNOW
99. REFUSED

[ASK IF E1 = 1 AND E7= 2]

E14. Let me make sure I understand: you would *not* have replaced your **[MEASURE1]** with a different **[MEASURE1]** without the See Ya Later, Refrigerator program? Is that correct?

1. Yes, correct
2. No, not correct
98. (DON'T KNOW)
99. (REFUSED)

F. Freeridership

This section determines the likely fate of appliances outside of the program which informs freeridership and which appliances are subject to secondary market impacts.

[ASK IF E1 = 2]

F7. Did you consider getting rid of the **[MEASURE1]** before you heard about **[UTILITY]'s** See Ya Later, Refrigerator program?

[If necessary: By getting rid 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)

F8. If the program was not available, would you have kept your **[MEASURE1]?**

1. Yes
2. No
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF D5 = 1 and F2=1 and MEASURE1 = Refrigerator]

F9. If you had kept the **[MEASURE1]**, would you have kept it in the same location you mentioned earlier? That is would it have been located in the [READ IN ANSWER FROM D5]?

1. Yes
2. No
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF F2 = 2, 98 OR 99 ELSE SKIP TO G1]

F10. How would you have disposed of the unit if the program had not been available? Would you have … [READ LIST UNTIL RESPONDENT SAYS "YES" AND RECORD ONE RESPONSE]

(PROGRAMMER: LIST SHOULD BE READ IN RANDOM ORDER)

1. Sold it to a private party such as a friend, family member, or via classified ad [SKIP TO G1]
2. Sold it to a used appliance dealer
3. Given it away for free to a private party such as a friend, family member or on Craig's list [SKIP TO G1]
4. Left it on curb with free sign [SKIP TO G1]
5. Given it away to an organization
6. Had it removed by the dealer you got your new or replacement **[MEASURE1]** from [SKIP TO G1]
7. Taken it to a dump or recycling center yourself or asked a friend or family member to do it for free
8. Hired someone to take it to a dump or recycling center [SKIP TO G1]

F11. [Programmer: If F4= 2 and AGE > 15 or F4 = 5 and AGE>15 or F4 = 7] then read corresponding text below and then ask F6]

[READ IF F4 =2 and AGE > 15]

Used appliance dealers typically only buy units that are less than 15 years old and are in very good condition.

[READ IF F4 =5 and AGE > 15]

Charity organizations only take units that are less than 15 years old and are in good condition

[READ IF F4 =7]

Appliances are heavy and require a truck, trailer, or large vehicle to relocate. Most waste transfer stations do not accept refrigerators and freezers unless the Freon has been drained.

[ASK IF F4 = 2 AND AGE>15 or F4 =5 AND AGE>15 or F4 =7]

F12. Considering this new information, would you have [READ IN ANSWER FROM F4], or would you have done something else?

1. Same thing [SKIP TO G1]
2. Something else
98. Don't know [SKIP TO G1]
99. Refused [SKIP TO G1]

[ASK IF F6 = 2]

F13. What would you have done instead? Would you have … [READ LIST UNTIL RESPONDENT SAYS "YES" AND RECORD ONE ANSWER] (PROGRAMMER: List should be read in random order)

1. Sold it to a private party such as a friend, family member, or on Craig's list]
2. Sold it to a used appliance dealer
3. Given it away for free to a private party such as a friend, family, or via classified ad]
4. Left it on curb with free sign
5. Given it away to charity organization
6. Had it removed by the dealer you got your new or replacement [MEASURE1] from
7. Taken it to a dump or recycling center yourself or asked a friend or family member to do it for free
8. Hired someone to take it to a dump or recycling center
9. Kept it

G. CFL Installation

G7. Was a free kit containing two CFL light bulbs, refrigerator thermometer, and energy information given to you at the time of pickup? [DO NOT READ]

1. Yes
2. No
98. Don't know
99. Refused

[IF G1<>1 SKIP TO H1]

G8. How would you rate the energy information found in this kit? Would you say it was… [READ LIST]

1. Very helpful
2. Somewhat helpful
3. Not very helpful
4. Not at all helpful
98. Don't know
99. Refused

[ASK IF G2<>98 or G2<>99]

G9. Why did you assign this rating? [DO NOT READ LIST. RECORD MULTIPLE]

1. Information too general
2. Already aware of information
3. Information did not apply
4. Written well
5. Other [RECORD VERBATIM]
6. Don't know
7. Refused

G10. How many of the CFLs that came in the kit did you install?

1. None
2. One
3. Two
98. Don't know
99. Refused

[ASK IF G4=2 OR G4=3]

G11. What type of bulbs were in the socket before you installed the CFLs? [READ LIST IF NECESSARY]

1. Incandescent (or "traditional" bulbs)
2. CFL
3. LED
4. Halogen
5. Empty
98. Don't know
99. Refused

[ASK IF G4=1 OR G4=2]

G12. Why didn't you install [IF G4=1, "them?" IF G4=2, "the other CFL?"] [DO NOT READ LIST. RECORD MULTIPLE]

1. Did not fit fixtures
2. Intend to install later
3. Do not like style
4. Do not like quality
5. Defective product
6. Other [RECORD VERBATIM]
7. Don't Know
8. Refused

[ASK IF G4=2 OR G4=3]

G13. Where did you install the CFL(s)? [DO NOT READ. RECORD UP TO TWO]

1. Bedroom
2. Bedroom (unoccupied)
3. Basement
4. Bathroom
5. Closet
6. Dining
7. Foyer
8. Garage
9. Hallway
10. Kitchen
11. Office/Den
12. Living Space
13. Storage
14. Outdoor
15. Utility
16. Other [Record verbatim]
98. Don't Know
99. Refused

G14. Did you install the refrigerator thermometer included in your energy-saving kit? [DO NOT READ]

1. Yes
2. No
98. Don't Know
99. Refused

[IF G8=1, ASK G9. ELSE, SKIP TO G11]

G15. After installing the thermometer, did you change the temperature setting on your refrigerator? [DO NOT READ]

1. Yes
2. No
98. Don't Know
99. Refused

[IF G9=1, ASK G10. ELSE, SKIP TO G11]

G16. Did you increase or decrease the temperature setting in your refrigerator?

1. Increase
2. Decrease
98. Don't Know
99. Refused

G17. Do you remember receiving a booklet in the kit with information about how to save energy? [DO NOT READ]

1. Yes
2. No

98. Don't Know
99. Refused

[IF G11=1, ASK G12. ELSE, SKIP TO H1]

G18. Have you followed any of the advice mentioned in the booklet? If so, which ones? [DO NOT READ]
1. Yes, [RECORD VERBATIM]
2. No
98. Don't Know
99. Refused

H. Spillover

H7. Since participating in the appliance recycling program, have you participated in any other incentive programs offered by [UTILITY]? [DO NOT READ]
1. Yes
2. No
3. Don't Know
4. Refused

[ASK IF H1=1, ELSE SKIP TO H4]

H8. Which programs did you participate in?
1. [RECORD VERBATIM]
98. Don't Know
99. Refused

H9. How influential was the recycling program in your decision to participate in other [UTILITY] energy efficiency programs? Would you say it was… [READ LIST]
1. Very influential
2. Somewhat influential
3. Not very influential
4. Not at all influential
5. Don't Know
6. Refused

H10. Based on your experience in recycling your appliance, how likely are you to participate in another utility energy efficiency program? Would you say you are… [READ LIST]
1. Much more likely
2. Somewhat more likely
3. No more or less likely
4. Less likely to participate in another program
5. Don't Know
6. Refused

H11. Besides recycling your old **[APPLIANCE TYPE]**, have you made other energy-efficiency improvements or purchases on your own since participating in the appliance recycling program?

1. Yes
2. No
98. Don't Know
99. Refused

[ASK IF H5=1, ELSE SKIP TO I1]

H12. What did you install or purchase? [DO NOT READ. RECORD MULTIPLE]

1. High-efficiency dishwasher
2. High-efficiency washing machine
3. High-efficiency refrigerator
4. Other [RECORD VERBATIM]

98. Don't Know
99. Refused

H13. Did you receive an incentive for any of those items?

1. Yes
2. No

98. Don't Know
99. Refused

H14. How much did your experience with the See Ya Later, Refrigerator Program influence your decision to install other high-efficiency equipment on your own? Would you say it was… [READ LIST]

1. Very influential
2. Somewhat influential
3. Not very influential
4. Not at all influential

98. Don't Know
99. Refused

I. *Program Satisfaction*

Now we have a few questions about your satisfaction with the See Ya Later, Refrigerator Program.

I7. Thinking about the contractor, JACO Environmental, who picked up the appliance(s), how would you rate your satisfaction? [IF RESPONDENT ASKS ABOUT JACO: JACO Environmental is a nation-wide See Ya Later, Refrigerator contractor that [UTILITY] has contracted with to administer the See Ya Later, Refrigerator Program.]

Would you say you were…. [READ LIST]

1. Very satisfied,
2. Somewhat satisfied,
3. Not too satisfied, or
4. Not satisfied at all?

98. (DON'T KNOW)
99. (Refused)

[ASK IF I1= 2, 3 OR 4]

I8. Why were you [INSERT RESPONSE FROM I1] with the contractor who picked up the appliance?
1. Other [RECORD VERBATIM]
98. (Don't know)
99. (Refused)

I9. How long did it take to receive the rebate check? Was it: [READ LIST AND RECORD ONE RESPONSE]
1. Less than 4 weeks
2. Between 4 and 6 weeks
3. Between 7 and 8 weeks
4. More than 8 weeks
5. (Have not received the rebate yet)
98. (Don't know)
99. (Refused)

I10. Would you still have participated in the program and recycled your unit if no rebate was given?
1. Yes
2. No
98. (DON'T KNOW)
99. (Refused)

I11. How likely would you be to participate if you could give your incentive to [if UT then "Utah Food Bank" OR if WA/WY/ID then "charity"]?
1. Very likely,
2. Somewhat likely,
3. Not too likely, or
4. Not likely at all?
98. (DON'T KNOW)
99. (Refused)

I12. Thinking about your overall experience with the See Ya Later, Refrigerator program, how would you rate your satisfaction? Would you say you are…. [READ LIST]
1. Very satisfied,
2. Somewhat satisfied,
3. Not too satisfied, or
4. Not satisfied at all?
98. (DON'T KNOW)
99. (Refused)

[ASK IF I6= 2, 3 OR 4]

I13. Why were you [INSERT RESPONSE FROM I6] with the program?

1. Incentive was too small.
2. Contractor never called me back.
3. Contractor showed up late.
4. Contractor was unreliable/unprofessional.
5. Difficult to get an appointment time that was convenient for me.
6. Wanted to use a different [non-program] contractor.
7. Incentive check took too long to arrive.
8. Other [RECORD VERBATIM]

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

[ASK IF I6= 2, 3 OR 4]

I1. What could [UTILITY] do to improve your experience?

1. [RECORD ANSWER]

98. (DON'T KNOW)
99. (Refused)

I2. Since participating in the See Ya Later, Refrigerator program and receiving your rebate, have you recommended the program to any friends, relatives, or colleagues? [DO NOT READ]

1. Yes
2. No

98. (DON'T KNOW)
99. (Refused)

J. Demographics

This section is asked of all residential respondents. Responses are used for segmentation during analysis and to allow [UTILITY] to compare program participants to the general customer population.

These next few questions are for classification purposes only. All information will be kept confidential.

J7. What type of residence do you live in? Is it:

1. A single-family detached residence
2. Multifamily apartment or condo building with 4 or more units
3. Attached house (townhouse, row house, or twin)
4. Mobile or manufactured house
5. Something else [SPECIFY:_____]

98. (DON'T KNOW)
99. (Refused)

J8. What is the highest level of education that you have completed? [DO NOT READ LIST; RECORD ONE RESPONSE]

1. (Less than high school diploma or equivalent)
2. (High school diploma or equivalent)

3. (Technical or business school certificate/2-year college degree/some college)
4. (4-year college degree/bachelor's degree)
5. (Graduate or professional degree/masters or PhD)
98. (DON'T KNOW)
99. (Refused)

J9. Do you rent or own your home?

1. Own
2. Rent
3. Other [RECORD]
98. (DON'T KNOW)
99. (Refused)

J10. How long have you lived at that location?

1. Less than one year
2. 2-5 years
3. More than 5 years
98. (DON'T KNOW)
99. (Refused)

J11. In what year were you born? [NUMERIC OPEN END; 1890-1999]

1. [ENTER YEAR]
99. (Refused)

J12. Including yourself, how many people lived in your home full-time [If Necessary: full-time is considered more than 9 months in the past year] during the past 12 months? [NOTE TO INTERVIEWER, if respondent says 0 or "just me", etc., please record "1"]

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13 or more
98. (DON'T KNOW)
99. (Refused)

K. COMMENTS

This question will gather additional information that the respondent has not mentioned during the rest of the survey.

K7. Thank you for your time in answering all my questions. Do you have any comments or additional feedback about [UTILITY]'s [PROGRAM] program? [IF OTHER COMMENTS MENTIONED DURING SURVEY ALSO SAY, "Earlier you mentioned ….Can you tell me about that so that I can capture all the details?"]

(Select one) [PHONE: DO NOT READ LIST]

1. [RECORD COMMENTS]
2. (Notes entered but no additional comments or details)
3. (No comments in this question or additional comments previously in survey)
98. (DON'T KNOW)
99. (Refused)

[ASK IF K1=1 or 2]

K8. Would you like us to pass this information along to [UTILITY] so that they can follow-up with you?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

[ASK IF K2=1]

K9. So that we have the most accurate information, can I have your name?

1. [RECORD NAME]
98. (Don't know)
99. (Refused)

[ASK IF K2=1]

K10. Is the number [INSERT PHONE NUMBER] the best phone number for [UTILITY] to reach you?

1. (Yes)
2. (No) [RECORD CORRECT NUMBER]
98. (Don't know)
99. (Refused)

L. Closing

Thank you for taking the time to respond to our survey. Have a nice day/evening.

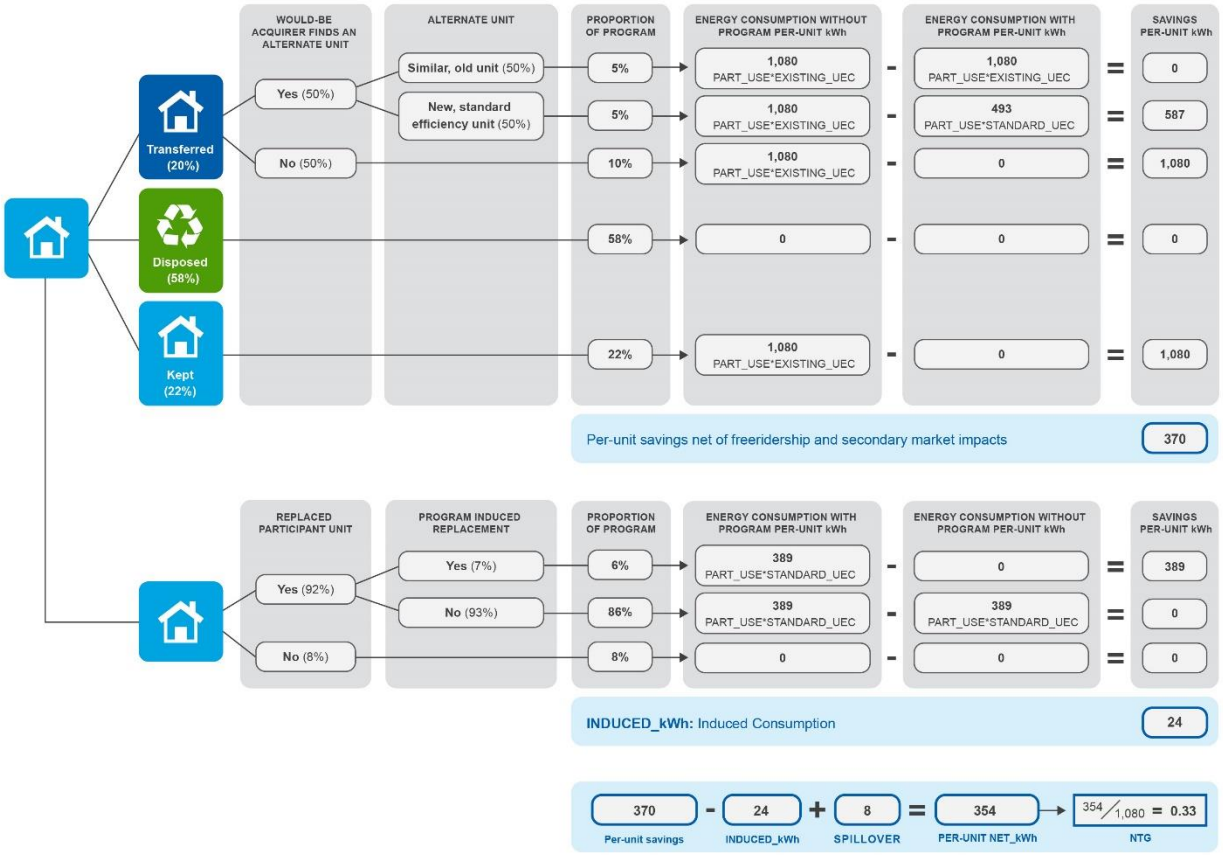
Appendix D. Logic Model

Table 35. See Ya Later, Refrigerator Program Logic Model Links: Working Hypotheses and Indicators

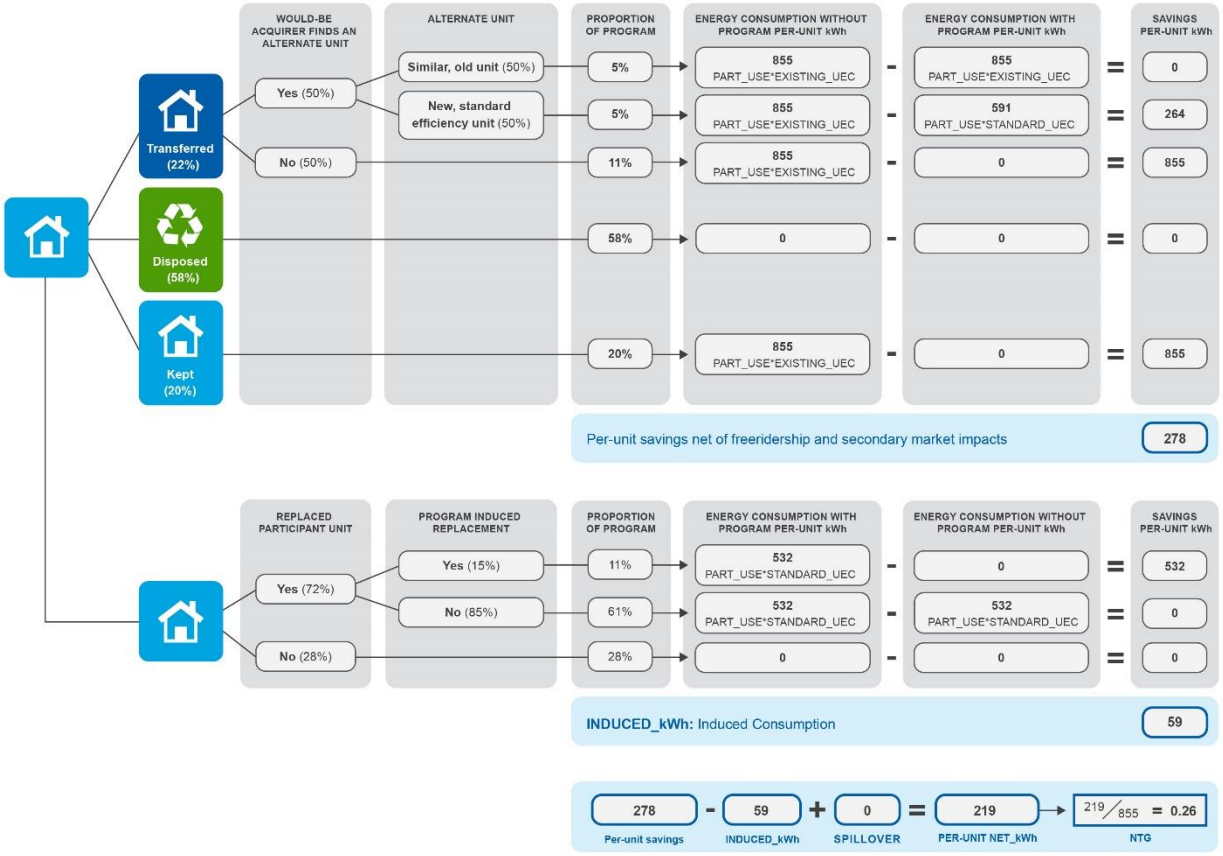
Link	Working Hypotheses	Indicators
1	Marketing and outreach lead to targeting communications to residential customers with refrigerators and freezers.	Number of eligible potential participants that express interest; marketing materials in bill inserts, on company website, in schools, in newspapers and on radio; presence at seminars, conferences, home shows, and community events.
2	Incentives lead to customers enrolling in the program.	Number of participants; participant interviews indicate role of incentives on enrollment activities.
3	Measurement and verification lead to the evaluation team conducting an evaluation.	Completed evaluation informs future program cycles.
4	Quality control leads to inspections being performed.	Number of inspections indicate that quality control occurred.
5	The delivery of marketing materials leads to increased customer awareness regarding energy efficiency and the program.	Increased customer awareness regarding energy efficiency identified in surveys.
6	Marketing efforts lead to customers enrolling in program.	Number of participants enrolled in the program who indicate they were reached by marketing efforts.
7	Customer participation results in removing inefficient appliances from the grid.	Number of appliances recycled due to participation in the program.
8	The evaluation leads to confirming program effectiveness.	Implementer interviews (qualitative); evaluation identifies best practices.
9	Inspections and reviews leads to confirming program effectiveness.	Implementer interviews (qualitative); inspections and reviews should be indicated as improving program effectiveness.
10	Education leads to program awareness.	Participant interviews (qualitative) should indicate that education led to program awareness.
11	Removing inefficient appliances from the grid leads to increased program penetration.	Number of appliances recycled compared to overall market.
12	Removal of inefficient appliances leads to kWh and kW savings.	Energy/demand savings generated expressed in kW and kWh.
13	kWh and kW savings leads to persistent demand savings.	Energy/demand savings over time; participant interviews regarding measure persistence.
14	Confirming effective program operations leads to verified program savings.	Implementer interviews (qualitative); effective program theory and demonstrated links indicate savings are attributable to the program.
15	Confirming effective program operations leads to the maintenance of optimum performance.	Implementer interviews (qualitative); program operations should be confirmed as effective.
16	Increased program awareness leads to fewer inefficient appliances on the grid.	Interviews regarding awareness and resulting behavior.
17	Fewer inefficient appliances on the grid lead to persistent energy savings.	Market study/number of appliances recycled; participant interviews regarding measure persistence.
18	Verified program savings leads to persistent energy and demand savings.	Energy/demand savings over time expressed in kW and kWh.

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

Appendix E. Refrigerator NTG Combined Decision Tree



Appendix F. Freezer NTG Combined Decision Tree



Appendix G. CFL Engineering Calculations and Assumptions

Hours of Use

Cadmus estimated CFL HOU using a multistate modeling approach, built on light logger data collected from two states: Missouri and Maryland. Both of these states were included in the 2011–2012 analysis and, subsequently, have been included in recent studies.

Metering Protocol

Following whole-house lighting audits, Cadmus installed up to 10 light meters on randomly selected lighting fixture groups, targeting incandescents, CFLs, and medium screw-based LEDs. To ensure unbiased installations, Cadmus used an iPad tool to randomly select fixtures receiving the meters. The iPad tool assigned meter installations based on room priorities, with the first five meters assigned to each of five priority room types (e.g., living area, dining room, kitchen, master bedroom, bathroom). The remaining five meters were randomly assigned to any fixture in any non-priority room (e.g., secondary bedrooms, closet, hall, basement, office, laundry, mechanical). Randomly assigning meters this way sought to improve precision around priority rooms (i.e., where most lamps were installed).

Data from the removal site visits were incorporated into the iPad tool and database to augment the installation information for each site and meter. As part of the lighting logger removal process, technicians conducted a series of pre-removal meter diagnostics, which included the following:

- Completing a logger state test (which determined if the meter functioned properly and whether ambient light affected the meter's operation);
- A visual review of the total time the logger recorded the fixture being on;
- Verbal verification from the customer that they used the light fixture;
- Verbal verification from the customer that the logger remained in place for the study's duration; and
- Recording the condition of the logger and its battery status.

Model Specification

To estimate HOU, Cadmus determined the total "on" time for each individual light logger per day, using the following guidelines:

- If a light logger did not record any light for an entire day, the day's HOU was set to zero.
- If a light logger registered a light turned on at 8:30 p.m. on Monday, and turned off at 1:30 a.m. on Tuesday morning, 3.5 hours were added to Monday's HOU and 1.5 hours to Tuesday's HOU.

Cadmus modeled daily HOU as a function of room type using an ANCOVA model—regression models that model a continuous variable as a function of a single, continuous explanatory variable (in this case, CFL saturation) and a set of binary variables. Consequently, an ANCOVA model simply serves as an analysis of variance (ANOVA) model with a continuous explanatory variable added. Cadmus chose this

specification due to its simplicity, making it suitable in a wide variety of contexts. Though the model lacked the specificity of other methods, it offered estimates far less sensitive to small differences in explanatory variables, compared to more complex methods. Therefore, these models could produce consistent estimates of average daily HOU for a given region, using its specific distribution of bulbs by room and household type.

Cadmus specified final models as cross-sectional, ANCOVA regressions:

$$Average\ Daily\ HOU = \beta_1 * \text{Basement} + \beta_2 * \text{Bathroom} + \beta_3 * \text{Bedroom} + \beta_4 * \text{Closet} + \beta_5 * \text{Dining} + \beta_6 * \text{Foyer} + \beta_7 * \text{Garage} + \beta_8 * \text{Hallway} + \beta_9 * \text{Kitchen} + \beta_{10} * \text{Living Space} + \beta_{11} * \text{Office} + \beta_{12} * \text{Outdoor} + \beta_{13} * \text{Storage} + \beta_{14} * \text{Utility} + \beta_{15} * \text{Other} + \beta_{16} * \text{SinHOU}$$

Where:

Basement = a dummy variable equal to one, if the bulb is in the basement, and zero otherwise;

Bathroom = a dummy variable equal to one, if the bulb is in the bathroom, and zero otherwise;

Bedroom = a dummy variable equal to one, if the bulb is in a bedroom, and zero otherwise;

Closet = a dummy variable equal to one, if the bulb is in the closet, and zero otherwise;

Dining = a dummy variable equal to one, if the bulb is in the dining room, and zero otherwise;

Foyer = a dummy variable equal to one, if the bulb is in the foyer, and zero otherwise;

Garage = a dummy variable equal to one, if the bulb is in the garage, and zero otherwise;

Hallway = a dummy variable equal to one, if the bulb is in the hallway, and zero otherwise;

Kitchen = a dummy variable equal to one, if the bulb is in the kitchen, and zero otherwise;

Living Space = a dummy variable equal to one, if the bulb is in the living space, and zero otherwise;

Office = a dummy variable equal to one, if the bulb is in an office, and zero otherwise;

Outdoor = a dummy variable equal to one, if the bulb is outdoors, and zero otherwise;

Storage = a dummy variable equal to one, if the bulb is in a storage room, and zero otherwise;

Utility = a dummy variable equal to one, if the bulb is in the utility room, and zero otherwise;

Other = a dummy variable equal to one, if the bulb is in a low-use room (such as a utility room, laundry room, or closet), and zero otherwise; and

SinHOU = amplitude of sinusoid function.

As not all loggers collected a full year of data, Cadmus estimated an annual average HOU for all lamps, fitting the data to a sinusoidal curve that represented changes in the hours of available daylight per day.[30]

Cadmus tested the potential influences of other demographic and day type variables, using model specifications such as home characteristics and weekend/weekday. These variables, however, were not included as their estimated coefficients did not differ significantly from zero or produced signs inconsistent with expectations.

Final Estimates and Extrapolation

Table 36. HOU Model Coefficients and Significance

Parm	Estimate	Stderr	LowerCL	UpperCL	Z	ProbZ
Intercept	0	0	0	0	.	.
SinHOU	0.16	0.05	0.07	0.26	3.4	0.0007
Basement	2.01	0.46	1.10	2.93	4.33	<.0001
Bathroom	1.38	0.12	1.14	1.62	11.08	<.0001
Bedroom	1.28	0.08	1.13	1.43	16.42	<.0001
Closet	0.49	0.08	0.34	0.63	6.46	<.0001
Dining	1.40	0.16	1.09	1.71	8.92	<.0001
Foyer	2.02	1.35	-0.63	4.68	1.49	0.1352
Garage	1.47	0.48	0.52	2.41	3.03	0.0024
Hallway	1.21	0.17	0.87	1.55	6.99	<.0001
Kitchen	3.25	0.26	2.74	3.76	12.56	<.0001
Living_Space	2.21	0.16	1.89	2.52	13.64	<.0001
Office_Den	1.36	0.21	0.95	1.77	6.44	<.0001
Other	1.12	0.37	0.40	1.84	3.07	0.0022
Outdoor	2.39	0.43	1.55	3.23	5.58	<.0001
Storage	0.07	0.02	0.03	0.11	3.42	0.0006
Utility	0.95	0.25	0.46	1.43	3.79	0.0001

Cadmus used these model parameters to predict average daily use for SYLR by taking the sum of the product of each coefficient shown in Table 36 and its corresponding average independent variable. Independent variables were calculated based on which rooms the survey participants reported installing bulbs included in the energy-savings kits.

Table 37 shows independent variables used for SYLR.

[30] Page 15 of the Uniform Methods Project protocols for lighting impact evaluations recommends using a sinusoidal annualization approach due to strong relationships between daylight hours and lighting usage, observed in a large number of studies. Available online at: http://www1.eere.energy.gov/wip/pdfs/53827-6.pdf

Table 37. Weekday HOU Estimation Input Values

Variable	Value
Bedroom	13%
Basement	6%
Bathroom	4%
Dining	6%
Garage	6%
Hallway	3%
Kitchen	16%
Office	1%
Living Space	44%
Storage	2%
Outdoor	6%
Utility	1%

Using these values, the equation calculated a 2.06 average daily HOU, a lower rate than the 2.3 for CFLs in 2011–2012 and likely due to increased saturations of efficient bulbs. As the efficient lighting market matures and saturation increases within the average home, efficient lamps will be installed in lower-use sockets, not just in high-use sockets, whether in rooms with lower usage or supplemental lighting (i.e., desk lamps).

Waste Heat Factor

The WHF is an adjustment representing the interactive effects of lighting measures on heating and cooling equipment operations. For this evaluation, Cadmus used Simplified Energy Enthalpy Model (SEEM)[31] results from the most recent version of the Regional Technical Forum (RTF) residential CFL and LED savings workbook to serve as the foundation for the WHF analysis.[32]

Table 38 and Table 39 show the RTF SEEM results and evaluation weightings. Saturation weightings for heating and cooling were based on results from the 2013–2014 phone survey. Cooling zone weightings were based on TMY3 weather data and census population data for Wyoming counties.

[31] The RTF calibrated the SEEM—a building simulation model—for residential homes to provide the magnitude of interaction between lighting and HVAC systems. Additional background information for SEEM may be found at: http://rtf.nwcouncil.org/measures/support/seem/

[32] RTF savings workbook for residential screw-in CFL and LED lamps: ResLighting_Bulbs_v4_0.xlsm

Table 38. WHF Heating Inputs Summary

WHF Component	Heating System Type	SEEM Results (kWh/kWh Saved)	Cadmus Saturation Weighting
Heating Impact	Electric Zonal	-0.440	0.128
	Electric Forced Air	-0.479	0.034
	Heat Pump	-0.258	0.006
	Non-Electric	0.000	0.833

Table 39. WHF Cooling Inputs Summary

WHF Component	System Type	SEEM Results (kWh/kWh Saved)	Cadmus Zone Weighting	Cadmus Saturation Weighting
Cooling Impact	Cooling Zone 1	0.033	0.434	30%
	Cooling Zone 2	0.053	0.375	
	Cooling Zone 3	0.074	0.192	

Calculating the weighted averages of the values shown in Table 38 and Table 39 provided average impacts due to heating and cooling, as shown in Table 40. Adding heating and cooling impacts produced a combined impact of -0.059 kWh/kWh saved.

Table 40. WHF Weighted Average Impacts

Component	(kWh/kWh Saved)
Heating	-0.074
Cooling	0.014
Combined	-0.059

Lastly, Cadmus considered the location of bulbs to determine the appropriate WHF for all bulbs, as not all bulbs were installed in conditioned spaces. Cadmus applied bulb allocations by space type from the phone survey data to RTF thermal coupling factors, shown in Table 41.

Table 41. Thermal Coupling by Space Type

Space Type	RTF Thermal Coupling Correction Factor	Bulb Allocation
Basement	50%	3.6%
Main House	75%	92.1%
Outdoor	0%	4.3%
Weighted Average		69%

Multiplying the combined impact from Table 40 with the weighted thermal coupling in Table 41 provided the final, overall WHF shown in Table 42.

Table 42. Wyoming Lighting WHF

Fuel	Value	Units
Electric	-0.042	kWh/kWh Saved