Ameren Missouri
Efficient Products
Impact and Process Evaluation:
Program Year 2014

May 15, 2015

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Executive Summary

Ameren Missouri engaged Cadmus and Nexant (the Cadmus team) to perform annual process and impact evaluations of the Efficient Products (formally RebateSavers) program for a three-year period, from 2013 through 2015. This annual report covers the impact and process evaluation findings for Program Year 2014 (PY14), the period from January 1, 2014, through December 31, 2014.

Program Description

In PY14, Ameren Missouri changed the name of the program from RebateSavers (used in PY13) to the Efficient Products program. The Efficient Products program provided downstream rebates for:

- ENERGY STAR®-certified room air conditioners (RACs)
- ENERGY STAR-certified heat pump water heaters
- ENERGY STAR-certified air purifiers
- ENERGY STAR-certified water coolers
- ENERGY STAR-certified two-speed pool pumps
- ENERGY STAR-certified variable-speed pool pumps
- Electric storage water heaters with an Energy Factor (EF) of 0.93 or higher

In addition to providing mail-in and online rebates, Efficient Products offered a free Home Energy Kit to customers using electric hot water heaters and who request the kit after receiving a postcard from Ameren Missouri. Four variations of the kit were offered in PY14. Kits 1 and 2, representing PY13 kit designs, were distributed to participants between January and June 2014. Kits 3 and 4 were updated to reflect PY13 evaluation findings and distributed to participants between July and December 2014. Customers could choose between Kit 3 and Kit 4, depending on whether they wanted a free kit (Kit 3) or wanted to pay $4.95 for a kit that included an Advanced Power Strip (Kit 4). Table 1 shows items provided in
each kit.

Table 1. PY14 Home Energy Kit Contents

Measure	Kit 1 Quantity	Kit 2 Quantity	Kit 3 Quantity	Kit 4 Quantity**
Low Flow Faucet Aerator	2	3	2	2
Low Flow Showerhead	1	2	1	1
Pipe Wrap*	1	1	1	1
Advanced Power Strip	1	1	0	1
Compact Fluorescent Bulbs (CFLs)	12	12	4	4
Light Emitting Diode Bulbs (LEDs)	0	0	2	2

* 12 ft total.

** Participants elected to pay $4.95 to receive this kit.

The program also provided direct-install kits for multifamily properties. Eligible properties received items from Kit 3 kit, with the expectation that property staff would install the items in each unit.

Advanced power strips also were available for purchase at a discounted price through Ameren Missouri's online store.

Key Impact Evaluation Findings

Cadmus' key findings follow for the PY14 evaluation period.

Program Data Adjustments

Cadmus reviewed two sets of Home Energy Kit, single-family, participant data to ensure counting only one kit per customer. One of these files included 483 PY13 kits, processed in PY14 (and not counted towards PY13 results); the other included 7,253 PY14 kits. In total, 7,736 kits were reported for the PY14 program.

Cadmus performed verification on the PY14 kits and adjusted the number of kits counted toward the program from 7,253 reported to 7,210 verified. This resulted in a 99% verification rate. Of the 43 records not counted toward the program:

- Eighteen were removed because the account number was listed as 0 and participant information was not available.
- Twenty-five account numbers were included in the PY14 data twice. Of 50 total kits distributed to 25 accounts, 25 were counted toward the program and 25 were removed.

Because the 483 PY13 kits processed in PY14 did not include account numbers, we could not review for duplication. Instead, Cadmus applied the 99% PY14 verification rate to those kits, and in total estimated that 7,690 kits counted toward the program.

Gross Impacts

As shown in Table 2, the Cadmus team estimated per-unit gross realization rates for all Efficient Product measures as the ratio of Ameren Missouri's *ex ante* savings from its 2012 Technical Resource Manual (TRM), which had not been updated to reflect PY13 findings and our evaluated (*ex post*) savings. We found the highest realization rates for direct-install pipe wrap (324%), heat pump water heaters (149%), and air purifiers (138%). We attributed these higher realization rates to the following:

- Longer lengths of pipe wrap installed;
- Higher installed-efficiency levels than assumed for purchased heat pump water heaters and air purifiers; and
- Higher clean air delivery rates for purchased air purifiers, compared to those assumed in the 2012 TRM.

Based on PY13 findings, programmable thermostats exhibited the lowest realization rate (19%). Advanced power strips (29%-35%) and water coolers (31%) also exhibited lower realization rates, due to lower estimates of how these products would be used than those assumed in the 2012 TRM.

As program delivery aspects changed in PY14 to increase installation rates, the Cadmus team conducted participant phone surveys to capture changes resulting from these updates. The surveys indicated higher installation rates for kit measures in single-family homes than in PY13, ranging from 41% to 92% (compared with 23% to 78% in PY13). We did not conduct phone surveys for direct-install or equipment rebate delivery channels in PY14. Therefore, we applied PY13 installation rates for those items.

Table 2 summarizes PY14 participation, *ex post* gross per-unit savings, realization and installation rates, and *ex post* total gross savings.

Table 2. PY14 Summary: *Ex Post* Program Gross Savings Accounting for Installation Rates

Measure	PY14 Participation*	Per-Unit *Ex Post* Savings (kWh/yr)	Realization Rate	Installed and Operating	Total *Ex Post* Gross Savings (kWh/yr)
Equipment Rebates**					
Electric Water Heaters	212	175	111%	100%	37,051
Heat Pump Water Heaters	371	2,682	149%	100%	995,181
RACs	372	50	43%	100%	18,452
Programmable Thermostats***	1,464	105	19%	99%	152,792
Variable-speed Pool Pumps	52	2,061	134%	100%	107,173
Air Purifier	392	664	138%	100%	260,333
Water Coolers	23	111	31%	100%	2,550
Kit Measures – Single-Family (7,690 total kits)					

Measure	PY14 Participation*	Per-Unit *Ex Post* Savings (kWh/yr)	Realization Rate	Installed and Operating	Total *Ex Post* Gross Savings (kWh/yr)
CFLs	48,932	32	102%	75%	1,173,591
LEDs	10,837	28	88%	92%	276,846
Advanced Power Strips, Load Sensing	3,782	54	29%	78%	159,842
Faucet Aerators	16,688	39	68%	52%	334,910
Low-Flow Showerheads	8,998	222	61%	47%	939,162
Water Heater Pipe Wrap	7,690	312	121%	41%	973,166
Kit Measures – Multifamily (2,114 total kits)****					
CFLs	8,488	32	102%	98%	267,075
LEDs	4,220	28	88%	98%	115,208
Advanced Power Strips, Load Sensing	4	54	29%	78%	169
Faucet Aerators	4,228	38	102%	100%	160,550
Low-Flow Showerheads	2,114	252	124%	86%	457,747
Water Heater Pipe Wrap	2,114	91	324%	100%	191,752
Upstream Discounts – Online Store *****					
Advanced Power Strips, Load Sensing	1,196	59	32%	100%	70,774

Measure	PY14 Participation*	Per-Unit *Ex Post* Savings (kWh/yr)	Realization Rate	Installed and Operating	Total *Ex Post* Gross Savings (kWh/yr)
Advanced Power Strips, Motion Sensing	47	64	35%	100%	3,010
Total	**122,226**	**n/a**	**57%**	**74%**	**6,697,335**

*Verified measures, including measures provided to 483 PY13 Home Energy participants and 98 advanced power strip participants, processed in PY14. Due to application of verification rate to PY13 Home Energy participants, total reflects rounding.

**Participant phone surveys were not conducted for this delivery channel in PY14. Results from online surveys conducted in PY14 were used to update the PY13 realization rates, which incorporated online and phone survey results.

***Programmable thermostats were not offered in PY14 and were not evaluated; however, PY13 rebates were honored in PY14. PY13 realization and installation rates were applied to attribute savings for this measure.

**** Phone surveys were not conducted for this delivery channel in PY14. PY13 realization and installation rates were applied to attribute savings for all but the advanced power strip delivered through this channel. The advanced power strip installation rate was updated to reflect PY14 single-family phone survey results.

***** Phone surveys were not conducted for this delivery channel in PY14. PY13 realization and installation rates were applied to attribute savings for this channel.

The program's overall gross savings realization rate increased from 40% in PY13 to 57% in PY14.

Net Savings

As shown in Table 3, the overall savings-weighted net-to-gross ratio (NTG) for the Efficient Products program is 90.9%. Since the overall program NTG was weighted by overall program participation and per-unit savings, it was strongly influenced by high-impact measures with low free ridership rates, such as heat pump water heaters and Home Energy Kit measures.

Table 3. PY14 Net Impact Results Summary

Measure Group	*Ex Post* Gross Savings (kWh/yr)	Free Ridership	Participant Spillover	Non-Participant Spillover	NTG	Net Savings (kWh/yr)
Equipment Rebates	1,573,532	19.4%	3.10%	0.70%	84.4%	1,328,620
Home Energy Kits	5,050,019	11.3%	3.40%	0.70%	92.8%	4,685,693
Upstream Discount Advanced Power Strips	73,784	N/A	N/A	0.70%	100.7%	74,301
Total	**6,697,335**	**N/A**	**N/A**	**N/A**	**90.9%**	**6,088,614**

As shown in Table 4, the program achieved 39% of its proposed net energy savings target for PY14 (15,768 MWh) in Ameren Missouri's residential tariff.

Table 4. PY14 Efficient Products Savings Comparisons

Metric	MPSC-Approved Target[1]	*Ex Ante* Gross Savings Utility Reported[2]	*Ex Post* Gross Savings Determined by EM&V[3]	*Ex Post* Net Savings Determined by EM&V[4]	Percent of Goal Achieved[5]
Energy (MWh)	15,768	11,849	6,697	6,089	39%
Demand (kW)	2,552	1,610	968	913	36%

[1] http://www.ameren.com/-/media/missouri-site/Files/Rates/UECSheet191EEResidential.pdf
[2] Calculated by applying verified program activity to 2012 TRM savings values.
[3] Calculated by applying verified program activity to Cadmus' evaluated savings values.
[4] Calculated by multiplying Cadmus' evaluated gross savings and NTG ratio, which accounts for free ridership, participant spillover, nonparticipant spillover, and market effects.
[5] Compares MPSC Approved Target and *Ex Post* Net Savings Determined by EM&V.

Key Process Evaluation Findings

Interviews with program stakeholders (program management and implementation staff) focused on changes made to PY14, including the new program name (which changed from RebateSavers to Efficient Products in PY14), adjustments to measures included in the program, and a shifting focus to the Home Energy Kits' direct-install component.

Stakeholders also reported encountering several challenges in PY14. Specifically, they reported lower-than-anticipated savings values and a slow start to the program year. These challenges resulted from the following three factors:

- Reductions in expected savings resulting from PY13 evaluation findings;
- A desire to wait until completion of the PY13 evaluation, so recommendations could be implemented to improve the program; and
- The slow ramp-up associated with new measures.

The program did not meet its PY14 energy savings goal of 15,768 kWh/year, as specified in the Ameren Missouri tariff. (Goals were based on assumed participation levels; so they differ from *ex ante* savings, of which Ameren Missouri achieved 51%.)

Marketing and Outreach

The Efficient Products program markets each component (equipment rebates, Home Energy Kits, direct-install kits, and discounted advanced power strips) differently:

- **Equipment Rebate Measures.** The program works with retailers to accomplish the following: place program materials in stores, coordinate in-store activities, and provide training on rebates and applications. Implementers also work with retailers to conduct on-site promotions to show customers products and to discuss the rebates.
- **Home Energy Kits.** Energy-efficiency kits are marketed to single-family homes through a series of postcards targeting electric hot water customers. Methods of identifying eligible multifamily properties for the Home Energy Kit's direct-install component include cross-marketing with other programs, following up with contractors researching upgrades but not qualifying for other programs, and using Ameren Missouri's low-income multifamily program to identify contacts that manage additional properties.
- **Advanced Power Strips.** Ameren Missouri offers discounted advanced power strips at promotional prices through the online store.

Customer Awareness and Decision-Making

Online equipment rebate participants most commonly learned of Efficient Product rebates through store representatives, signage in stores, and the Ameren Missouri website. Similarly to PY13, these survey respondents were most likely to purchase the rebated measure to replace aging or broken equipment or to save money on energy costs.

Conversely, Home Energy Kit participants most commonly learned of the program through postcards mailed by Ameren Missouri. These survey respondents indicated the most important reason for participating in the program was to receive free items. "General interest" in the kit items increased from PY13 and was identified as the second-most important reason for participating in PY14.

Program Satisfaction

Home energy kit participants reported high satisfaction levels with all program elements addressed, including the following:

- The process of requesting and receiving their Home Energy Kits;
- The items included in the Home Energy Kits; and
- The instructions provided to assist with Home Energy Kit items.

Additionally, respondents felt satisfied with Ameren Missouri as a power utility, and many reported their experience with the program created a positive change in their opinion of Ameren Missouri.

Program Data

The program transitioned to a new database in PY14. Vision, the new database, was designed to make program data accessible to program administrators and evaluators in real time. The transition was incomplete at the time of the final evaluation, and the Cadmus team relied on implementer data and PY13 findings for evaluation activities. PY14 program data did not include some relevant product information for all measures (e.g., room air conditioner data did not include Btu/hr or Energy Efficiency Ratio (EER) values).

Key Conclusions and Recommendations

The slow PY14 program launch and the difference between TRM based deemed savings and evaluated savings values resulted in Efficient Products falling short of its annual target in 2014. Additionally, NTG was slightly reduced from 92.7% in PY13 to 90.9% in PY14.

However, the changes made at the beginning of the program year appeared to strengthen the program. The program's free Home Energy Kit proved particularly successful, as customer reports indicated increased interest in the kit items compared with the previous year and higher installation rates. Additionally, a large portion of the program's energy savings were attributed to installation of the kit's measures.

The Cadmus team offers the following conclusions and recommendations for improving the program.

Conclusion 1. Changes made to the type and quantity of items included in the PY14 Home Energy Kits appeared to succeed, with higher installation rates reported by PY14 survey respondents, along with as increased interest in Home Energy Kit items. However, participants requesting and paying for the Home Energy Kits containing advanced power strips reported lower installation rates for other items included in the kits. Changes made to PY13 kits, including reductions in the number of CFLs and the inclusion of LED lighting, appear to have succeeded, based on reported installation rates and interest in Home Energy Kit items. While PY14 impacts were estimated using overall installation rates for each Home Energy Kit items, the Cadmus team found participants paying for Home Energy Kits containing the advanced power strip measure reported lower installation rates for lighting and water heater saving items, compared to participants receiving free Home Energy Kits. These installation rate differences were found to be statistically significant for all but low-flow showerheads, when proportion of installed items were compared between the two types of PY14 kits. This indicates customers may purchase the Home Energy Kits to acquire the low-cost advanced power strip, without intending to install the other items in the kits.

> **Recommendation 1a. Consider tying installation of kit items to receipt of the advanced power strip through "call to action" marketing to help capture savings associated with installing Kit 4 items.**

Conclusion 2. Surveys indicated Ameren Missouri's installation rate at 50% for CFLs, compared with 33% in PY13. The Cadmus team estimates a future installation rate of 75%, compared with 63% in

PY13. Installation rates for LEDs were even higher, with surveys indicating 75% installed, for a final installation rate projected at 92%.[1] Including future installations, CFL installations align with other direct-mail kit programs reviewed in PY13, which ranged from 69% to 96%. This likely resulted from the reduction of CFLs and inclusion of LEDs in PY14.

> **Recommendation 2a. Consider increasing the number of LEDs included in kits.** In determining the optimal number of bulbs to include in the kit, consider the balance between likely installation rates and overhead cost savings achieved from providing a larger number bulbs in each kit. High LED installation rates indicate participants may be willing to replace older bulbs prior to burn out.

Conclusion 3. Efforts to increase participation in the multifamily direct-install component of the Home Energy Kit program appear to be successful, showing a 615 % increase over the previous year. With increased emphasis on this delivery channel, accurate data reporting will prove critical to estimating future energy savings. While this program component did not experience sufficiently substantial changes in its design or process to warrant a detailed evaluation in PY14, the number of participants increased, and this increase expected to continue in PY15. In future evaluations, detailed data reporting will prove critical to assessing accurate energy impacts resulting from this delivery channel.

> **Recommendation 3a. Develop a protocol for property management staff to report the number and location of items installed at each property and to report these data along with current data, showing the number of kits delivered through the program.** This will increase the accuracy of reported participation in this delivery channel and improve verification activities.

> **Recommendation 3b. Report the number of items and kits returned by property management staff.** This will increase the ability to track items and kits distributed through the program.

Conclusion 4. Changes made to the data tracking and reporting system are expected to improve future program reporting and evaluation activities. The transition to Vision in PY14, however, was not complete at the end of the program year, and the Cadmus team's ability to use these data was limited. Additionally, ensuring detailed measure information is populated in Vision would improve the evaluation process.

> **Recommendation 4a. Consider working with the evaluator and implementer to revisit data currently unpopulated in Vision and identify changes to would help improve program and evaluation activities.** For example, while a field exists for EER values for RACs in the Vision database, these data were not captured. Detailed program data would help ensure rebated items qualify for the program and would improve verification.

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[1] To account for Ameren customers installing some currently uninstalled bulbs at a later date, the Cadmus team calculated the installation rate based on the protocol recommended in Residential Lighting chapter of *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures* (UMP). Using these data, we determined the probable rate of future installations applicable to Ameren results.

Recommendation 4b. Develop a protocol for assigning dates to participant and program activities and define the date used to establish participation year. Inconsistent dating protocols may have contributed to differences between Vision data and reported participation in PY14.

PY13 Recommendation Tracking

Cadmus also followed up with Ameren Missouri's response to PY13 evaluation's recommendations to track what has and has not been implemented by them. These actions are in Table 5.

Table 5. PY13 Evaluation Recommendation Tracking

PY13 Recommendation	Ameren Missouri Response	Explanation
As part of the planning for future years, explore whether RACs and programmable thermostats will still meet cost-effectiveness requirements, given the current levels of free ridership and the relatively low per-unit savings.	Implemented	RACs continue to be cost-effective and remain in the program. Programmable thermostats were removed in PY14, though research into options continues.
Consider shifting the target segment for programmable thermostats from single-family to multifamily properties and use a direct-install strategy to reduce the occurrence of replacing existing programmable thermostats.	Not Implemented	Programmable thermostats were removed in PY14, though research into options continues.
Use online advertising tactics such as paid search and/or banner advertisements on home improvement websites, such as Homedepot.com or Lowes.com.	Implemented	Ameren Missouri continues to work with major retailers on online marketing, and used online banners and social media in PY14.
Reduce the number of CFLs in the kit to six bulbs to improve installation rates and cost-effectiveness.	Implemented	PY14 kits included four CFLs and 2 LEDs.
Provide educational material about the energy and costs savings associated with replacing incandescent bulbs with CFLs right away rather than waiting for the incandescent bulbs to burn out.	Implemented	Marketing and educational materials included in kits and follow-up calls were conducted with participants.

PY13 Recommendation	Ameren Missouri Response	Explanation
Diversify the type and wattage level of bulbs included in the kit to provide participants with more options and consider adding LEDs.	Implemented	PY14 kits included four CFLs and 2 LEDs.
Consider changing the kit's measure mix to one aerator and one showerhead per household and provide a follow-up mechanism so participants can request additional devices if they are satisfied with the ones they received.	Implemented	PY14 kits included one aerator and one showerhead.
Research new ways for identifying hot water customers or consider mailing CFL kits to all electric customers.	Implemented	PY14 program offers kits for direct install my property managers and participation in this delivery channel increased from PY13.
Engage heavy online users through increased online program marketing and through promoting the online submission functionality at retail.	Partially Implemented	Ameren Missouri used online marketing and social media in PY14. Unclear if point-of-purchase signage was used to promote online portal.
Ameren Missouri and APT should consider developing their own simplified collateral and instructions to educate customers on the best way to use the power strip.	Implemented	Kits and installation guides were redesigned in PY14.

Introduction

Ameren Missouri engaged Cadmus and Nexant (the Cadmus team) to perform process and impact evaluations of the Efficient Products (formerly RebateSavers) program for a three-year period. This annual report covers the limited impact and process evaluation findings for Program Year 2014 (PY14), the period from January 1, 2014, through December 31, 2014.

Program Description

The Efficient Products program began in Cycle 1 (2009–2012) as the energy-efficient product rebate component of the combined PY09 Lighting and Appliance program.

In implementing the program, Ameren Missouri partners with two third-party contractors:

- CLEAResult (formerly Applied Proactive Technologies), which implements the program, and manages a network of retail partners that sell qualifying equipment.
- Energy Federation Incorporated (EFI), which processes the rebates on Ameren Missouri's behalf and operates the online store for smart strips.

Beginning in PY12, Ameren Missouri discontinued the appliance portion of the combined Lighting and Appliance program and focused exclusively on lighting products. Ameren Missouri and CLEAResult reintroduced RebateSavers in PY13 (now called Efficient Products) as a new, stand-alone appliance program, designed to promote a variety of energy-efficient products in the marketplace.

The program provides incentives that encourage customers to purchase technologies that can save money, improve comfort, and save energy. The program also seeks to educate customers about energy-efficient product options and energy-savings tips.

In PY14, Ameren Missouri changed the name of the program from RebateSavers (used in PY13) to the Efficient Products program." The PY14 Efficient Products program provided downstream rebates for the following[2]:

- ENERGY STAR®-certified room air conditioners (RACs)
- ENERGY STAR-certified heat pump water heaters
- ENERGY STAR-certified air purifiers
- ENERGY STAR-certified water coolers
- ENERGY STAR-certified two-speed pool pumps
- ENERGY STAR-certified variable-speed pool pumps
- Electric storage water heaters with an Energy Factor (EF) of 0.93 or higher

[2] Programmable thermostats were not offered in PY14 and were not re-evaluated; however, PY13 rebates were honored in PY14.

In addition to providing mail-in and online rebates, Efficient Products offered a free Home Energy Kit upon request to customers with electric hot water heaters. Four variations of the kit were offered in PY14. Kits 1 and 2, representing PY13 kit designs, were distributed to participants between January and June 2014. Kits 3 and 4 were updated to reflect PY13 evaluation findings and were distributed to participants between July and December 2014. Customers could choose between Kit 3 and Kit 4, depending on whether they wanted a free kit (Kit 3) or wanted to pay $4.95 for a kit that included an Advanced Power Strip (Kit 4). Table 6 shows items provided in each kit.

Table 6. PY14 Home Energy Kit Contents

Measure	Kit 1 Quantity	Kit 2 Quantity	Kit 3 Quantity	Kit 4 Quantity
Low Flow Faucet Aerator	2	3	2	2
Low Flow Showerhead	1	2	1	1
Pipe Wrap*	1	1	1	1
Advanced Power Strip	1	1	0	1**
Compact Fluorescent Bulbs (CFLs)	12	12	4	4
Light Emitting Diode Bulbs (LEDs)	0	0	2	2

* 12 ft total.

** Participants elected to pay $4.95 to receive this measure.

The program also provides direct-install kits for multifamily properties. Eligible properties receive the items from Kit 3 kit, with the expectation that property staff will install the items in each unit. Advanced power strips are available for purchase at a discounted price through Ameren Missouri's online store.

Program Activity

In PY14, a total of 13,933 products were delivered to Ameren Missouri participants in the Efficient Products program, as shown in Table 7.

Table 7. Efficient Products PY14 Program Activity

Measure	PY14 Totals
Equipment Rebates	
Electric Water Heaters	212
Heat Pump Water Heaters	371
RACs	372
Programmable Thermostats	1,464
Pool Pumps	52
Air Purifiers	392
Water Coolers	23
Subtotal	**2,886**
Home Energy Kits	
Home Energy Kits – Single-family	7,690

Measure	PY14 Totals
Home Energy Kits – Direct Install in Multifamily	2,114
Subtotal	**9,804**

Measure	PY14 Totals
Upstream Discounts – Online Store Purchases	
Advanced Power Strips – Load Sensing	1,196
Advanced Power Strips – Motion Sensor	47
Subtotal	**1,243**
Total	**13,933**

Evaluation Methodology

In evaluating Ameren Missouri's Efficient Products program, the Cadmus team identified the following objectives for PY14:

- Identify PY14 program changes;
- Update equipment installations for single-family Home Energy Kits;
- Assess free ridership and spillover through participant surveys;
- Estimate the program's gross energy savings and demand reductions;
- Calculate the program's cost-effectiveness;
- Assess the program's achievements against goals; and
- Review participant experience, satisfaction, and decision-making motivations.

Table 8 lists evaluation activities and briefly explains the purpose of each activity. Overviews of each activity follow the table.

Table 8. PY14 Process and Impact Evaluation Activities and Rationale

Evaluation Activity	Process	Impact	Rationale
Review the Technical Resource Manual (2012 TRM)		•	Review 2012 TRM values and assumptions.
Review the Tracking Data	•	•	Provide ongoing support to ensure all necessary program data are tracked accurately; identify gaps for evaluation, measurement, and verification (EM&V) purposes.
Interview Stakeholders	•		Obtain an in-depth understanding of the program and identify its successes and challenges.
Survey Participants - phone (n=71) and online (n=197)	•	•	Verify measure installation; collect data to inform the net-to-gross ratio (NTG); collect process-related data.
Conduct Engineering Analysis		•	Determine gross kWh savings for new PY14 measures.
Conduct a Cost-Effectiveness Analysis		•	Measure the program's cost-effectiveness using five standard perspectives: total resource cost, utility cost, societal cost test, participant cost test, and ratepayer impact test.

TRM Review

The Cadmus team reviewed the algorithms used by Ameren Missouri and ENERGY STAR for new measures introduced to Efficient Products in PY14. This review identified—early in the program year—any potential differences between values Ameren Missouri assumed in the 2012 TRM and values that may result from the formal evaluation process. Our goals included the following:

- Enhance our understanding of the specific measures that Ameren Missouri's implementers delivered; and
- Provide early feedback that could potentially allow Ameren Missouri's implementers to make mid-year course corrections for improving program delivery.

Data Tracking Review

The Cadmus team reviewed the program tracking database used by CLEAResult. In PY14, this database was in transition, switching from the Salesforce database (used in PY13 and most of PY14) to Vision (used henceforth). We reviewed both databases, but ultimately relied on Salesforce data for the evaluation.

Stakeholder Interviews

In November 2014, the Cadmus team interviewed Efficient Products stakeholders. We designed these interviews to:

- Gather information on how the program has changed since PY13;
- Identify challenges program staff or implementers have encountered; and
- Determine appropriate solutions.

The Cadmus team spoke with three program stakeholders across Ameren Missouri and CLEAResult, as shown in Table 9. Appendix D provides the stakeholder interview guide.

Table 9. Completed Stakeholder Interviews

Stakeholder Group	Interviews Conducted
Ameren Missouri Program Staff	1
CLEAResult Program Management	2
Total	**3**

Throughout the program year, we regularly spoke with Ameren Missouri program staff and CLEAResult to discuss program operations and to coordinate evaluation activities.

Participant Surveys

The Cadmus team conducted one telephone survey and one online survey of Efficient Product participants. The telephone survey addressed single-family participants who received Home Energy Kits and was used to update installation rates, free ridership, and spillover values resulting from changes made to the kit configuration in PY14. The telephone survey did not include recipients of the multifamily direct-install kits or equipment rebate participants. The online survey collected information from online rebate participants, used to update PY13 online survey free ridership and spillover results.

The surveys covered both impact evaluation and process evaluation topics, including free ridership, spillover, participant awareness and decision making, and satisfaction. In total, we completed 278

surveys for the Efficient Products PY14 evaluation, as shown in Table 10. Appendix E presents the survey instruments used.

Table 10. Efficient Products Participant Survey Summary

Target Audience	Survey Method	Field dates	Completed Surveys
Kit Participants	Phone	Nov 2014	71
Equipment Rebate Participants – online applicants	Online	Jan – Dec 2014	197
Total			**278**

Survey Timing

Survey results may be influenced by the time elapsed between a participants' engagement with a program and a survey's administration. Logic implies that a participant's memory will be more accurate (i.e., greater recall) closer to the time of participation and less accurate (i.e., recall bias) further from the time of participation. With greater recall, survey results most accurately reflect a participant's experience with a program and installation activities.

However, allowing greater elapsed time between program participation and survey administration enhances a study's ability able to capture installations over time, measure retention, and estimate spillover. Inadequate evidence exists to determine whether recall bias increases or decreases free ridership estimates.

Optimally, participant surveys will be administered immediately after participation to capture greater recall and further from the time of participation to capture later installations, retention, and spillover. Conducting multiple participant surveys, however, is subject to program and evaluation timelines as well as budget constraints.

In PY14, the Cadmus team completed surveys in a single wave, with surveys administered in late fall. This allowed us to include the greatest number of PY14 participants in our sample, ensuring our findings reflected programmatic changes that occurred over the course of the year and appropriately balancing the impact of recall bias with respondents' ability to address measure retention and spillover. Specifically, the Cadmus team administered Home Energy Kit phone surveys in late November to customers who received kits between January and August 2014. This timing gave participants a minimum of 2.5 months to install the measures they received. Participants completed equipment rebate online surveys throughout the year.

Sampling

For the phone survey, we generated a simple random sample, stratified by kit type, to ensure capture of data from participants receiving the newly designed kits. The average participation month for respondents who received Kits 1 or 2 was January, whereas the average participation month for respondents receiving Kits 3 or 4 was August. The phone survey samples sought to achieve results at

90% confidence with 10% precision at the program level. In contrast, the online survey was offered to everyone who completed an online rebate application.

Table 11. Completed Surveys by Measure

Stakeholder Group	Population	Targeted Surveys	Achieved Surveys
Phone Survey—Single-Family Home Energy Kit Participants			
Kit 1	956	35	11
Kit 2	1,310		24
Kit 3	6,033	18	18
Kit 4	1,503	18	18
Subtotal	**9,802**	**71**	**71**
Online Survey—Online Equipment Rebate Participants*			
Electric Water Heater	38	n/a	29
Heat Pump Water Heater	103	n/a	62
Room Air Conditioner	42	n/a	24
Pool Pump	1	n/a	1
Water Cooler	0	n/a	0
Air Purifier	4	n/a	3
Subtotal	**188**	**n/a**	**151**
Total (All Methods)	**9,990**		**455**

*The online survey population is a subset of general program participant population. Only online equipment rebate applicants received an opportunity to participate in the online survey.

The Cadmus team used PY13 installation rates, free ridership, and spillover values for the direct-install Home Energy Kit and online store delivery channels, as this channel did not receive a phone survey in PY14. Additionally, while phone surveys and online surveys were used to evaluate rebated products in PY13, only online surveys were conducted in PY14. As such, the Cadmus team used PY14 online survey results and PY13 phone survey results to estimate installation rates, free ridership, and spillover for this delivery channel.

Engineering Analysis

To estimate per-unit gross savings for each Efficient Products measure, the Cadmus team used engineering algorithms, assumptions, and all available Ameren Missouri- and participant-specific inputs. These algorithms yielded estimates of the difference in energy usage of the rebated product and usage of a similar product meeting the minimum federal standard for efficiency. The Gross Impact Evaluation Results section of this report presents each algorithm and input assumption.

Cost-Effectiveness Analysis

Using final PY14 Efficient Products participation and implementation data as well as *ex post* gross and net savings estimates presented in this report, Morgan Marketing Partners (MMP) determined the program's cost-effectiveness using DSMore (a financial analysis tool designed to evaluate the costs,

benefits, and risks of demand-side management [DSM] programs and services). MMP also calculated measure-specific cost-effectiveness. As shown in the Cost-Effectiveness Results section, MMP assessed cost-effectiveness using all five of the standard perspectives produced by DSMore:

- Total Resource Cost (TRC)
- Utility Cost (UCT)
- Societal Cost Test (SCT)
- Participant Cost Test (PART)
- Ratepayer Impact Test (RIM)

CSR Impact Evaluation Requirements

According to the Missouri Code of State Regulations (CSR), demand-side programs that are part of a utility's preferred resource plan are subject to ongoing process and impact evaluations that meet certain criteria. Specifically, the CSR requires that impact evaluations of demand-side program satisfy the requirements noted in Table 12. The table indicates the data our team used to satisfy these impact CSR evaluation requirements for Efficient Products. We provide a summary of the process CSR requirements in Table 17 at the end of the Process Evaluation section.

Table 12. Summary Responses to CSR Impact Evaluation Requirements

CSR Requirement	Method Used	Description of Program Method
Approach: The evaluation must use one or both of the following comparisons to determine the program impact:		
Comparisons of pre-adoption and post-adoption loads of program participants, corrected for the effects of weather and other intertemporal differences	x	The program compares the pre-adoption load based on assumed baseline technology with the post-adoption load based on program technology, and estimates weather and interactive effects using TRM and industry assumptions, metering, and modeling, when necessary.
Comparisons between program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	x	Metered lighting hours of use by room in a sample of homes in the program area during 2013-2014.
Building and equipment simulation models	x	Use simulation modeling to determine the waste-heat impact of efficient lighting.

Survey responses	x	Surveyed metering participants on purchasing practices and other product participants to determine installation rates.
Audit and survey data on:		
Equipment type/size efficiency	x	Evaluation team conducted an audit of all lighting in sample of homes in program area. Evaluation team conducted an audit of equipment type/efficiency for other products through review and analysis of the program database.
Household or business characteristics	x	Evaluation team collected household characteristics from homes participating in lighting audit: home type, own/rent home, as well as kit participants and Low Income program participants.
Energy-related building characteristics		

Process Evaluation Findings

This section presents the Cadmus team's process evaluation findings for Ameren Missouri's Efficient Products program. The findings divide into four sections: Program Design, Program Delivery, Marketing and Outreach, and Program Satisfaction.

Program Design

The Efficient Products program's design seeks to promote energy-efficiency awareness; and encourage the purchase and use of energy-efficient products. The program uses three components to achieve these objectives:

- Downstream rebates for customers purchasing high-efficiency, home energy products from participating retailers;
- Free Home Energy Kits for customers with electric water heaters; and
- Upstream discounts for advanced power strips, sold through Ameren Missouri's online store.

Downstream Rebates

The downstream rebate component primarily relies on partnerships with participating retailers to communicate available incentives and to create customer awareness about energy-efficient products. Table 13 lists the eligible products and associated rebate amounts.

Table 13. Rebated Measures[3]

Qualifying Products	Rebate Amount
ENERGY STAR Certified Heat Pump Water Heater	$500
ENERGY STAR Certified Dual Speed Pool Pumps	$250
ENERGY STAR Certified Variable Speed Pool Pumps	$250
ENERGY STAR Certified Air Purifiers	$50
Electric Storage Water Heaters with an EF of 0.93 or higher	$45
ENERGY STAR Certified Room Air Conditioner	$20
ENERGY STAR Certified Water Coolers	$15

At the end of PY14, 222 retail locations participated in the Efficient Products program.

Free Home Energy Kits

Ameren Missouri continued to distribute free Home Energy Kits to its electric water heating customers in FY14, though the measure configuration evolved during the year. Kits 1 and 2, representing PY13 kit designs, were distributed to participants between January and June 2014. Kits 3 and 4 were updated to reflect PY13 evaluation findings and were distributed to participants between July and December 2014. Customers could choose between Kit 3 and Kit 4, depending on whether they wanted a free kit (Kit 3) or

[3] Programmable thermostats were not offered in PY14 and were not re-evaluated; however, PY13 rebates for $25 per thermostat were honored in PY14.

would pay $4.95 for a kit that included an Advanced Power Strip (Kit 4). In addition to the energy-saving measures, each kit contained instructions to assist with installation. Table 14 lists the number of measures in each kit.

Table 14. Home Energy Kit Measures

Measure	Kit 1 Quantity	Kit 2 Quantity	Kit 3 Quantity	Kit 4 Quantity
Low Flow Faucet Aerator	2	3	2	2
Low Flow Showerhead	1	2	1	1
Pipe Wrap*	1	1	1	1
Advanced Power Strip	1	1	0	1**
Compact Fluorescent Bulbs (CFLs)	12	12	4	4
Light Emitting Diode Bulbs (LEDs)	0	0	2	2

* 12 ft total.

** Participants elected to pay $4.95 to receive this measure.

CLEAResult delivered these kits through two channels: direct mail and direct install. The majority of kits were mailed directly to single-family households requesting a kit, while the remaining kits were mailed to multifamily property owners and directly installed by building maintenance staff:

- ***Direct mail, single-family.*** Electric hot water heating customers were identified by their past participation in the Lighting and Appliance program and through billing segmentation analysis conducted to identify likely electric hot water customers. These customers received postcards advertising the availability of the kit, and, by returning the postcard or by calling Ameren Missouri, they opted-in to receive a kit.
- ***Direct install, multifamily***. The program implementer worked with and provided kits to multifamily property management companies; building maintenance staff completed installations.

Upstream Discounts

Ameren Missouri sells four types of advanced power strips at a discount through an online store, managed by EFI.[4] To qualify for the discount, customers must verify upon check-out that they live within Ameren Missouri's service territory. The price of these advanced power strips ranges from $4.95 to $32.95, as shown in Table 15.

[4] https://www.energyfederation.org/012609/default.php

Table 15. Available Advanced Power Strips

Manufacturer and Model	Type	Cost	Image
TrickleStar 12 Outlet Advanced Power Strip	Load-sensing	$18.95	
TrickleStar Motion Sensor Advanced Power Strip	Occupancy-sensing and Load-sensing	$15.95	
TrickleStar 7-Outlet Advanced Power Strip	Load-sensing	$4.95	
TrickleStar APS Plus +	Infra-red remote sensing and Load-sensing	$32.95	

Program Delivery

This section discusses responses from program stakeholder interviews regarding program management and delivery topics assessed by the Cadmus team. As detailed interviews were conducted in PY13, PY14 interviews primarily focused on changes occurring since the previous evaluation.

PY14 Program Changes

Stakeholders reported program performed well, but *ex ante* and evaluated savings substantially differed in PY13. Consequently, the program did not offer programmable thermostats as they did not prove cost-

effective in PY13. The program added air purifiers, water coolers, and pool-pumps and increased rebate amounts for heat pump water heaters and high-efficiency water heaters.

Additionally, the configuration of the Home Energy Kits evolved over the year, with reductions made to the number of CFLs, showerheads, and aerators included in the kits. Conversely, the Home Energy Kits added LEDs in PY14, and customers could pay $4.95 for a kit that included a Smart Power Strip. Program staff reported the direct-install delivery channel received greater emphasis. Apart from measure changes, program staff reported follow-up phone calls to Home Energy Kit participants, seeking to verify they received the kits and found the instructions helpful.

While stakeholders reported these changes beneficial to the program, they found the process of making the changes time-consuming, given the timing of evaluation results, filing deadlines, and additional analysis. As a result, updated Home Energy Kits and new equipment rebates did not become available until mid-year.

Delivery Successes and Program Achievements

When the Cadmus team asked about program aspects that worked particularly well, stakeholders reported the following:

- Program staff expressed encouragement about the number of participants who opted to pay $4.95 for the Home Energy Kit that included the Smart Power Strip; they felt this indicated participants recognized value in the offer.
- While the program introduced new measures late into the year, respondent thought these continue to gain traction, and they expect program participation to increase for most measures in the coming year. Respondents noted the water cooler rebate was not "designed for big movement."
- The direct-install channel experienced an increase in participation in PY14, resulting from a new relationship with a property management firm managing a large number of properties.
- Ameren Missouri's relationship with Lowes and Home Depot made it easier for customers learn of the online rebate. Program staff reported seeing increases in rebates processed online, with about 80% to 90% of heat pump and water heaters requests through the online portal. Respondents reported the number of participating retailers increased from approximately 180 in PY13 to 222 in PY14.
- Stakeholders responded positively to this year's marketing and to the new marketing manager that joined the staff in PY14. Respondents reported discussion continues about leveraging the HVAC program's heat pump water heater marketing as to cross multiple programs.
- Respondents reported the rebate process continued to run smoothly, with processing times meeting or exceeding expectations.

Program Implementation Challenges and Potential Changes

In interviews, stakeholders identified PY14 challenges and areas for future exploration:

- Overall, stakeholders found PY14 a challenging year. Program staff wanted to respond to evaluation findings and help increase cost-effectiveness and improve the program for customers. Due to the timing of the PY13 evaluation's final approval and subsequent filing activities, however, stakeholder's reported impossible to make program changes based on evaluation findings at the beginning of the program year. Consequently, the program did not introduce new measures and Home Energy Kit changes until late in PY14. Respondents reported the program will need to catch up on savings goals in PY15.
- Program staff reported that tax credit changes may have impacted participation in PY14, as the $300 tax credit for heat pump water heaters was discontinued. Additionally, respondents reported that plumbers may still be hesitant to install this technology. Respondents reported, however, that Ameren Missouri's decision to help compensate for the tax credit change by increasing the rebate proved successful. Stakeholders also reported confidence that plumbers' hesitation will diminish as they gain experience with heat pump water heaters.
- Program staff reported research and consideration of measure changes will continue for future program years. The program removed programmable thermostats in PY14, following evaluation results that indicated these were not cost-effective, though Ameren Missouri continued to honor PY13 rebates returned by customers and noted customer interest in Wi-Fi thermostats. Program staff would like to offer these measures to customers and continue to research technologies and studies that demonstrate energy savings. Additionally, research continues on Smart Power Strip technologies, with adjustments considered to types offered through the program for PY15. Conversely, the program may remove electric storage water heaters at the end of PY14.
- The program database changed in PY14, with all program data transitioned to the new Vision database by the end of the year. This process required extensive testing and created delays in reporting. Respondents reported, however, that the new database should streamline future reporting.

Marketing and Outreach

This section provides the Cadmus team's findings on Efficient Products marketing strategies and outcomes.

Primary Marketing Channels: Equipment Rebates

The Efficient Products Rebate Program primarily conducts marketing through work with retailers to place program materials in stores, coordinate in-store activities, and provide training on rebates and applications. Implementers also work with retailers to conduct on-site promotions to show products to customers and to discuss the rebates. The implementer reported over 200 promotions conducted by October 2014, with the majority at the beginning of the year. Promotions were thought helpful for

increasing participation and for developing relationships with the retailers. A senior field representative visits stores and produces quarterly reports on these visits.

Primary Marketing Channels: Home Energy Kits and Advanced Power Strips

In addition to providing equipment rebate measures, the program promotes the availability of discounted advanced power strips through Ameren Missouri's online store and free Home Energy Kits. PY14 marketing for these delivery channels relied on the same strategies discussed in PY13:

- Advanced Power Strips: Ameren Missouri offered discounted advanced power strips at promotional prices through the online store.
- Home Energy Kits: Energy-efficiency kits were marketed through a series of postcards targeting electric hot water customers.

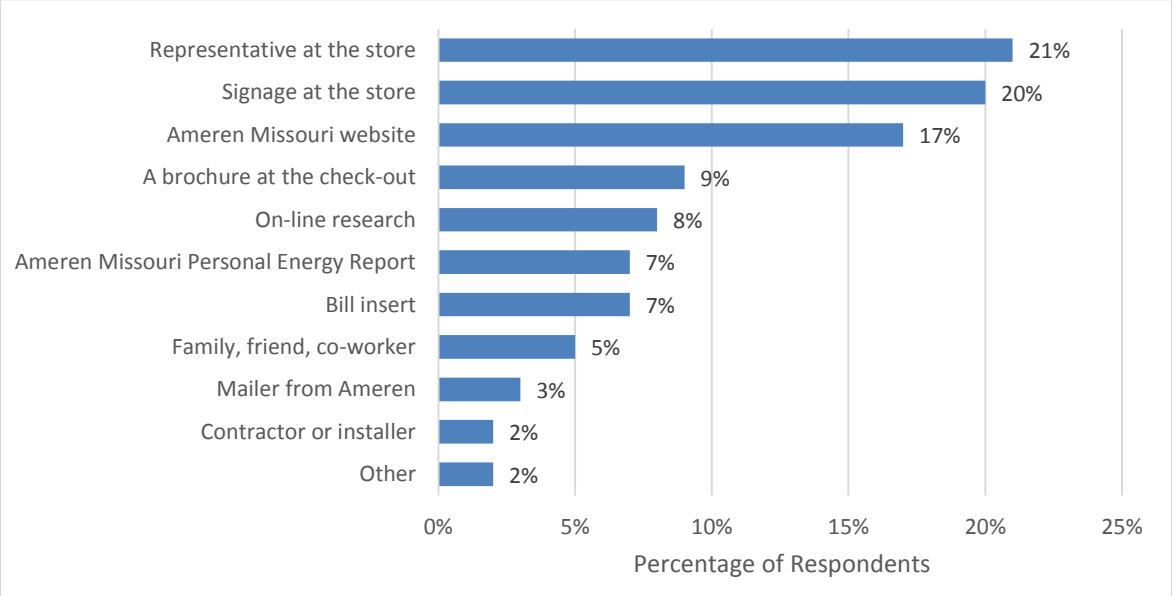
Respondents reported the methods of identifying eligible multifamily properties for the direct-install component of the Home Energy Kit were more successful in PY14. These methods included: cross-marketing with other programs; following up with contractors researching upgrades but not qualifying for other programs; and using Ameren Missouri's low-income multifamily program to identify contacts that manage additional properties.

Customer Awareness and Decision Making

The Cadmus online survey revealed customers learned of the online rebate program primarily though representatives and signage in stores (21% and 20% respectively, n=115). Participants also learned of program through Ameren Missouri's website (17%) and forms available at check-out (9%).

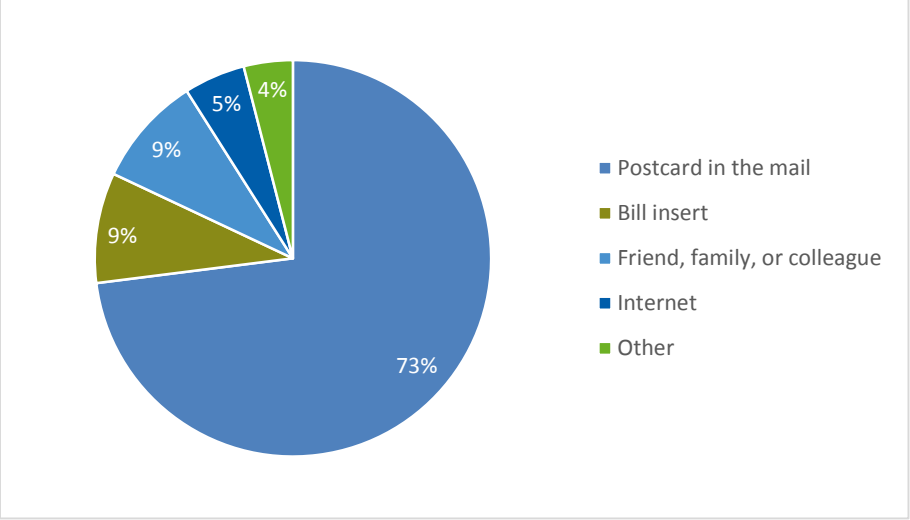
Figure 1 shows the distribution of program awareness sources from all respondents.

Figure 1. Sources of Rebate Program Awareness—Online Equipment Rebate Participants (n=115)



The Cadmus survey found that, for the Home Energy Kits, 73% of customers became aware of the program through postcards mailed by the utility (n=56). Figure 2 breakdowns the different methods by which customers leaned of the program.

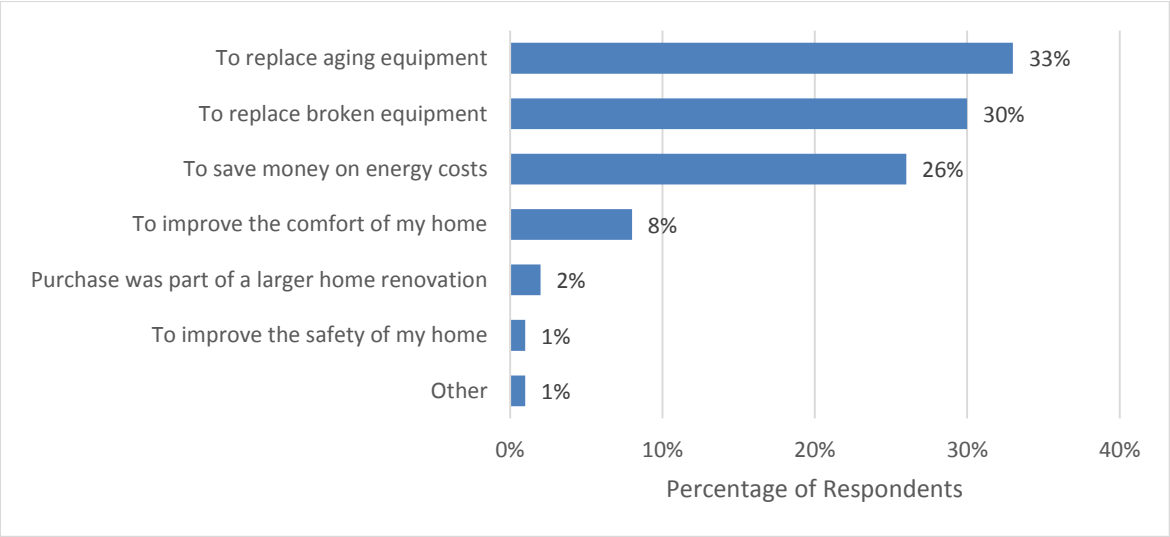
Figure 2. How did Customers First Hear about the Home Energy Kits? (n=56)



Purchase Reasons

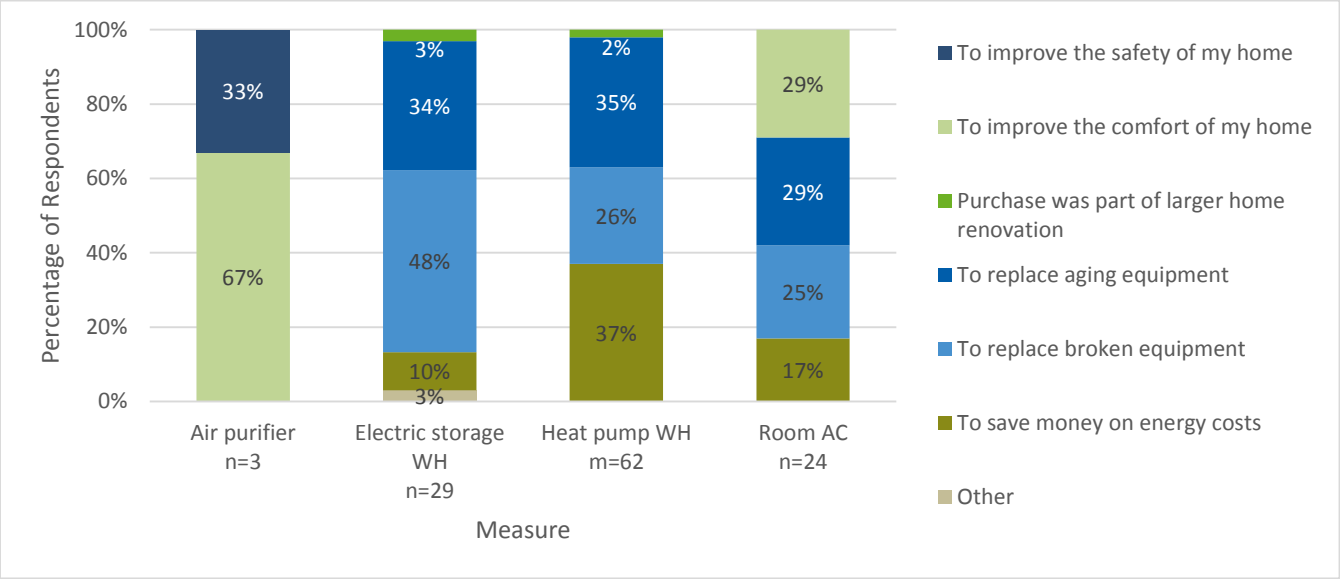
Online equipment rebate respondents most commonly said they purchased the measure to replace aging equipment (33%, n=119) or broken equipment (30%). As shown in Figure 3, respondents cited saving money on energy costs (26%) as the other top reason for purchasing measures.

Figure 3. Primary Reasons for Participants' Measure Purchases—Online Equipment Rebate Participants (n=119)



However, these results differed between measures. As shown in Figure 4, participants most commonly purchased air purifiers to improve home comfort (67%). For electric storage water heaters, participants most commonly replaced broken equipment (48%). For heat pump water heaters, participants most commonly sought to save money on energy costs (37%). Improving home comfort and replacing aging equipment tied for the most common reason that participants purchased air conditioners (29%).

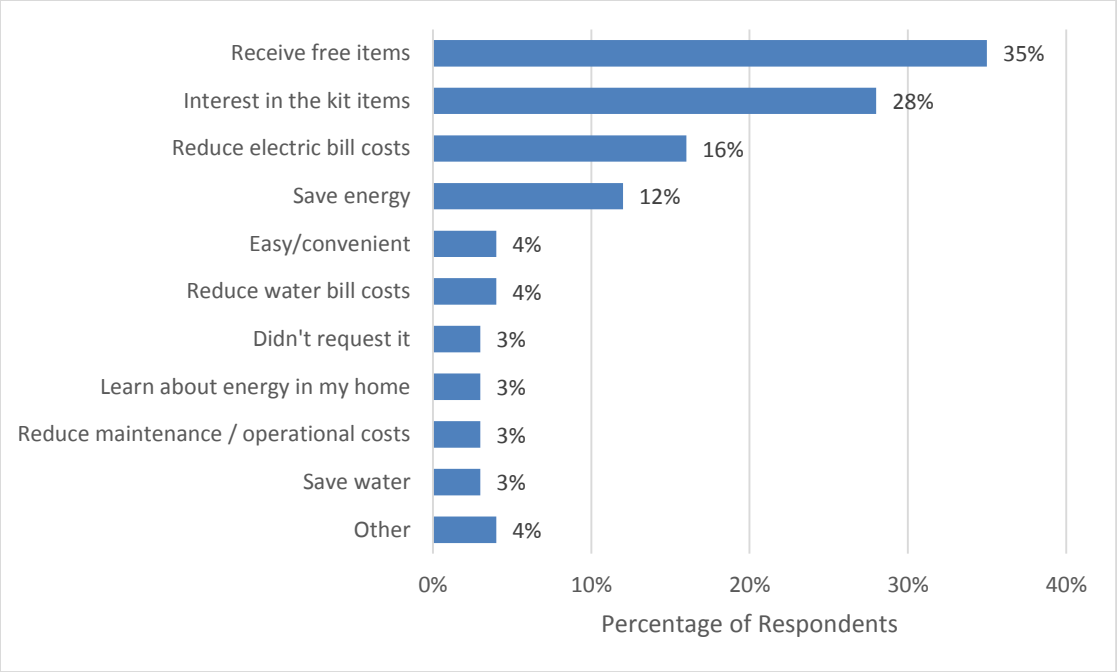
Figure 4. Primary Reasons for Participants' Purchase by Measure—Online Equipment Rebate Participants



Home Energy Kit participants indicated they primarily participated in the program to receive free items (35%, n=68). Other key reasons identified by respondents included: interest in the items contained in the kits (24%) and reducing electrical bills and energy usage (14% and 10% respectively).

Figure 5 displays survey respondents' responses.

Figure 5. Customer Reasons for Requesting the Home Energy Kit (n=68, r=79)



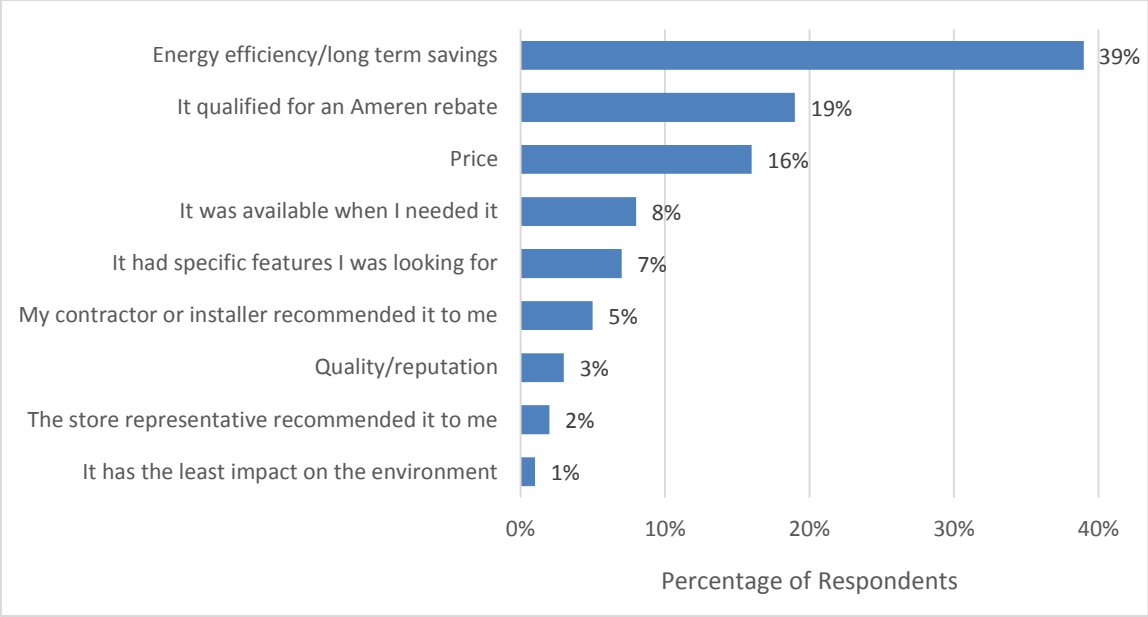
Note: multiple responses allowed.

While the previous year responses also cited receiving free items as the most significant reason for participation (37%), they expressed greater interest in reducing bills (36% in PY13, compared to 16% in PY14) and less interest in specific kit items (3% in PY13 compared to 28% in PY14).

Why Equipment Rebate Participants Chose a Specific Model and Brand

When asked for the primary reason that they purchased a specific model and brand, respondents most commonly cited energy efficiency and achieving long-term savings (at 39%, n=119), as shown in Figure 6. Other key factors included if equipment qualified for an Ameren Missouri rebate (19%) and upfront prices (16%).

Figure 6. Primary Factor in Decision Making Among Equipment Rebate Participants (n=119)

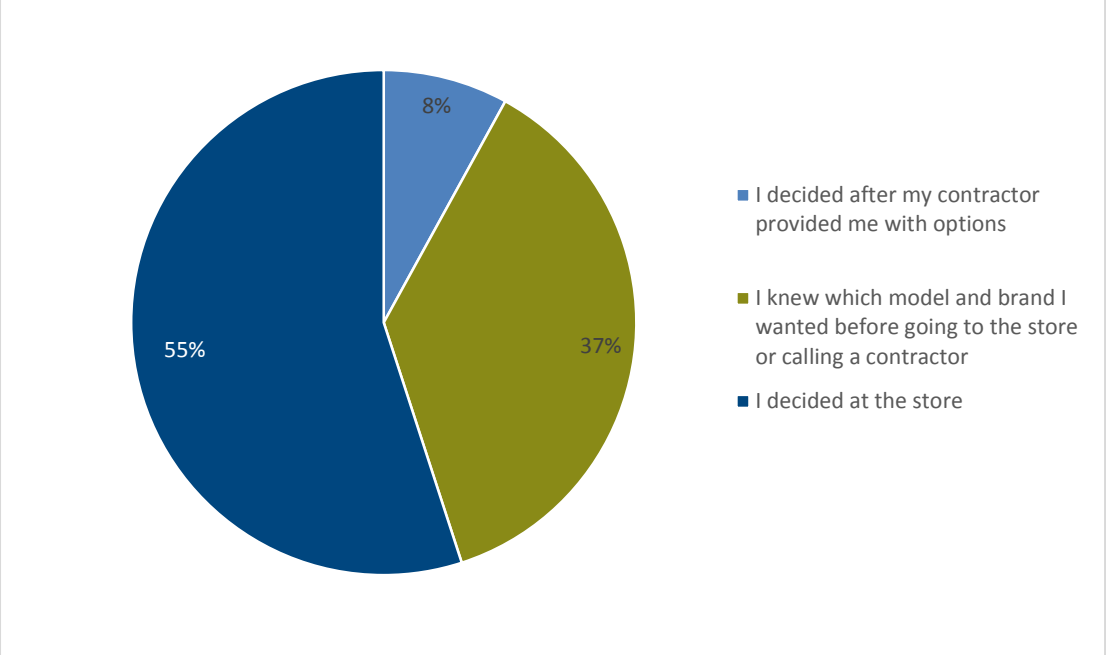


Compared to the previous year's evaluation, energy efficiency and price continued to be the common responses (35% and 19% respectively in PY13), but products with features the customers looked for fell from 21% to 7%, and qualification for a rebate rose from 11% in PY13 to 19%.

Participant Decision Timing

As shown in Figure 7, the Cadmus team asked respondents to identify when they decided on the exact model and brand they wanted to buy. The majority (55%, n=119) decided at the store where they made their purchase. An additional 37% made the decision before going to the store or contacting a contractor, and 8% made their decision based on options provided by the contractor. According to the implementer, customers that had made their decision prior to going to the store may have been influenced by prior marketing activities such as in store demonstrations, the Ameren Missouri Personal Energy Report, or bill inserts..

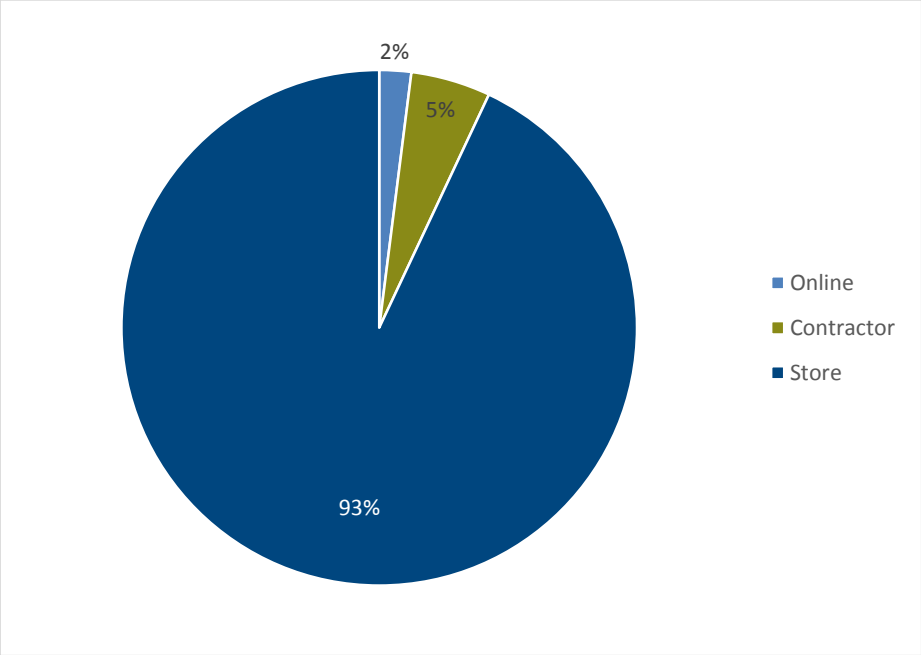
Figure 7. Timing of Purchase Decision—Online Equipment Rebate Participants (n=119)



Retailer and Contractor Promotion

The great majority of respondents (93%, n=119) indicated they purchased their rebated products in stores, rather than through a contractor (5%) or online (2%).

Figure 8. Location of Measure Purchase—Online Equipment Rebate Participants (n=119)



Online equipment rebate surveys asked respondents who purchased a product at a store whether store associates said the measure qualified for an Ameren Missouri rebate.[5] As shown in Figure 1, participants frequently learned of the program through a retailer (store signage or rebate forms upon check-out). When asked if a store representative informed them of the rebate, 59% said "*no*" and 41% said "*yes*" (n=87).

Surveys also asked respondents who reported purchasing their product from a contractor about the contractor's promotions, For these respondents, three out of five said the contractor informed them about the program; two said the contractor did not.

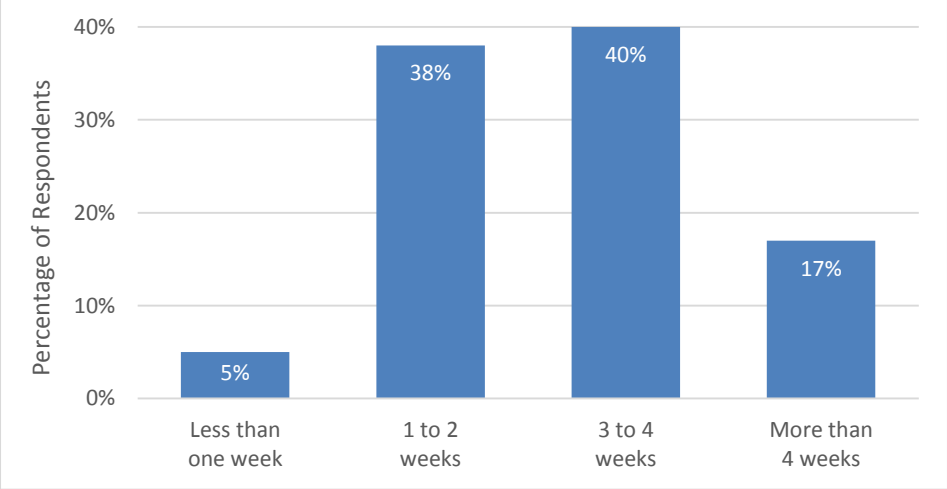
Program Satisfaction

Surveys asked the Home Energy Kit program participants to rate their satisfaction with the following program elements:

- Request process
- Measures included
- Kit instructions
- Overall Ameren Missouri utility satisfaction

When asked how long it took to receive their Home Energy Kit in the mail, most respondents indicated it took one to two weeks (38%, n=58) or three to four weeks (40%), as shown in Figure 9. This indicates a slightly longer wait than in the previous evaluation year, when 52% indicated receiving their kits in one to two weeks and 36% in three to four weeks. In both years, however, the majority of respondents indicated it took four weeks or less to receive the kits (93% in PY13, 83% in PY14).

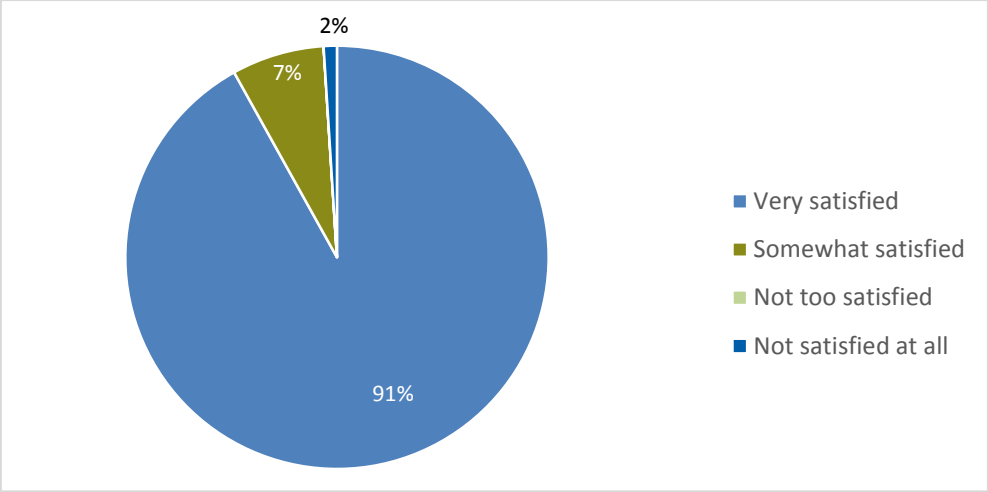
Figure 9. Time it Took to Receive Home Energy Kit after Making Request (n=58)



[5] If respondents learned about the program from retail store staff, the survey omitted this follow-up question.

When asked to rate their satisfaction with the process of requesting and receiving their Home Energy Kits, 91% of recipients (n=68) indicated they felt very satisfied, while 7% indicated they felt somewhat satisfied (see Figure 10). Only 2% of respondents indicated they felt not at all satisfied.

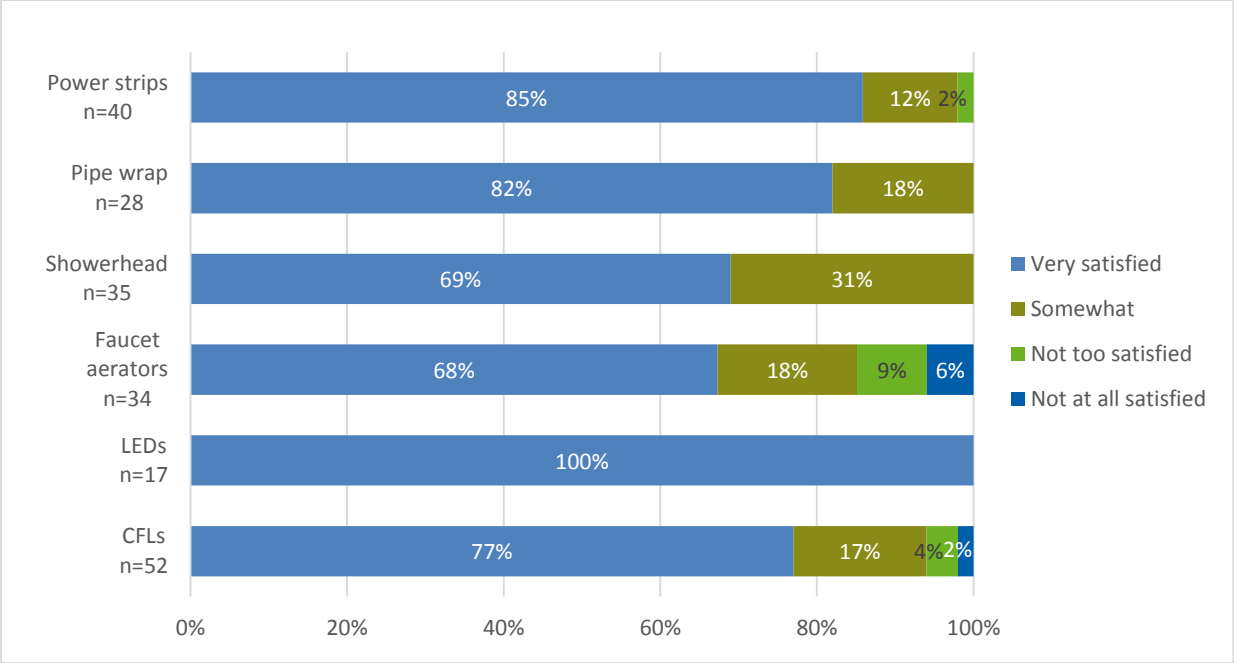
Figure 10. Satisfaction with Home Energy Kit Request Process (n=68)



Measure Satisfaction

The Cadmus team investigated participants' satisfaction with six energy-efficient products included in the Home Energy Kits. Satisfaction (very or somewhat satisfied) among Home Energy Kit participants ranged from 86% to 100%, as shown in Figure 11. Kit recipients expressed the greatest satisfaction with LED bulbs, with 100% of 17 respondents indicating the highest satisfaction level. Recipients awarded faucet aerators the lowest satisfaction ratings, with 15% of 34 respondents indicating they were less-than-satisfied with the product. Figure 11 breaks down satisfaction levels across all six measures.

Figure 11. Satisfaction with Home Energy Kit Measures



Surveys asked respondents indicating being less than *very* or *somewhat satisfied* with the measures to provide feedback on reasons for their ratings. Table 16 shows the number of respondents per measure and themes arising from their comments. Comments on CFLs and faucet aerators were similar to those reported in PY13.

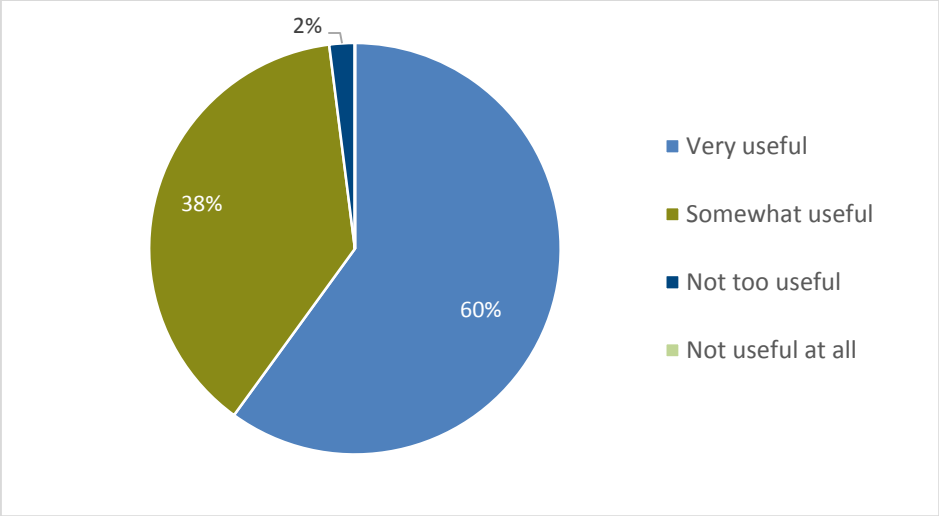
Table 16. Reasons for *Not Too-* and *Not at All Satisfied* Ratings—Home Energy Kit Measures

Measure	Number of Respondents	Measure-Related Comments
CFLs	3	Bulbs not bright enough; mercury filled
Faucet aerators	5	Insufficient water volume; noisy; sprays too hard
Advanced power strips	1	Blinks on and off

Kit Instructional Materials

Most respondents (93%, n=62) indicated they recalled receiving information in the kit that included instructions on how to install energy-efficient items in their homes. For those receiving instructions, 98% found the information very or somewhat useful, as shown in Figure 12. Only 2% of respondents found the instructions not too useful, and none found the instructions not useful at all.

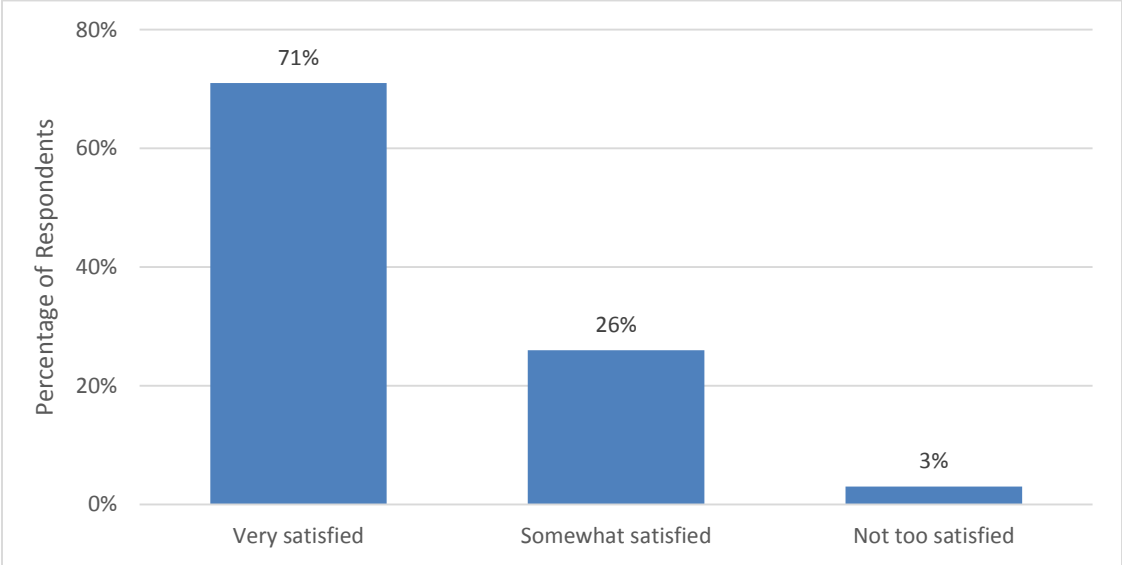
Figure 12. Feedback on Usefulness of Home Energy Kit Instructions (n=55)



Satisfaction with Ameren Missouri

Overall, almost three-quarters (71%, n=70) of all Home Energy Kit respondents indicated they were very satisfied with Ameren Missouri as a power utility, as shown in Figure 13. Another quarter indicated they were somewhat satisfied (26%) with the utility. In total, only 3% of respondents indicated they were less than somewhat satisfied with the utility.

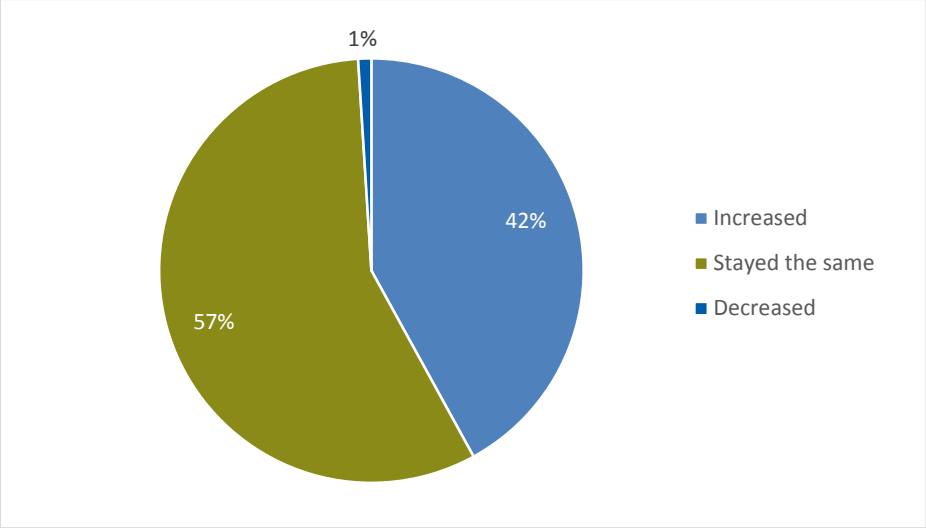
Figure 13. Feedback on Satisfaction with Ameren Missouri—Home Energy Kits (n=70)



When asked if their experience with the kit program affected the customers' opinion of Ameren Missouri, more than one-half of the respondents indicated their opinion stayed the same (57%). Slightly less than one-half (42%) of respondents indicated their program experience created a positive change in

their opinion of the utility. Only 1% of respondents indicated their experience in the program created a negative change in their opinion of Ameren Missouri. Figure 14 illustrates the responses.

Figure 14. Change in Home Energy Kit Respondents' Opinion of Ameren Missouri (n=69)



CSR Summary

As previously mentioned, the Missouri CSR, requires that demand-side programs that are part of a utility's preferred resource plan are subject to ongoing process and impact evaluations that meet certain criteria. Process evaluations must address, at a minimum, the five questions listed in Table 17. The table provides a summary response for each specified CSR process requirement, taken from both this year's evaluation and the prior year. We previously offered a summary of the data used to meet with impact CSR requirements in Table 12.

Table 17. Summary Responses to CSR Process Evaluation Requirements

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	It is assumed that the primary market remains largely unchanged from PY13, and lack of energy-efficiency awareness and the higher upfront cost of energy-efficient products are common barriers to this market segment. While energy efficiency and savings were identified most frequently when Equipment Rebate participants were asked for the primary factor in deciding on specific equipment, most respondents indicated a factor other than energy efficiency was primary in their decision.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The target market segments remain unchanged from PY13 and it was determined that a market study would not be completed in PY14. Based on PY13 findings, the target market of all residential customers is appropriate for the equipment rebate programs; Efficiency Kits are limited to those with electric water heating. This is appropriate for this program.
3	Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	Between the equipment rebates and free kit measures, a total of 13 energy-efficient home technologies (four more than the previous year) are offered through this highly diverse program. These include HVAC, lighting, plug-load, pumps, and water heating end-uses. This is a highly diverse program.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	The delivery channels are appropriate and reach customers through retail and direct-mail efforts, including in-store advertisements, bill inserts, contractors, postcards, and Ameren Missouri's website.
5	What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	Continued promotion and education can continue to overcome market imperfections. In PY14, we found that Installation rates were lowest for measures included in the kits containing advanced power strips. (See Conclusions and Recommendations for specific suggestions).

Gross Impact Evaluation Results

The section report details the Cadmus team's determination of each measure's installation rate and calculations of per-unit savings for Ameren Missouri's Efficient Products' Program.

Measure Installation Verification

Through participant phone surveys, the Cadmus team confirmed that measures were installed and operating. The installation rate—the percentage of measures found to be installed and operating—is a key factor in estimating each measure's overall savings contribution to the program. As shown in Table 19, installation rates varied between each delivery channel. Precision also varied, based on the total number of each measure included in the sample. Further, precision was not estimated for measures without variance (that is, we did not estimate precision for measures with a 100% installation rate).

Table 18. Measure Installation

Measure	Percentage Installed and Operating
Equipment Rebates	
Electric Water Heaters	100%*
Heat Pump Water Heaters	100%*
RACs	100%*
Programmable Thermostats	99%*
Variable-speed Pool Pumps	100%*
Air Purifier	100%*
Water Coolers	100%*
Kit Measures—Single-Family	
CFLs	75%
LEDs	92%
Advanced Power Strips	78%
Faucet Aerators	52%
Low-Flow Showerheads	47%
Water Heater Pipe Wrap	41%
Kit Measures—Multifamily	
CFLs	98%*
LEDs	98%*
Advanced Power Strips	78%
Faucet Aerators	100%*
Showerheads	86%*
Water Heater Pipe Wrap	100%*
Advanced Power Strips, Load Sensing	100%
Advanced Power Strips, Motion Sensing	100%

Measure	Percentage Installed and Operating

*PY13 value applied in PY14.

Measure-Specific Gross Savings

Using the engineering algorithms outlined in the Efficient Products evaluation plan, the Cadmus team's engineers estimated savings for each program measure. Summaries of the gross energy savings determined for each measure follow, along with algorithms and inputs used.

Electric Water Heaters

We estimated per-unit electric savings for water heaters using the following algorithm:

$$\boldsymbol{Energy\ Savings\ (kWh/Year)} = \left(\frac{\mathbf{1}}{\boldsymbol{EFbase}} - \frac{\mathbf{1}}{\boldsymbol{EFeff}}\right) \times (\boldsymbol{HWT} - \boldsymbol{CWT}) \times \boldsymbol{Den} \times \boldsymbol{GPD} \times \mathbf{365} \times \boldsymbol{C_p} \times \frac{\mathbf{1}}{\mathbf{3413}}$$

Table 19. Electric Water Heaters PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
EFbase	0.90	Federal minimum standard
EFeff	0.94	PY14 Efficient Products Database - Average EF[1]
HWT	135	Ameren Missouri 2012 TRM
CWT	61.3	Ameren Missouri 2012 TRM
GPD	64	Secondary Source [2]
C_P	1	Specific Heat of Water (Btu/lb-oF)
Den	8.33	Density of water (lb/gallon)
Days	365	Conversion Factor (day/yr)
3413	3,413	Conversion Factor (Btu/kWh)

[1] Value updated from PY13.

[2] DOE Federal Energy Management Program Energy Cost Calculator http://www1.eere.energy.gov/femp/technologies/eep_waterheaters_calc.html

Using this engineering algorithm, the Cadmus team determined an *ex post* energy savings value of 175 kWh/year for each installed and retained electric water heater. This value represented approximately 111% of the program's *ex ante* value (157 kWh/year), based on Morgan Measure Library (MML) data (Table 20). The difference between *ex ante* and *ex post* savings estimates resulted from the average energy-efficiency rating (EF) of the rebated measures (0.95), whereas the *ex ante* value assumed a value of 0.94.

Table 20. *Ex Ante* and *Ex Post* Comparison for Electric Water Heaters

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
157 kWh/yr	175 kWh/yr	111%

Heat Pump Water Heaters

The Cadmus team estimated per-unit savings for heat pump water heaters using the following algorithm:

$$Energy\ Savings\ (kWh/Year) = \left(\frac{\mathbf{1}}{\boldsymbol{EFbase}} - \frac{\mathbf{1}}{\boldsymbol{EFeff}}\right) \times (\boldsymbol{HWT} - \boldsymbol{CWT}) \times \boldsymbol{Den} \times \boldsymbol{GPD} \times \mathbf{365} \times \boldsymbol{C_p} \times \frac{\mathbf{1}}{\mathbf{3413}} - \boldsymbol{kWhheat} + \boldsymbol{kWhcool}$$

Where:

EFbase = energy factor of baseline water heater

EFeff = energy factor of program-qualified water heaters

HWT = hot water temperature (°F)

CWT = cold water temperature (°F)

GPD = gallons of hot water used per day

C_p = specific heat of water

Den = the water density (lb/gal)

kWhheat = heating interaction due to heat removed from room to heat water

kWhcool = cooling interaction due to heat removed from room to heat water

Table 21. Heat Pump Water Heaters PY14 Savings Assumptions

Term	PY13 Value	PY13 Source
EFbase	0.90	Federal minimum standard
EFeff	2.4	PY14 Efficient Products Database, Average EF[1]
HWT	135	Ameren Missouri 2012 TRM
CWT	61.3	Ameren Missouri 2012 TRM
GPD	64	Secondary Source [2]
kWhheat	Electric Resistance = 1,577 Heat Pump = 779	Ohio Statewide 2012 TRM [3]
kWhcool	180	Ohio Statewide 2012 TRM [3]
C_P	1	Specific Heat of Water (Btu/lb-oF)
Den	8.33	Density of water (lb/gallon)
Days	365	Conversion Factor (day/yr)
3413	3,413	Conversion Factor (Btu/kWh)

[1] Value updated from PY13.

[2] DOE Federal Energy Management Program Energy Cost Calculator.

[3] Interactive effects were adjusted to account for the saturation of electric resistance heat, heat pumps, and central air conditioners in Ameren Missouri's territory, as found by the PY14 Efficient Products survey (11%, 29%, and 91% respectively).

Using this engineering algorithm, we determined an *ex post* energy savings value of 2,682 kWh/year for each installed and retained heat pump hot water heater. This value was approximately 149% of the program's *ex ante* value (1,802 kWh/year), based on MML data (Table 22). The difference between

estimates resulted from addition of heating and cooling interactive effects and higher-than-expected efficiency levels of actual purchases.

The reduced heat loss lead to higher savings (as compared to traditional water heaters), resulting in a reduced need for energy to cool a room, even after accounting for increased heating needs in winter.

Table 22. *Ex Ante* and *Ex Post* Comparison for Heat Pump Water Heaters

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
1,802 kWh/yr	2,682 kWh/yr	149%

Room Air Conditioners

The Cadmus team estimated per-unit savings for RACs using the following algorithm:

$$\textbf{\textit{Energy Savings}}\ (\textbf{\textit{kWh/Year}}) = \frac{\frac{\textbf{\textit{BTU}}}{\textbf{\textit{hr}}} \times \left(\frac{1}{\textbf{\textit{EER}}_{\textbf{\textit{BASE}}}} - \frac{1}{\textbf{\textit{EER}}_{\textbf{\textit{EFF}}}}\right) \times \textbf{\textit{EFLH}}_{\textbf{\textit{COOL}}}}{1{,}000}$$

Where:

Btu/hr = the RAC's cooling capacity (Btu/hour)

EER_{BASE} = the baseline energy-efficiency ratio (Btu/W-hour)

EER_{EFF} = the energy-efficiency ratio (Btu/W-hour)

$EFLH_{COOL}$ = the cooling equivalent full-load hours (hour)

1,000 = the conversion factor between Wh and kWh (Wh/kWh)

Table 23. Room Air Conditioner PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
Btu/hr	9,558	PY13 Efficient Products Program Database, Average Btu/hr
EER_{BASE}	9.8	Federal minimum efficiency standard
EER_{EFF}	10.7	PY13 Efficient Products Program Database, Average EER
$EFLH_{COOL}$ – primary unit[1]	860	PY13 CoolSavers Program Data
$EFLH_{COOL}$ – secondary unit[1]	556	Secondary Source[2]
1,000	1,000	Conversion Factor (Wh/kWh)

[1] A weighted average for $EFLH_{COOL}$ for primary and secondary sources was used, based on PY14 survey responses; 84% of respondents reported using their RAC as a secondary cooling source.

[2] Based on weather-adjusted metering data from California. Report available here: Cadmus. *Residential Retrofit High Impact Measure Evaluation Report: Evaluation of PGE2000, SDGE3024, & SCE2501 Room Air Conditioners (2006-2008*). 2010. http://www2.epa.gov/sites/production/files/documents/CA_PUC_Assessment.pdf

Using this engineering algorithm, we determined an *ex post* energy savings value of 50 kWh/year for each installed and retained RAC. This value was approximately 43% of the program's *ex ante* value (115 kWh/year), based on PY10 evaluated savings (Table 24).

Table 24. *Ex Ante* and *Ex Post* Comparison for RACs

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
115 kWh/yr	50 kWh/yr	43%

The difference between estimates primarily resulted from the difference in effective full-load hours (EFLH)—with a higher assumed value in *ex ante* calculations, which relied on the ENERGY STAR calculator. The ENERGY STAR calculator assumes: a RAC was used as the primary cooling source in the home; and it would be used similarly to a central air conditioner, whereas the PY13 Efficient Products participant survey determined 84% of respondents used their RACs as secondary cooling sources. The PY13 evaluation determined a weather-adjusted EFLH for secondary units, as shown in Table 25, which lists the CPUC study EFLH, the weather adjustment factor for conversion to an Ameren Missouri-specific value, and the resulting Ameren Missouri-specific EFLH value.

Table 25. Weather-Adjusted EFLH Value for Ameren Missouri

Source Study	Metered Sites	CA Climate Zone 9 CDD	Ameren Missouri CDD	Adjustment Factor	CA Climate Zone 9 EFLH	Adjusted EFLH for Ameren Missouri
2009 CPUC	102 RACs	1,456	1,550	106%	522	556

ENERGY STAR Air Cleaner

The Cadmus team estimated per-unit ENERGY STAR Air Cleaner savings using the following ENERGY STAR calculator algorithm:

$$Energy\ Savings\ \left(\frac{kWh}{Year}\right) = \left\{CADR\left(\left(\frac{1}{Eff_{BL}}\right) - \left(\frac{1}{Eff_{ES}}\right)\right) \times (Hr_{oper}) + (SB_{BL} - SB_{ES}) \times (24 - Hr_{oper})\right\} \times \frac{365}{1{,}000}$$

Where:

Eff_{ES}	=	CADR/Watt for ENERGY STAR unit
Eff_{BL}	=	CADR/Watt for baseline unit
SB_{EW}	=	Standby for ENERGY STAR unit
SB_{BL}	=	Standby for baseline unit
CADR	=	Clean air recovery rate for dust
Hr_{oper}	=	Hours per day of operation

Table 26. ENERGY STAR Air Cleaner PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
Eff_{ES}	3.53	PY14 Efficient Products Database
Eff_{BL}	1.00	ENERGY STAR Appliance Calculator
SB_{EW}	0.314	ENERGY STAR Appliance Calculator
SB_{BL}	1.00	ENERGY STAR Appliance Calculator
CADR	158.21	PY14 Efficient Products Database
Hr_{oper}	16	ENERGY STAR Appliance Calculator

Using this engineering algorithm, we estimated a per-unit savings value of 664 kWh/year for each ENERGY STAR Air Cleaner (shown in Table 27). This value was approximately 138% of the 2012 TRM estimate (482 kWh/year), based on an older version of the ENERGY STAR calculator algorithm (which has since been updated). The difference between 2012 TRM and estimated savings estimates primarily resulted from a higher clean-air delivery rate for dust, which was 123.5 when the 2012 TRM was developed, compared with 158.2 in the program data.

Table 27. *Ex Ante* and *Ex Post* Comparison for ENERGY STAR Air Cleaners

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
482 kWh/yr	664 kWh/yr	138%

ENERGY STAR Hot & Cold Storage Tank Water Coolers

The Cadmus team estimated per-unit ENERGY STAR hot and cold storage tank water cooler savings using the following ENERGY STAR calculator algorithm:

$$\boldsymbol{Energy\ Savings}\left(\frac{\boldsymbol{kWh}}{\boldsymbol{Year}}\right) = (\boldsymbol{DEU_{BL}} - \boldsymbol{DEU_{ES}}) \times \mathbf{365}$$

Where:

DEU_{BL} = Daily energy use (kWh/day) for baseline

DEU_{ES} = Daily energy use (kWh/day) for ENERGY STAR

Table 28. ENERGY STAR Hot & Cold Storage Tank Water Cooler PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
DEU_{BL}	1.09	Baseline value established by ENERGY STAR Program
DEU_{ES}	0.78	PY14 Efficient Products Database

Using this engineering algorithm, we estimated a per-unit savings value of 111 kWh/year for each ENERGY STAR water cooler. This value was approximately 31% of the 2012 TRM estimate (361 kWh/year), based on an older version of the ENERGY STAR calculator algorithm (which has since been updated), as shown in Table 29. The difference between 2012 TRM and estimated savings estimates primarily resulted from a lower daily energy use baseline (i.e., water coolers have become much more efficient) and the new ENERGY STAR specification level effective in February 2014. The 2012 TRM

estimate was based on a much higher difference between baseline and ENERGY STAR specification DEU values.

Table 29. *Ex Ante* and *Ex Post* Comparison for ENERGY STAR Water Coolers

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
361 kWh/yr	111 kWh/yr	31%

ENERGY STAR Dual Speed Pool Pumps

The Cadmus team estimated per-unit dual speed pool pump savings using the following algorithm:

$$\boldsymbol{Energy\ Savings}\left(\frac{\boldsymbol{kWh}}{\boldsymbol{Year}}\right) = \boldsymbol{Days}_{\boldsymbol{oper}} \times \left\{\left(\frac{\boldsymbol{kWh}_{\boldsymbol{ss}}}{\boldsymbol{Day}}\right) - \left(\frac{\boldsymbol{kWh}_{\boldsymbol{ds}}}{\boldsymbol{Day}}\right)\right\}$$

Where:

$$\left(\frac{kWh_{ds}}{Day}\right) = \left(\frac{kWh_{hs}}{Day}\right) + \left(\frac{kWh_{ls}}{Day}\right)$$

And:

$$\left(\frac{\boldsymbol{kWh}_{\boldsymbol{ss}}}{\boldsymbol{Day}}\right) = \frac{(\boldsymbol{RT}_{\boldsymbol{ss}} \times \boldsymbol{GPM}_{\boldsymbol{ss}} \times \mathbf{60})}{(\boldsymbol{EF}_{\boldsymbol{ss}} \times \mathbf{1,000})}$$

And:

$$\left(\frac{\boldsymbol{kWh}_{\boldsymbol{hs}}}{\boldsymbol{Day}}\right) = \frac{(\boldsymbol{RT}_{\boldsymbol{hs}} \times \boldsymbol{GPM}_{\boldsymbol{hs}} \times \mathbf{60})}{(\boldsymbol{EF}_{\boldsymbol{hs}} \times \mathbf{1,000})}$$

And:

$$\left(\frac{\boldsymbol{kWh}_{\boldsymbol{ls}}}{\boldsymbol{Day}}\right) = \frac{(\boldsymbol{RT}_{\boldsymbol{ls}} \times \boldsymbol{GPM}_{\boldsymbol{ls}} \times \mathbf{60})}{(\boldsymbol{EF}_{\boldsymbol{ls}} \times \mathbf{1,000})}$$

And where:

$Days_{oper}$	=	Days/year of operation
RT_{ss}	=	Runtime in hours/day using single-speed pump
RT_{ls}	=	Runtime in hours/day in low speed using dual-speed pump
RT_{hs}	=	Runtime in hours/day in high speed using dual-speed pump
GPM_{ss}	=	Gallons per minute using single-speed pump
GPM_{ls}	=	Gallons per minute in low speed using dual-speed pump
GPM_{hs}	=	Gallons per minute in high speed using dual-speed pump
EF_{ss}	=	Energy factor using single-speed pump
EF_{ls}	=	Energy factor in low speed using dual-speed pump

EF_{hs} = Energy factor in high speed using dual-speed pump

Table 30. ENERGY STAR Dual Speed Pool Pump PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
$Days_{oper}$	121.6	ENERGY STAR Pool Pump Calculator adjusted for dual speed in Missouri.
RT_{ss}	11.4	
RT_{ls}	9.8	
RT_{hs}	2.0	
GPM_{ss}	64.4	
GPM_{ls}	31.0	
GPM_{hs}	56.0	
EF_{ss}	2.1	
EF_{ls}	5.4	
EF_{hs}	2.4	

Using this engineering algorithm, we estimated a per-unit saving value of 1,810 kWh/year for dual-speed pool pumps (shown in Table 31). This value was approximately 167% of the 2012 TRM's per unit savings (1,081 kWh/year), based on motor efficiency, load factor, and horsepower and not using the ENERGY STAR calculation methodology to estimate savings.

Table 31. *Ex Ante* and *Ex Post* Comparison for ENERGY STAR Dual Speed Pool Pumps

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
1,081 kWh/yr	1,810 kWh/yr	167%

ENERGY STAR Variable Speed Pool Pumps

The Cadmus team estimated per-unit variable speed pool pump savings using the following algorithm:

$$\boldsymbol{Energy\ Savings}\left(\frac{\boldsymbol{kWh}}{\boldsymbol{Year}}\right) = \boldsymbol{Days_{oper}} \times \left\{\left(\frac{\boldsymbol{kWh_{ss}}}{\boldsymbol{Day}}\right) - \left(\frac{\boldsymbol{kWh_{vs}}}{\boldsymbol{Day}}\right)\right\}$$

Where:

$$\left(\frac{kWh_{vs}}{Day}\right) = \left(\frac{kWh_{hs}}{Day}\right) + \left(\frac{kWh_{ls}}{Day}\right)$$

And:

$$\left(\frac{\boldsymbol{kWh_{ss}}}{\boldsymbol{Day}}\right) = \frac{(\boldsymbol{RT_{ss}} \times \boldsymbol{GPM_{ss}} \times \mathbf{60})}{(\boldsymbol{EF_{ss}} \times \mathbf{1{,}000})}$$

And:

$$\left(\frac{\boldsymbol{kWh_{hs}}}{\boldsymbol{Day}}\right) = \frac{(\boldsymbol{RT_{hs}} \times \boldsymbol{GPM_{hs}} \times \mathbf{60})}{(\boldsymbol{EF_{hs}} \times \mathbf{1{,}000})}$$

And:

$$\left(\frac{kWh_{ls}}{Day}\right) = \frac{(RT_{ls} \times GPM_{ls} \times 60)}{(EF_{ls} \times 1,000)}$$

And where:

$Days_{oper}$ = Days/year of operation

RT_{ss} = Runtime in hours/day using single-speed pump

RT_{ls} = Runtime in hours/day in low speed using variable-speed pump

RT_{hs} = Runtime in hours/day in high speed using variable-speed pump

GPM_{ss} = Gallons per minute using single-speed pump

GPM_{ls} = Gallons per minute in low speed using variable-speed pump

GPM_{hs} = Gallons per minute in high speed using variable-speed pump

EF_{ss} = Energy factor using single-speed pump

EF_{ls} = Energy factor in low speed using variable-speed pump

EF_{hs} = Energy factor in high speed using variable-speed pump

Table 32. ENERGY STAR Variable Speed Pool Pump PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
$Days_{oper}$	121.6	ENERGY STAR Pool Pump Calculator (version last updated 12-13) adjusted for variable speed in Missouri.
RT_{ss}	11.4	
RT_{ls}	10.0	
RT_{hs}	2.0	
GPM_{ss}	64.4	
GPM_{ls}	30.6	
GPM_{hs}	50.0	
EF_{ss}	2.1	
EF_{ls}	7.3	
EF_{hs}	3.8	

Using this engineering algorithm, we estimated a per-unit saving value of 2,061 kWh/year for variable speed pool pumps (shown in Table 33). This value was approximately 134% of the 2012 TRM's per-unit savings (1,542 kWh/year), based on motor efficiency, load factor, and horsepower and not using the ENERGY STAR calculator to estimate savings.

Table 33. *Ex Ante* and *Ex Post* Comparison for ENERGY STAR Variable Speed Poop Pumps

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
1,542 kWh/yr	2,061 kWh/yr	134%

Programmable Thermostats

The Cadmus team did not evaluate this measure in PY14, as the program did not offer it. Instead, we used PY13 evaluated savings, estimated using the PY13 Efficient Products participant survey data with the Ameren Missouri 2012 TRM savings algorithm and assumptions.

To calculate programmable thermostat savings, we weighted the savings values from the MML database to the reported program building stock, and then applied an adjustment factor to account for changes in participant behavior. We used the following resources
and inputs:

- MML database to obtain home type, HVAC system type, home vintage, and building type.
- Participant survey data to obtain heating and cooling system saturations.
- Participant survey data to obtain behavioral data:
  - Use of previous thermostat (whether manual or programmable)
  - Use of Ameren Missouri-rebated replacement thermostat (including Nest thermostats)

Using weighted MML savings values—modified with a thermostat use factor derived from participant behavioral data—we determined the per-unit thermostat savings using the following algorithm:

We determined per-unit thermostat savings using the following algorithm:

$$\boldsymbol{Energy\ Savings}\left(\frac{\boldsymbol{kWh}}{\boldsymbol{Year}}\right) = \boldsymbol{MML\ kWh\ X\ Thermostat\ use\ factor}$$

Where:

- MML kWh = MML kWh savings weighted by program-specific housing characteristics
- Thermostat use factor = Program-specific behavioral adjustment (%)

For our PY13 calculation of the thermostat use factor, we asked survey respondents how they used their new programmable thermostat (including participants who purchased Nest thermostats). Then, to determine if their behavior changed after the new thermostat was installed, we asked about their use of their previous thermostat. Our survey results showed a large percent (72%) of PY13 respondents had been using their previous thermostat in a way that saved energy, and that that 93% of PY13 respondents used their new thermostat in a manner that would save energy. The high percentage of PY13 participants who were already using a thermostat in a manner that would save energy resulted in low net value of 21%. Table 34 presents the MML kWh, the thermostat use factor, and the *ex post* per-unit kWh for programmable thermostats.

Table 34. Programmable Thermostat Savings

Program	MML kWh	Thermostat Use Factor	*Ex Post* kWh
Efficient Products	502.0	21%	105.4

We determined an *ex post* energy savings value of 105 kWh/year for each installed and retained programmable thermostat. As shown in Table 35, this value was approximately 19% of the program's *ex ante* value (543 kWh/year). The main differences between the *ex ante* and *ex post* savings resulted from the program-specific adjustments made for heating and cooling equipment saturations and the thermostat use factor of 21%.

Table 35. *Ex Ante* and *Ex Post* Comparison for Programmable Thermostats

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
543 kWh/yr	105.4 kWh/yr	19%

CFLs and LEDs

The Cadmus team estimated per-unit savings for CFLs and LEDs using the following algorithm:

$$\boldsymbol{Energy\ Savings\ (kWh/Year)} = \frac{(\boldsymbol{WattBASE} - \boldsymbol{WattEE}) \times \boldsymbol{HoursRES} \times \boldsymbol{Days}}{\boldsymbol{1,000}} \times \boldsymbol{WHF}$$

Where:

WattBASE = wattage of the original incandescent bulb replaced by a Home Energy Kit CFL or LED

WattEE = wattage of new bulb installed

HoursRES = the average hours of use per day

Days = days used per year

1,000 = the conversion factor between Wh and kWh (Wh/kWh)

WHF = Waste heat factor to account for interactive effects

Table 36. CFL PY14 Savings Assumptions

Term	PY14 Value		PY14 Source
	CFL	LED	
WattBASE	53.8	45.4	PY14 Lighting Evaluation shelf-stocking study[1]
WattEE	13	10	Program Data – kits contain 13 Watt CFLs and 10 Watt LEDs
Hours	2.2		PY14 Lighting and Appliance Evaluation[1]
Days	365		Conversion Factor (day/yr)
1,000	1,000		Conversion Factor (Wh/kWh)
WHF	0.98		PY13 Engineering Simulation Modeling adjusted for heating and cooling saturations[2]

[1] Value updated from PY13. See the PY14 Lighting evaluation for more details regarding the metering study.

[2] See the PY13 evaluation report for more details.

Using this engineering algorithm, we determined an *ex post* energy savings value of 32 kWh/year for each installed and retained CFL, and 28 kWh/year for LEDs. These values were approximately 102% and 88%, respectively, of the program's *ex ante* values (31.5 kWh/year), based on the MML. The difference

between estimates primarily resulted from lower hours of use found during the PY14 Lighting Evaluation than those assumed by MML as well as differences baseline kWh/year values.

Table 37. *Ex Ante* and *Ex Post* Comparison for Kit CFLs and LEDs

Lighting Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
CFLs	31.5 kWh/yr	32 kWh/yr	102%
LEDs	31.5 kWh/yr	28 kWh/yr	88%

Advanced Power Strips

The Cadmus team used a PY13 evaluated per-unit savings to estimate savings for advanced power strips, based on secondary research.[6] Using these estimates, we calculated the *ex ante* and *ex post* per-unit savings for the different types of advanced power strips sold through the program in various home locations (Table 38).

Table 38. *Ex Ante* and *Ex Post* Comparison for Advanced Power Strips

Lighting Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
Home Office—Load sensing	184 kWh/yr	31 kWh/yr	17%
Home Entertainment—Load sensing		75 kWh/yr	41%
Home Office—Motion sensing	N/A	34 kWh/yr	N/A
Home Entertainment—Motion sensing	N/A	82 kWh/yr	N/A

To determine final per-unit savings values for load-sensing advanced power strips provided through the kit, we adjusted *ex post* savings based on the saturation levels of peripheral device use, as determined through PY14 Home Energy Kit participant surveys. Responses to our surveys revealed saturation levels differed by delivery channel (Table 39).

Table 39. Adjusted *Ex Post* Values Considering Peripheral Device Saturation

Delivery Channel and APS Type	Home Office Saturation	Entertainment Center Saturation	Adjusted *Ex Post* Savings/unit
Home Energy Kit: Load sensing[1]	48%	52%	54 kWh/yr
Online Store: Load sensing[2]	36%	64%	59 kWh/yr
Online Store: Motion sensing[2]	36%	64%	64 kWh/yr

[1] Source: PY14 Home Energy Kit participant survey.

[2] Source: PY13 PerformanceSavers participant survey.

[6] A detailed overview of NYSERDA algorithms used and differences in assumptions between the NYSERDA report and the Ameren TRM are contained in the PY13 Final RebateSavers Evaluation.

Faucet Aerators

The Cadmus team estimated per-unit savings for faucet aerators using the following algorithm:

$$\textbf{Energy Savings}\ (\textbf{kWh/Year}) = \frac{\textbf{People} \times \textbf{Faucet Time} \times \textbf{Days} \times \Delta\textbf{GPM} \times (T_{FAUCET} - T_{IN}) \times C_P \times \textbf{Den}}{3413 \times \textbf{RE} \times \textbf{Number of Faucets}}$$

Where:

People = the number of people using faucet aerators (people/household)

Faucet Time = the average length of faucet use per day (min/day)

Days = the number of days per year (day/yr)

ΔGPM = the difference in rated gallons per minute between the base unit and the new unit (gal/min)

T_{FAUCET} = the average water temperature out of the faucet (°F)

T_{IN} = the average inlet water temperature (°F)

C_P = the specific water heat (Btu/lb-°F)

Den = the water density (lb/gal)

ΔTemp = the temperature at the tap minus the temperature at the water main

RE = the water heater's recovery efficiency

Number of Faucets = the number of used faucets per home

Although the engineering algorithm was the same for faucet aerators delivered to single-family homes and those installed in multifamily properties, several assumptions differed.

Table 40. Faucet Aerator PY14 Savings Assumptions

Term	PY14 Value: Single-Family	PY14 Source: Single-Family	PY14 Value: Multifamily	PY14 Source: Multifamily
People	2.67	PY14 Energy Kit Participant Survey[1]	2.07	PY14 Community Savers Program Data[1]
Faucet Time	3.7	PY11 MFIQ Metering Study/Person	3.7	PY11 MFIQ Metering Study/Person
Days	365	Conversion Factor (day/yr)	365	Conversion Factor (day/yr)
ΔGPM	0.7	PY13 Program Data	0.7	PY13 Program Data
T_{FAUCET}	80	Ameren Missouri 2012 TRM	80	Ameren Missouri 2012 TRM
T_{IN}	61.3	Ameren Missouri 2012 TRM	61.3	Ameren Missouri 2012 TRM
RE	0.98	Secondary Source[2]	0.98	Secondary Source[2]
CP	1	Specific Heat of Water (Btu/lb-oF)	1	Specific Heat of Water (Btu/lb-oF)

Term	PY14 Value: Single-Family	PY14 Source: Single-Family	PY14 Value: Multifamily	PY14 Source: Multifamily
Den	8.33	Density (lb/gal)	8.33	Density (lb/gal)
3413	3,413	Conversion Factor (Btu/kWh)	3,413	Conversion Factor (Btu/kWh)
Number of faucets	3.04	Secondary Source[3]	2.4	PY13 Program Data

[1] Value updated from PY13.
[2]RE for electric hot water heater. 2010 Ohio Technical Reference Manual. Available at: http://amppartners.org/pdf/TRM_Appendix_E_2011.pdf
[3] Assumes one kitchen faucet per household, plus an average of 2.04 bathrooms per home, as determined by the Ameren Missouri 2012 potential study.

Using this engineering algorithm, we determined the following *ex post* energy savings values:

- 39 kWh/year for each installed and retained aerator delivered to single-family homes (approximately 68% of the program's *ex ante* values).
- 38 kWh/year for multifamily homes (approximately 102% of the program's *ex ante* values).

The difference between *ex post* and *ex ante* estimates primarily resulted from two factors:

- The 2012 TRM assumed an average faucet time of five minutes per day, based on a 1997 report by American Water Works Association Research Foundation. For the evaluated savings assumption, we used metering data from the PY11 Multifamily Income Qualified (MFIQ) program, which found an average faucet use time of 3.7 minutes per day.
- The 2012 TRM assumed 1.9 faucets per home, based on the PY10 MFIQ program site visits. In contrast, the 2012 Ameren Missouri potential study found an average of 2.04 bathrooms and assumed one kitchen faucet (for a total of 3.04 faucets per home) for single-family homes; PY13 data indicated 2.4 faucets per home in multifamily homes.

Table 41 shows *ex ante* and *ex post* savings.

Table 41. *Ex Ante* and *Ex Post* Comparison for Kit Low-Flow Aerators

Home Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
Single-Family	57 kWh/yr	39 kWh/yr	68%
Multifamily	37 kWh/yr	38 kWh/yr	102%

Showerheads

The Cadmus team estimated energy-efficient showerhead savings using the following algorithm:

$$\boldsymbol{Energy\ Savings}\ (\boldsymbol{kWh/Year}) = \frac{\boldsymbol{People} \times \boldsymbol{Shower\ Time} \times \boldsymbol{Days} \times \%\boldsymbol{Days} \times \Delta\boldsymbol{GPM} \times (\boldsymbol{T_{SHOWER}} - \boldsymbol{T_{IN}}) \times \boldsymbol{C_P} \times \boldsymbol{Den}}{\boldsymbol{3,413} \times \boldsymbol{RE} \times \boldsymbol{Showerheads}}$$

Where:

People = the number of people taking showers (ppl/household)

Shower Time = the average shower length (min/shower)

Days = the number of days per year (day/yr)

%Days = the number of showers per day, per person (shower/day-ppl)

ΔGPM = the difference in rated gallons per minute for the base showerhead and the new showerhead (gal/min)

T_{SHOWER} = the average water temperature at the showerhead (^{o}F)

T_{IN} = the average inlet water temperature (^{o}F)

C_P = the specific heat of water (Btu/lb-^{o}F)

Den = the water density (lb/gal)

3,413 = the conversion rate between Btu and kWh (Btu/kWh)

RE = the water heater's recovery efficiency

Showerheads = the number of showerheads used per home

Although the engineering algorithm was the same for showerheads delivered to single-family homes and those installed in multifamily properties, several assumptions differed. Table 42 contains the assumptions for both home types.

Table 42. Showerhead PY14 Savings Assumptions

Term	PY14 Value: Single-Family	PY14 Source: Single-Family	PY14 Value: Multifamily	PY14 Source: Multifamily
People	2.67	PY14 Energy Kit Participant Survey[1]	2.07	PY14 CommunitySavers Program Data[1]
ShowerTime	8.66	Secondary Source[2]	8.66	Secondary Source[2]
Days	365	Conversion Factor (day/yr)	365	Conversion Factor (day/yr)
%Days	0.66	Secondary Source[3]	0.66	Secondary Source[3]
ΔGPM	0.75	PY14 Program Data	0.75	PY14 Program Data
T_{SHOWER}	105	Secondary Source[4]	105	Secondary Source[4]
T_{IN}	61.3	Ameren Missouri 2012 TRM	61.3	Ameren Missouri 2012 TRM
RE	0.98	Secondary Source[5]	0.98	Secondary Source[5]
C_P	1	Specific Heat of Water (Btu/lb-°F)	1	Specific Heat of Water (Btu/lb-°F)
Den	8.33	Density (lb/gal)	8.33	Density (lb/gal)
3,413	3,413	Conversion Factor (Btu/kWh)	3,413	Conversion Factor (Btu/kWh)
Showerheads	2.05	PY13 Program Data	1.4	PY13 Program Data

[1] Value updated from PY13.

[2] DeOreo, William, P. Mayer, L. Martien, M. Hayden, A. Funk, M. Kramer-Duffield, and R. Davis (2011). "California Single-Family Water Use Efficiency Study." *Sponsored by*: California Department of Water Resources. pp. 90-91. http://www.aquacraft.com/sites/default/files/pub/DeOreo-%282011%29-California-Single-Family-Water-Use-Efficiency-Study.pdf.

[3] DeOreo, Op cit. %Days are calculated by the number of showers per day per household (1.96, pp. 90 of the DeOreo study) divided by the average number of people per household (2.95, pp. 182 of the DeOreo study).

[4] The Bonneville Power Administration measured average shower temperatures as 104–106.

[5] RE for electric hot water heater. 2010 Ohio Technical Reference Manual. Available at: http://amppartners.org/pdf/TRM_Appendix_E_2011.pdf

Using this engineering algorithm, we determined the following *ex post* energy savings values for each installed and retained showerhead:

- 222 kWh/year for single-family homes (approximately 61% of the program's *ex ante* values).
- 252 kWh/year for multifamily homes (approximately 124% of the program's *ex ante* values).

Table 45 shows *ex ante* and *ex post* savings. The difference between the estimates for single-family homes primarily resulted from the following two factors:

- The 2012 TRM assumed one shower per person per day (%Days in the algorithm). The study we used, however, indicated 0.66 showers per person per day.[7]
- The 2012 TRM assumed one showerhead per home. However, primary data collected in PY13 found single-family homes receiving the kits had an average of 2.05 showerheads per home, whereas multifamily homes had an average of 1.4 showerheads.

Table 43. *Ex Ante* and *Ex Post* Comparison for Kit Low-Flow Showerheads

Home Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
Single-family	361 kWh/yr	222 kWh/yr	61%
Multifamily	204 kWh/yr	252 kWh/yr	124%

Water Heater Pipe Wrap

The Cadmus team estimated per-unit savings from pipe wrap using the following algorithm:

$$\textbf{Energy Savings (kWh/Year)} = \frac{\left(\left(\frac{1}{R_{EXIST}} - \frac{1}{R_{NEW}}\right) \times L \times C \times \Delta T \times 8{,}760\right)}{RE \times 3413}$$

Where:

R_{EXIST} = pipe heat loss coefficient of uninsulated pipe (existing) (Btu/hr-°F-ft) = 1.0

R_{NEW} = pipe heat loss coefficient of insulated pipe (new) (Btu/hr-°F-ft)

L = length of pipe from a water heating source covered by pipe wrap (ft)

C = circumference of pipe (ft); (Diameter (in) * π * 0.083)

ΔT = average temperature difference between supplied water (hot water) and ambient air temperatures (°F)

8,760 = the number of hours during which heat loss occurs throughout the year (hr/yr)

RE= recovery efficiency of the electric hot water heater

3,413 = the conversion rate between Btu and kWh (Btu/kWh)

Although the engineering algorithm was the same for pipe wrap delivered to single-family homes and pipe wrap installed in multifamily properties, multifamily used a shorter length of pipe wrap for multifamily homes, resulting in a lower *ex post* savings value.

Table 44 shows the difference in the two assumptions.

[7] DeOreo, William, P. Mayer, L. Martien, M. Hayden, A. Funk, M. Kramer-Duffield, and R. Davis (2011). "California Single-Family Water Use Efficiency Study." *Sponsored by*: California Department of Water Resources. pp. 90-91. http://www.aquacraft.com/sites/default/files/pub/DeOreo-%282011%29-California-Single-Family-Water-Use-Efficiency-Study.pdf.

Table 44. Pipe Wrap PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
R_{EXIST}	1	Secondary Source[1]
R_{NEW}	4	PY14 Program Data
L (in feet)	12 ft – single-family 4 ft - multifamily	PY13 & PY14 Program Data[2]
C	0.196	Calculated (assumed ¾" D)[3]
ΔT	67.5 – single-family 58.9 – multifamily	Secondary Source; Ameren Missouri 2012 TRM[4] Secondary Source; PY11MFIQ site-visits[5]
8,760	8,760	Constant (Hours per year)
RE	0.98	Secondary Source[6]
3,413	3,413	Conversion Factor (Btu/kWh)

[1] Navigant Consulting Inc. "Measures and Assumptions for Demand Side Management Planning; Appendix C Substantiation Sheets." April 2009. Pg. 77.
[2] Value updated from PY13.
[3] 3/4" is standard pipe diameter.
[4] Ambient air temperature is 67.5 degrees based on: Department of Energy: Test Procedure for Water Heaters. May 11, 1998. http://www.gpo.gov/fdsys/pkg/FR-1998-05-11/pdf/98-12296.pdf. Hot water temperature is 135 degrees according to Ameren Missouri 2012 TRM.
[5] Ambient air temperature is 67.5 degrees based on DoE Test procedure. Hot water temperature of 126.4 based on site visits.
[6] RE for electric hot water heater. 2010 Ohio Technical Reference Manual. Available at: http://amppartners.org/pdf/TRM_Appendix_E_2011.pdf

Using this engineering algorithm, we determined the following *ex post* energy savings values for installed pipe wrap:

- 312 kWh/year in single-family homes (approximately 121% of the program's *ex ante* value).
- 91 kWh/year in multifamily homes (approximately 324% of the program's *ex ante* value).

Table 45 shows *ex ante* and *ex post* savings. The difference between *ex ante* and *ex post* savings estimates for multifamily homes primarily resulted from the shorter average pipe length wrap installed (4 feet).

Table 45. *Ex Ante* and *Ex Post* Comparison for Pipe Wrap

Home Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
Single-family	257 kWh/yr	364 kWh/yr	121%
Multifamily	28 kWh/yr	91 kWh/yr	324%

Summary

Table 46 lists per-unit *ex ante* and *ex post* gross savings by measure.

Table 46. PY14 Summary: Comparison of *Ex Ante and Ex Post* Per-Unit Gross Savings

Measure	*Ex Ante* (kWh/yr)	*Ex Post* (kWh/yr)	Realization Rate
Equipment Rebates			
Electric Water Heaters	157	175	111%
Heat Pump Water Heaters	1,802	2,682	149%
RACs	115	50	43%
Programmable Thermostats	543	105	19%
Variable-speed Pool Pumps	1,542	2,061	134%
Air Purifier	482	664	138%
Water Coolers	361	111	31%
Kit Measures—Single-Family			
CFLs	32	32	102%
LEDs	32	28	88%
Advanced Power Strips—Load Sensing	184	54	29%
Faucet Aerators	57	39	68%
Showerheads	361	222	61%
Water Heater Pipe Wrap	257	312	121%
Kit Measures—Multifamily			
CFLs	32	32	102%
LEDs	32	28	88%
Advanced Power Strips—Load Sensing	184	54	29%
Faucet Aerators	37	38	102%
Showerheads	204	252	124%
Water Heater Pipe Wrap	28	91	324%
Upstream Discounts—Online Store			
Advanced Power Strips—Load Sensing	184	59	32%
Advanced Power Strips—Motion Sensing	184	64	35%

To estimate the program's total gross energy savings, we applied the per-unit values shown in Table 47 to the Efficient Products' PY14 participation rates, as shown in Table 47.

Table 47. PY14 Summary: *Ex Post* Program Gross Savings Accounting for Installation Rates

Measure	PY14 Participation	Per-Unit *Ex Post* Savings (kWh/hr)	Percent Installed and Operating	Total *Ex Post* Savings (kWh/yr)
Equipment Rebates				
Electric Water Heaters	212	175	100%	37,051
Heat Pump Water Heaters	371	2,682	100%	995,181
RACs	372	50	100%	18,452
Programmable Thermostats	1,464	105	99%	152,792
Variable-speed Pool Pumps	52	2,061	100%	107,173
Air Purifier	392	664	100%	260,333
Water Coolers	23	111	100%	2,550
Kit Measures—Single-Family				
CFLs	48,932	32	75%	1,173,591
LEDs	10,837	28	92%	276,846
Advanced Power Strips—Load Sensing	3,782	54	78%	159,842
Faucet Aerators	16,688	39	52%	334,910
Low-Flow Showerheads	8,998	222	47%	939,162
Water Heater Pipe Wrap	7,690	312	41%	973,166
Kit Measures—Multifamily				
CFLs	8,488	32	98%	267,075
LEDs	4,220	28	98%	115,208
Advanced Power Strips—Load Sensing	4	54	78%	169
Faucet Aerators	4,228	38	100%	160,550
Low-Flow Showerheads	2,114	252	86%	457,747
Water Heater Pipe Wrap	2,114	91	100%	191,752
Upstream Discounts—Online Store				
Advanced Power Strips—Load Sensing	1,196	59	100%	70,774
Advanced Power Strips—Motion Sensing	47	64	100%	3,010
Total	**122,226**	**n/a**	**87%**	**6,697,335**

*Kit measure installation rates varied, depending on where they were mailed or installed directly. Final *ex post* savings were weighted according to the proportion of kits delivered through each method.

Table 48 compares the program's *ex ante* and *ex post* gross savings. Appendix A provides *ex post* demand savings, determined through DSMore using these *ex post* energy savings.

Table 48. PY14 Summary: Comparison of *Ex Ante and Ex Post* Program Gross Savings

Measure	*Ex Ante* (kWh/yr)	*Ex Post* (kWh/yr)	Realization Rate
Equipment Rebates			
Electric Water Heaters	33,284	37,051	111%
Heat Pump Water Heaters	668,542	995,181	149%
RACs	42,780	18,452	43%
Programmable Thermostats	794,952	152,792	19%
Variable-speed Pool Pumps	80,201	107,173	134%
Air Purifier	188,942	260,333	138%
Water Coolers	8,311	2,550	31%
Kit Measures—Single-family			
CFLs	1,541,363	1,173,591	102%
LEDs	341,377	276,846	88%
Advanced Power Strips, Load Sensing	695,969	159,842	29%
Faucet Aerators	951,243	334,910	68%
Low-Flow Showerheads	3,248,399	939,162	61%
Water Heater Pipe Wrap	1,976,365	973,166	121%
Kit Measures—Multifamily			
CFLs	267,372	267,075	102%
LEDs	132,930	115,208	88%
Advanced Power Strips, load Sensing	736	169	29%
Faucet Aerators	157,282	160,550	102%
Low-Flow Showerheads	430,622	457,747	124%
Water Heater Pipe Wrap	59,192	191,752	324%
Upstream Discounts—Online Store			
Advanced Power Strips, Load Sensing	220,123	70,774	32%
Advanced Power Strips, Motion Sensing	8,589	3,010	35%
Total	**11,848,574**	**6,697,335**	**57%**

Net Impact Evaluation Results

Free ridership is the percentage of savings that would have occurred in the program's absence due to participants purchasing the same measures without the program's influence. Thus free riders are customers who would have purchased the measure independently of the program, and, because they account for some program costs but none of its benefits, they decrease a program's net savings. The Cadmus team estimated free ridership based on Efficient Products survey responses to a battery of questions regarding customer purchasing decisions.

To calculate the Efficient Products Program's NTG, the Cadmus team used the following formula:

$$NTG = 1 - Freeridership + Participant\ Spillover + Nonparticipant\ Spillover + Market\ Effects$$

Spillover is the savings that occur when customers undertake installation of additional energy-efficiency measures or perform energy-efficient activities without receiving financial assistance due to their experience participating in a given program. Unlike free ridership, no program costs are associated with spillover savings, but energy-saving benefits do occur, which increase net savings.

Similarly to free ridership, the Cadmus team estimated spillover using a battery of survey questions that determined whether respondents' energy-efficient actions were: (1) influenced by participation in the Efficient Products program; and (2) not incentivized through another Ameren Missouri program. (Due to time and resource constraints, we did not estimate market effects for the Efficient Products program.)

This section describes the Cadmus team's methodology for calculating net savings by measure.

Table 49 summarizes the program's net impacts.

Table 49. PY14 Net Impact Results Summary

``	*Ex Post* Gross Savings (kWh/yr)	Free ridership	Participant Spillover	Non-participant Spillover	NTG	Net Savings (kWh/yr)
Equipment Rebates						
Electric Water Heaters	37,051	60.2%	3.1%	0.7%	43.6%	16,154
Heat Pump Water Heaters	995,181	18.7%			85.1%	846,899
RACs	18,452	58.2%			45.6%	8,414
Programmable Thermostats	152,792	56.0%			47.8%	73,034
Variable-speed Pool Pumps	107,173	0.0%			103.8%	111,245
Air Purifier	260,333	0.0%			103.8%	270,226
Water Coolers	2,550	0.0%			103.8%	2,647
Subtotal[1]	**1,573,532**	**19.4%**	**3.1%**	**0.7%**	**84.4%**	**1,328,620**
Kit Measures						
CFLs	1,440,666	12.0%	3.4%	0.7%	92.1%	1,326,854
LEDs	392,054	24.1%			80.0%	313,643
Advanced Power Strips	160,011	8.1%			96.0%	153,610
Faucet Aerators	495,460	3.7%			100.4%	497,442
Low-Flow Showerheads	1,396,910	10.6%			93.5%	1,306,110
Water Heater Pipe Wrap	1,164,918	10.7%			93.4%	1,088,034
Subtotal[1]	**5,050,019**	**11.3%**	**3.4%**	**0.7%**	**92.8%**	**4,685,693**
Upstream Discounts—Online Store*						
Advanced Power Strips—Load Sensing	70,774	N/A	N/A	0.7%	100.7%	71,270
Advanced Power Strips—Motion Sensing	3,010	N/A	N/A		100.7%	3,031
Program Total**	**6,697,335**	**13.1%**	N/A	**0.7%**	**90.9%**	**6,088,614**

* Values weighted by total program measure-level savings.

** Free ridership and participant spillover were not assessed for these measures.

Free Ridership Methodology

Equipment Rebate Measures

The Cadmus team determined equipment rebate free ridership via a participant self-report approach, based on a standard battery of questions that define whether the participant did or would do the following:

- Already purchased the product before learning about the incentive;
- Was planning to purchase the same product before learning about the incentive;
- Would have purchased a product that was just as energy efficient without the incentive; or
- Would have purchased the product at the same time as they did when going through the Efficient Products program.

We then applied a free ridership score—ranging from 0% to 100%—to individual participants based on their survey responses. (Appendix B contains a flowchart showing our methodology.)

We used the following process for determining a free ridership score for equipment rebates:

- We categorized customers as 0% free riders in three instances: (1) they had no plans to install the measure in the absence of program's incentives and would not have installed the measure within one year in the program's absence; (2) they had considered installing the measure before learning about the program, but would not have done so without program incentives; or (3) in the absence of program incentives, they would have purchased or installed less-efficient equipment.
- We categorized customers as 100% free riders if they had installed the measure before learning about the program, or if they would have installed the same measure at the same time without the program.
- We assigned a partial free ridership score to customers if, before the program, they decided to install the measure, and the program influenced their decision about the product to purchase or the likely purchase date. For customers highly likely to install an energy-efficient measure right away and for whom the program had less influence over their decisions, we assigned a higher free ridership percentage than customers for whom the program may have been less of an influence or whose purchase would likely have occurred later in the program's absence.
- We cross-checked responses to questions about intentions, efficiency levels, and timing by asking: "To summarize, how important was Ameren Missouri's energy-efficiency promotion on your decision to purchase the [Measure Name]?" and "Please describe in your own words the process that led you to decide to purchase the more energy-efficient option." Based on responses to these questions, we adjusted some free ridership scores, as appropriate (the Results section presents further details).

After translating survey responses into each participant's free ridership score, we calculated an average free ridership estimate for each equipment rebate measure.

Appendix C contains information about the conversion of each raw survey response option into free ridership scoring matrix values and shows the free ridership score combinations and scoring legend we used to categorize customer survey responses.

Kit Measures

For each kit measure that was installed, the Cadmus team assigned a free ridership score based on the respondents' reported intentions to purchase the measure in the absence of the free energy-efficiency kit.

For each kit measure, we asked participants if they would have purchased and installed the item had it not been provided for free (Kits 1, 2, and 3) or for the reduced cost of $4.95 (Kit 4) by Ameren Missouri:

- Respondents who said they would not have purchased a measure within the same year were estimated as 0% free riders.
- Respondents who said they would have purchased the measure within the same year—or did not know when they would have purchased the measure—were estimated as 25% free riders.
- Respondent who said they would have purchased the measure at the same time as they received the kit were estimated as 100% free riders.

Free Ridership Results

As discussed, the Cadmus team's evaluation relied on two data collection methods to assess net savings for equipment rebate measures: a phone survey (n=213, conducted in PY13); and an online survey (n=197, conducted in PY14). We also used a phone survey, conducted in PY14, to assess net savings for kit measures (n=71). The calculated free ridership results for rebated measures (shown in Table 50) combined the results from the rebated equipment phone survey and the rebated equipment online survey, based on the total percentage of savings generated by each channel.

The PY13 phone results for equipment rebate measures showed average free ridership of 18% across all respondents (weighted by measure savings) (n=213), while the PY14 online survey results showed a lower average free ridership rate of 23.5% (compared with 15% in PY13).

Equipment rebate measures had a combined average free ridership rate of 19.4%; kit measures had a free ridership rate of 11.3%.

Table 50 provides preliminary free ridership results by measure and survey group.

Table 50. Efficient Products Free Ridership Results

Program Measure	Phone Sample Size	Phone FR Estimate	Online Sample Size	Online FR Estimate	Total Weighted Free Ridership Estimate
Equipment Rebates					
Electric Water Heater	15	60.0%	29	61.2%	60.2%
Heat Pump Water Heater	38	18.1%	62	20.4%	18.7%
Room Air Conditioner	68	58.5%	24	56.3%	58.2%
Programmable Thermostat	92	56.7%	84	52.4%***	56.0%
Variable-speed Pool Pumps	0	-	1	0.0%	0.0%
Air Purifier	0	-	3	0.0%	0.0%
Water Coolers	0	-	0	0.0%	0.0%
Overall—Equipment Rebates	**213**	**18.4%***	**203**	**23.5%***	**19.4%***
Home Energy Kits					
CFLs	52	12.0%	-	-	12.0%
LEDs	17	24.1%			24.1%
Faucet Aerators	30	3.7%	-	-	3.7%
Low-flow Showerheads	34	10.6%	-	-	10.6%
Advanced Power Strip	40	8.1%	-	-	8.1%
Pipe Wrap	28	10.7%	-	-	10.7%
Overall—Kit Measures	**201****	**11.3%***	-	-	**11.3%***

*Values weighted by total program measure-level savings.

** Total number of individual measures.

*** Using PY13 estimate due to measure being discontinued for PY14, though rebates were still processed.

Free ridership for Home Energy Kit measures was lower than for equipment rebate measures. Equipment rebate measures exhibited the following:

- The results show a wide variation between heat pump water heaters and the other products.
- Heat pump water heaters, the main driver of the overall savings-weighted equipment rebates' free ridership estimate, had the lowest free ridership of 18%.
- Electric water heaters had the highest free ridership of 60%.
- Programmable thermostats had a free ridership rate of 57%.
- Room air conditioners had a free ridership rate of 59%.

While rebates increased for electric water heaters and heat pump water heaters in PY14, the incentive amount relative to the incremental purchase cost remained highest for heat pump water heaters and much lower for other measures. Free ridership rates for the non-heat pump water-heater measures probably resulted in part due to incentive amounts relative to incremental purchase costs of these

measures. Table 51 lists the measure costs, incentive levels, and free ridership scores for equipment rebate measures.

Table 51. Ameren Missouri Measure Costs, Incentive Levels, and Free Ridership Estimates

Measure	Average Cost	Ameren Missouri Rebate	Percentage of Cost Covered by Rebate –		Free Ridership Estimate
			PY13	PY14	
Electric Water Heater	$383	Up to $45	6%	12%	60.2%
Heat Pump Water Heater	$1,018	Up to $500	30%	49%	18.7%
Programmable Thermostat*	$112	Up to $25	27%	22%	56.0%
Room Air Conditioner	$253	$20	8%	8%	58.2%
Air Purifier **	$131	$50	-	38%	0.0%
Water Cooler **	$143	$15	-	10%	0.0%
Pool Pumps **	$1,227	$250	-	20%	0.0%

* Free ridership was not evaluated in PY14.

** Free ridership was assumed to be 0%.

As shown, electric water heaters received a rebate of up to $45, or only 12% of the average purchase price of approximately $434. Similarly, a $20 incentive only covered about 8% of the typical RAC cost. As in PY13, incentive amounts for heat pump water heaters covered the greatest percentage of measure costs and produced significantly lower free ridership rates than other measures.

Free Ridership Scoring

Equipment Rebate Measures

The Cadmus team noted a common pattern in PY14 online respondents' answers to free ridership questions. Among this group, 92 respondents (47%) were considered 100% free riders. Forty-eight of the 92 respondents estimated as 100% free riders said when they first learned of the Efficient Products program, they already had been planning to purchase the measure, and, without the incentive, they would have purchased the same measure. These respondents also reported they would have installed the measure to the same efficiency level without the program incentive, and they would have done it at the same time as they did through the program.

The additional 44 respondents estimated as 100% free riders reported they already had purchased their new equipment before learning of the ActOnEnergy campaign.

PY13 phone respondents' freeridership responses were used in the PY14 analysis, as no new surveys were administered with PY14 participants.

Scoring Adjustments for Equipment Rebate Measures

As previously discussed, the Cadmus team used a multiple-question approach to assess free ridership of each participant. Our methodology applied a standardized, rigorous approach to measuring a complex question: What would the participant have done in the absence of the program? Most participants find this a challenging question to answer accurately, hence we used several questions to determine a participant's score.

Even using the multiquestion approach to scoring free ridership, however, bias may result. For example, social desirability bias occurs when respondents provide what they believe is the "best" answer (in this case, saying they would have purchased the most energy-efficient product, even without the rebate). Another type—recall bias—occurs when respondents have difficulty remembering what they did in the past or what their past needs, desires, or motivations were as those factors related to a hypothetical situation.

To control for these common self-report biases in our free ridership results, we included the following questions in the free ridership battery, though these were not used in the initial scoring process:

> *"To summarize, how important was Ameren Missouri's energy-efficiency promotion on your decision to purchase the [SURVEYMEASURE]?"*
>
> *a. Important*
> *b. Somewhat important*
> *c. Not very important*
> *d. Not at all important*

And,

> "*Please describe in your own words the process that led you to decide to purchase the more energy-efficient option.*"

If responses to these questions contradicted answers reported in the initial free rider scoring questions, we made adjustments to control for the social desirability response bias known to impact self-reported findings. Thus, we made the following adjustments for the phone and online survey respondents:

- When respondents assigned an initial free ridership score of 100% answered that the Ameren Missouri energy-efficiency promotion was "important" to their purchasing decision, we assigned them a final free ridership score of 50%.
- When respondents assigned an initial free ridership score of 100% answered that the Ameren Missouri energy-efficiency promotion was "somewhat important," we assigned them a final free ridership score of 75%.
- When respondents assigned an initial free rider score of 0% answered that the Ameren Missouri energy-efficiency promotion was "not at all important" to their purchasing decision, we assigned them a final free ridership score of 50%.

- When respondents assigned an initial free rider score of 0% answered that the Ameren Missouri energy-efficiency promotion was "not very important," we assigned them a final free ridership score of 25%.

After reviewing all responses, we adjusted 101 free ridership scores for rebated equipment customers (across both the PY13 phone and PY14 online survey groups), according to the method described above. Table 52 shows the adjustment's magnitude and direction.

Table 52. Adjusted Free Ridership Scores: Phone and Online Respondents

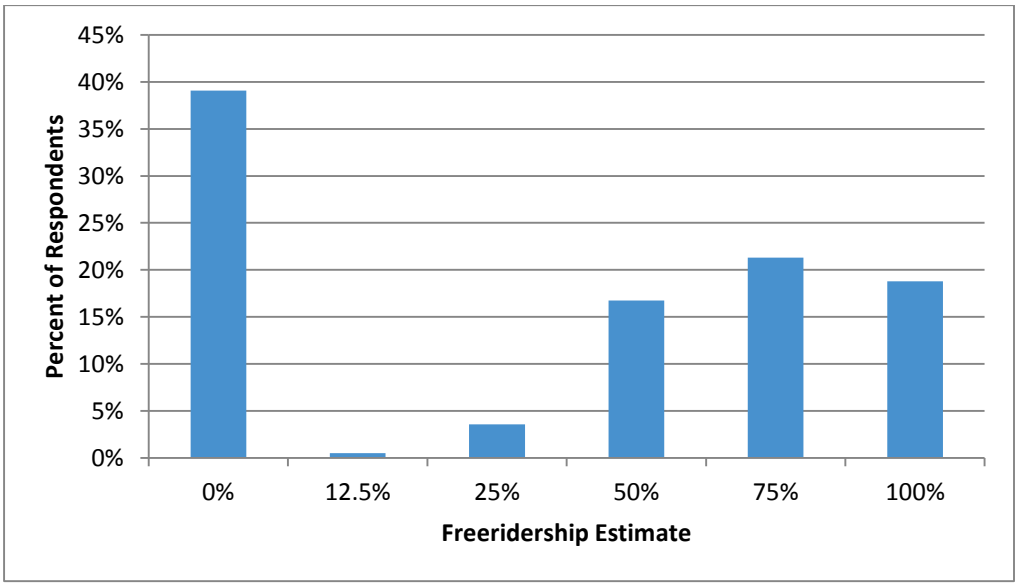
Number of Responses	Original Free Ridership %	Adjusted Free Ridership %
56	100%	75%
41	100%	50%
1	100%	0%
1	0%	50%
2	0%	25%

*Adjustment based on response to open-ended question.

Distribution of Free Ridership Scores: Equipment Rebate Measures

Figure 15 shows the distribution of PY14 online survey equipment rebate participants by the free ridership score assigned to each respondent by the Cadmus team. Approximately 39% of online survey respondents were scored as 0% free riders and 19% were scored as true free riders (100%).

Figure 15. Overall Distribution of Free Ridership Scores - Online Survey Equipment Rebate Participants



Distribution of Free Ridership Scores: Kit Measures

For each kit measure installed, we assigned free ridership score based on the respondents' reported intentions to purchase the measure in the absence of the free energy-efficiency kit. Table 53 shows the distribution of kit measure responses, free ridership scores assigned by measure, and the overall free ridership scores, weighted by the quantity installed.

Table 53. Kit Measures Free Ridership Estimation (n=71)

Purchase Timing In Absence of Receiving Kit	Free Rider %	CFLs (n)	LEDs (n)	Faucet Aerators (n)	Showerheads (n)	Advanced Power Strips (n)	Pipe Wrap (n)
At the same time of receiving the kit	100%	3	2	1	2	1	2
Within the same year/ Don't Know	25%	17	7	2	5	9	4
More than one year/ Never	0%	32	8	27	27	30	22
Weighted Average FR % Estimate		**12.0%**	**24.1%**	**3.7%**	**10.6%**	**8.1%**	**10.7%**

Participant Spillover

The Cadmus team estimated participant spillover based on answers from respondents purchasing additional high-efficiency equipment or appliances following their participation in the Efficient Products program.

Spillover Results

We asked equipment rebate participants and Home Energy Kit participants if they had undertaken any additional energy-efficient actions since participating in the program. To calculate spillover, we then asked them to rate the importance, relative to their decision, that their Efficient Products measure qualified for a rebate from Ameren Missouri. We also asked how important Ameren Missouri's educational material was to their decision. We only allocated respondents to program spillover if they answered "important" to at least one of these two questions. To avoid the double-counting of savings captured by a concurrent program, we eliminated responses if the respondent received an incentive from another
Ameren Missouri program.

Although multiple respondents indicated they purchased CFLs or LED bulbs, we omitted these lighting measures in our analysis to avoid double-counting the savings. The lighting spillover analysis from the home inventory study accounted for non-program bulbs purchased by Ameren Missouri customers.

Six phone survey equipment rebate respondents, 10 online survey respondents, and six kit measure respondents reported installing additional energy-efficient measures in which their participation in the Efficient Products program or information from Ameren Missouri proved "important" to their

purchasing decisions. Measures installed by these respondents included the following: nine refrigerators, three freezers, two clothes washers, two RACs, five central air conditioners, three air source heat pumps, three low-flow showerheads, three water heaters, and home insulation.

We applied deemed TRM savings estimates to refrigerator, freezer, and clothes washer measures, and we applied PY14 *ex post* savings values to the RAC, central air conditioner, air source heat pump, water heater, insulation, and showerhead measures. Using both, we arrived at spillover savings totals. Next, we divided the sample spillover savings by the program gross savings from the survey sample, as shown in the following equation:

$$Spillover\ \% = \frac{\sum[Net\ spillover\ measure\ kWh\ savings\ for\ all\ rebate\ survey\ respondents]}{\sum[Gross\ program\ measure\ kWh\ \ for\ all\ rebate\ survey\ respondents]}$$

This yielded a 3.1% spillover estimate for equipment rebate respondents and a 3.4% spillover estimate for kit measures respondents, as shown in Table 54.

Table 54. Participant Spillover by Data Collection Method and Measure

Collection Method	Spillover Measure	Quantity	Per-Unit Spillover kWh Savings	Total Survey Sample Spillover Savings	Total Survey Sample Program Savings	Spillover % Estimate
Equipment Rebate Measures						
Phone (PY13)	Refrigerator	2	101	202	**287,007**	
	Central Air Conditioner	1	355	355		
	Freezer	1	44	44		
	Clothes Washer	1	251	251		
	Room Air Conditioner	1	50	50		
Online (PY14)	Air Source Heat Pump	3	1,516	4,547		
	Refrigerator	5	101	505		
	Central Air Conditioner	4	355	1,419		
	Freezer	1	44	44		
	Clothes Washer	2	251	501		
	Room Air Conditioner	1	50	50		
	Insulation	2,850 sq ft	0.1557	444		
	Low-flow Showerhead	2	222	444		
Overall	**All**			**8,853**	**287,007**	**3.1%**
Kit Measures						

Phone (PY14)	Refrigerator	2	101	202	**29,541**	
	Freezer	1	44	44		
	Low-flow Showerhead	1	222	222		
	Water Heater	3	175	524		
Overall	**All**			**992**	**29,541**	**3.4%**

Nonparticipant Spillover

Effective program marketing and outreach generates program participation *and* increases general energy-efficiency awareness among customers. The cumulative effect of sustained utility program marketing (which often occurs concurrently for multiple programs) can affect customers' perceptions of their energy usage and, in some cases, motivates customers to take efficiency actions outside of the utility's program. This phenomenon—called nonparticipant spillover (NPSO)—results in energy savings caused by but not rebated through a utility's demand-side management (DSM) activity.

During PY14, Ameren Missouri spent over $1.53 million dollars to market individual residential efficiency programs and the portfolio-wide Act on Energy campaign. This amount almost equals Ameren Missouri's PY13 marketing expenditure ($1.55M).

To understand whether Ameren Missouri's program-specific and general Act On Energy marketing efforts generated energy-efficiency improvements outside of Ameren Missouri's incentive programs, the Cadmus team implemented a general population survey of residential customers in PY13. We will repeat the survey in PY15 to compare differences in awareness and energy-efficiency actions between the first and last year of Ameren Missouri's three-year program implementation cycle.

While Cadmus did not conduct a similar general population survey in PY14, we believe—given Ameren Missouri's continued program activity and comparable marketing expenditure—we can use the PY13 survey results to estimate NPSO that probably occurred in PY14.

Methodology

In PY13, the Cadmus team randomly selected and surveyed 401 customers, using Ameren Missouri's entire residential customer information system as the sample frame. We determined that our sample contained a small number of customers (n=36) self-reporting that they participated in an Ameren Missouri residential program during PY13. When estimating NPSO, we excluded these customers from analysis, focusing on 365 identified nonparticipants; this avoided potential double-counting of program savings and/or program-specific spillover.

We also limited the NPSO analysis to the same efficiency measures rebated through Ameren Missouri programs (known as "like" spillover). Examples include removing a secondary refrigerator and installing

a programmable thermostat. We did, however, exclude one notable category of "like" measures: lighting products. This precluded double-counting NPSO lighting savings already captured through the upstream Lighting program market affects analysis.

To ensure the responses included in the analysis represent electric spillover savings, Cadmus asked customers questions about fuel type for water heaters, heating systems, and cooling systems. Only savings associated with measures where there was a corresponding electric water heater, electric heat, or central air conditioning were counted as spillover in the analysis.

To confirm a relationship between Ameren Missouri's energy-efficiency programs and the Act On Energy awareness campaign and actions taken by nonparticipants, the Cadmus team's survey asked about nonparticipants' familiarity with Ameren Missouri's energy-efficiency programs and Act On Energy. To be included in the NPSO analysis, nonparticipating respondents had to indicate the following:

- They were familiar with Ameren Missouri's campaign; and
- Ameren Missouri's efficiency messaging motivated their purchasing decisions.

Results

Of 365 nonparticipants surveyed, 11 cited Ameren Missouri's marketing as "very important" or "somewhat important" in their decisions to purchase non-rebated, high-efficiency measures during 2013:[8]

- Among nonparticipants citing their knowledge of Ameren Missouri's energy-efficiency programs or the Act On Energy campaign as "very important," we counted *ex post,* gross, per-unit savings, determined through the PY13 evaluation towards the NPSO analysis.
- If nonparticipants said Ameren Missouri reported "somewhat important" in their decisions, we applied a 50% decrement and applied one-half of *ex post* energy savings for the specified measure.

The analysis excluded nonparticipant responses indicating Ameren Missouri's programs or Act On Energy were "not very important" or "not at all important" to their efficiency actions.

Table 55 shows measures and PY13 gross evaluated kWh savings attributed to Ameren Missouri, with average savings per spillover measure of 242 kWh.

[8] This translates to approximately 3% of the general population, with a range of 90% confidence of 1.54% to 4.49%. Despite the range, the 3% middle point remains the most likely value. With 3% of the population undertaking actions on their own, the sample size of nearly 10,000 surveys would be needed to detect such a level with ±10%—clearly a prohibitive undertaking.

Table 55. NPSO Response Summary

Individual Reported Spillover Measures	Influence of Ameren Missouri Information on Purchase	PY13 Measure Savings (kWh)*	Allocated Savings	Total kWh Savings	Avg kWh Per Spillover Measure
Water Heater	Very	245.7†	100%	245.7	
Central Air Conditioner (CAC)	Somewhat	288*	50%	144.0	
Installed Programmable Thermostat	Somewhat	105†	50%	52.7	
Installed Programmable Thermostat	Somewhat	105†	50%	52.7	
Installed Programmable Thermostat	Somewhat	105†	50%	52.7	
Installed Programmable Thermostat	Somewhat	105†	50%	52.7	A
Installed Programmable Thermostat	Somewhat	105†	50%	52.7	
Removed Refrigerator	Very	1,013ˆ	100%	1,013	
Scheduled CAC Tune-Up	Somewhat	993**	50%	496.5	
Water Heat Pipe Wrap	Very	363.8†	100	363.8	
Windows	Somewhat	271***	50%	136	
Total (n=11)				**2,662**	**242**

†Based on savings calculated for the Efficient Products program.
*Assumption used for the HVAC program's gross evaluated savings, based on a 2.5-ton unit rated at 15 SEER, with a baseline of 13 SEER.
ˆBased on savings calculated for the Refrigerator Recycling program.
**Assumption used for the HVAC program's gross evaluated savings, based on a 3-ton unit and a 7.7% efficiency improvement in heating and cooling for condenser cleaning.
***Based on savings calculated for the Home Energy Performance program.

To arrive at a single savings estimate (Variable A in Table 56), the Cadmus team used numbers in the Total kWh Savings column to calculate an average for the 11 measures assessed for NPSO. Thus, the estimate of 242 kWh represents average nonparticipant energy savings, per respondent attributing spillover to Ameren Missouri's residential programs.

To determine the total NPSO generated by Ameren Missouri marketing in 2013, we used the following variables (as shown in Table 56):

- **A** is the average kWh savings per NPSO response.
- **B** is the number of NPSO measures attributed to the program.
- **C** is the number of nonparticipants contacted by the survey implementer.
- **D** is Ameren Missouri's total residential customer population.
- **E** is NPSO energy savings, extrapolated to the customer population, and calculated by dividing B by C, and then multiplying the result by A and D.

- **F** is Ameren Missouri's total reported 2014 program year *ex ante* gross savings for Appliance Recycling, HVAC, Lighting, Home Energy Performance, and Efficient Products. (Similarly to PY13, the PY14 analysis did not include the Low Income and New Homes programs.)[9]
- **G** (representing NPSO as a percentage of total evaluated savings) is the nonparticipant percentage used in the NTG calculations.

Using this information, the Cadmus team estimated overall, portfolio-level NPSO at 3.6% of total PY14 reported *ex ante* gross savings, as shown in Table 56. While, in percentage terms, a larger amount than last year (2.8% in PY13), this NPSO value represents the same number of MWH NPSO savings (7,592); it is only larger because total reported gross savings were lower in PY14. As discussed, the program's marketing expenditure in PY14—the primary driver of NPSO—was nearly identical ($1.55M vs. $1.53M) between PY13 and PY14.

[9] The Cadmus team excluded the Low Income program and the New Homes program as both exclusively employ very targeted marketing; so marketing for these programs would likely generate little NPSO. For Low Income, the program works directly with property managers of low-income buildings. For New Homes, most program marketing targets regional builders.

Table 56. NPSO Analysis

Variable	Metric	Value	Source
A	Average kWh Savings per Spillover Measure	242	Survey Data/Impact Evaluation
B	Number of Like Spillover Nonparticipant Measures	11	Survey data
C	Number Contacted	365	Survey disposition
D	Total Residential Population	1,040,928	Customer database
E	Non-Part SO MWh Savings Applied to Population	7,592	(((B÷C)×A) × D)/1000
F	Total Reported Gross *Ex Ante* Savings (MWh)	210,530	2014 Program Evaluations
G	NPSO as Percent of Total Evaluated Savings	3.6%	E ÷ F

In some jurisdictions, evaluators apply NPSO as an adjustment at the portfolio-level. Though a reasonable approach, it inherently assumes all programs contribute equally to generating observed NPSO. However, given the significant differences between the programs' marketing tactics and budgets as well as programs' designs and scales, an alternate approach likely produces a better attribution estimate.

The Cadmus team considered the following three approaches for allocating total observed NPSO to individual programs:

1. **Even Allocation**: The most straightforward approach, this allocates NPSO evenly across residential programs (i.e., makes a 3.6% adjustment to each program's NTG). Doing so, however, is equivalent to applying NPSO at the portfolio-level, which, as noted, assumes all programs contribute equally to generating NPSO.
2. **"Like" Programs:** This approach allocates NPSO savings to specific programs, based on the measure installed by the nonparticipant or by the action they took. For example, one nonparticipant reported tuning up their CAC, based on energy-efficiency messaging from Ameren Missouri. Using this approach, we would assign NPSO savings associated with an HVAC tune-up. While this approach establishes a clear connection between a reported NPSO measure and Ameren Missouri's program promoting that measure, our research has found this direct measure-program relationship does not prove as straightforward as it appears. Specifically, while our study found all 11 respondents reporting NPSO were familiar with Act on Energy or Ameren Missouri's energy-efficiency messaging, only nine could cite specific program names. Further, just over one-half of the customers (six of 11) reporting NPSO measures were unfamiliar with the program or the programs corresponding to the measure they installed. These findings indicate Ameren Missouri generated NPSO through the cumulative effects of various program-specific and portfolio-level marketing efforts. Mapping NPSO measures solely to the program offering that measure could undervalue overall impacts of cumulative and sustained energy-efficiency messaging.
3. **Marketing Budget and Program Size.** The final allocation approach the Cadmus team considered—and eventually chose to use—assigns overall NPSO as a function of each program's marketing and program budget. This approach remains consistent with the theory that NPSO

results from the cumulative effect of program-specific and Act On Energy marketing and program activity over a period of time, not necessarily by a single, program-specific marketing effort. In addition, while NPSO most commonly is associated with mass media marketing campaigns, the scale of program activity proves to be a factor. For example, even without a significant marketing campaign, a program's size can drive NPSO through word-of-mouth and in-store program messaging. We find this approach accurately reflects and attributes NPSO to programs, ensuring proper accounting for total costs (including marketing) and total benefits (net savings, including NPSO) when assessing overall program cost-effectiveness.

The Cadmus team distributed the portfolio-level result of 7,592 MWh NPSO to Ameren Missouri's residential programs (excluding Low Income and New Homes). As noted, we considered the PY14 program size (in terms of total gross *ex ante* MWh savings) and each program's marketing budget (as shown in Table 57) when allocating NPSO across programs.

Table 57. Program-Specific Savings and Marketing

Program	Program *Ex Ante* Gross Savings (MWh)	Percentage of Portfolio Savings	Total Marketing	Percentage of Total Marketing
Refrigerator Recycling	8,176	3.9%	$471,192	30.8%
HVAC	42,214	20.1%	$882,041	57.7%
Lighting	147,749	70.2%	$87,684	5.7%
Home Energy Performance	650	0.3%	$36,627	2.4%
Efficient Products	11,741	5.6%	$50,655	3.3%
Total	**210,530**	**100%**	**$1,528,199**	**100%**

The results of this approach—shown in Table 58 and Table 59—reflect each program's impact on the nonparticipant population, based on marketing expenditures and magnitude of the program's intervention in the regional marketplace.

Table 58. Combined Savings and Marketing Allocation Approach

Program	*Ex Ante* Gross Energy Savings (A)	Marketing Spending (B)	Combined Savings/Marketing (AxB)	Percentage of Combined Savings/Marketing
Refrigerator Recycling	3.9%	30.8%	1.2%	7.0%
HVAC	20.1%	57.7%	11.6%	68.1%
Lighting	70.2%	5.7%	4.0%	23.7%
Home Energy Performance	0.3%	2.4%	0.007%	0.04%
Efficient Products	5.6%	3.3%	0.2%	1.1%
Total	**100%**	**100%**	**17.0%**	**100%**

Analysis credited two programs with the greatest NPSO: HVAC (accounting for over one-half of all marketing dollars) at 5,171 MWh; and Lighting (accounting for 70% of total energy savings) at 1,799 MWh. As NPSO impacts program-specific NTG results,[10] all NPSO estimates have been reported as a percentage of each program's total gross energy savings.

As shown in Table 59, the Cadmus team allocated 83 MWh of NPSO to the Efficient Products program, representing 1.1% of the combined residential portfolio savings and marketing expenditure. This resulted in a 0.7% adjustment to the program's PY14 NTG—findings generally similar to the PY13 NPSO analysis.

Table 59. NPSO by Program

Program	Program Gross Savings (MWh)	Total NPSO (MWh)	Percentage of Combined Savings/Marketing	Program-Specific NPSO (MWh)	NPSO as a Percentage of Gross Savings
Refrigerator Recycling	8,176		7.0%	535	6.5%
HVAC	42,214		68.1%	5,171	12.3%
Lighting	147,749	**7,592**	23.7%	1,799	1.2%
Home Energy Performance	650		0.04%	3	0.5%
Efficient Products	11,741		1.1%	83	0.7%
Total	**210,530**		**100%**	**7,592**	**3.6%**

Net Savings Summary

To estimate the overall program and measure NTG ratios, the Cadmus team used total population *ex post* gross kWh savings to weight results for each data collection method. Table 60 shows the components of each program measure's NTG estimate (free ridership and spillover) and the percentage of total program savings related to each measure's data collection method. We used the percentage of total program savings and NTG ratios specific to each measure to arrive at a savings-weighted NTG estimate of 84.4% for the program's equipment rebate portion. The savings-weighted NTG estimate for the program's kit measures portion was 92.8%.

[10] NTG = 1 – Free Ridership + Participant Spillover + NPSO + Market Effects

Table 60. NTG by Measure

Measure	Survey Delivery Channel	% of Program Savings (By Measure & Delivery Channel)	Free Ridership	Participant Spillover	Non-participant Spillover	Net-To-Gross
Equipment Rebate Measures						
Electric Hot Water Heater	Phone	1.9%	60.0%	3.1%	0.7%	43.8%
	Online	0.4%	61.2%			42.6%
Heat Pump Hot Water heater	Phone	45.6%	18.1%			85.7%
	Online	17.5%	20.4%			83.4%
Programmable Thermostat	Phone	8.3%	56.7%			47.1%
	Online	1.5%	52.4%			51.4%
Room Air Conditioner	Phone	1.0%	58.5%			45.3%
	Online	0.1%	56.3%			47.5%
Variable-speed Pool Pumps	Phone	6.7%	0.0%			103.8%
	Online	0.1%	0.0%			103.8%
Water Coolers	Phone	0.2%	0.0%			103.8%
	Online	0.0%	0.0%			103.8%
Air Purifier	Phone	16.4%	0.0%			103.8%
	Online	0.2%	0.0%			103.8%
Total	**Both**	**100.0%**	**19.4%**	**3.1%**	**0.7%**	**84.4%**
Kit Measures						
CFLs	Phone	28.5%	12.0%	3.4%	0.7%	92.1%
LEDs	Phone	7.8%	24.1%			80.0%
Faucet Aerators	Phone	9.8%	3.7%			100.4%
Low-flow Showerheads	Phone	27.7%	10.6%			93.5%
Advanced Power Strip	Phone	3.2%	8.1%			96.0%
Pipe Wrap	Phone	23.1%	10.7%			93.4%
Total	**Phone**	**100.0%**	**11.3%**	**3.4%**	**0.7%**	**92.8%**

As shown in Table 61, an overall weighted-by-total gross program savings NTG estimate of 90.9% resulted for the program as a whole.

Table 61. Overall Program NTG

Subprogram	Total Gross Program kWh Savings	% of Program Savings	NTG	Overall Program NTG
Equipment Rebate Measures	1,573,532	23.5%	84.4%	90.9%
Kit Measures	5,050,019	75.4%	92.8%	
Advanced Power Strip-Online	73,784	1.1%	100.7%	

Cost-Effectiveness Results

To analyze the cost-effectiveness of the PY14 Efficient Products program, MMP utilized DSMore. MMP assessed cost-effectiveness using the following five tests as defined by the California Standard Practice Manual:[11]

- TRC test
- UCT
- RIM
- PART
- Societal test

DSMore took hourly prices and hourly energy savings from specific measures installed through Efficient Products, and correlated prices and savings to 30 years of historic weather data. Using long-term weather ensured the model captured low-probability, high-consequence weather events and appropriately valued them. As a result, the model produced an accurate evaluation of the demand-side efficiency measure relative to other alternative supply options.

Key assumptions included the following:

- Discount Rate = 6.95%
- Line Losses = 5.72%
- Summer Peak would occur during the 16th hour of a July day on average.
- Avoided Electric T&D = $31.01/kW
- Escalation rates for different costs would occur at the component level, with separate escalation rates for fuel, capacity, generation, T&D and customer rates carried out over 25 years.

In addition, MMP leveraged the "Batch Tools" (model inputs) used by Ameren Missouri in its original analysis as input into the *ex post* DSMore analysis. Starting with the original DSMore Batch Tool used by Ameren Missouri and modifying it with new data from the evaluation (e.g., PY14-specific Efficient Products participation counts, per-unit gross savings and NTG) assured consistency. In particular, model assumptions were driven by measure load shapes, which told the model when to apply savings during the day. This assured the load shape for that end use matched the system peak impacts of that end use and provided the correct summer coincident savings. MMP used measure lifetime assumptions and incremental costs, based the program's database, the Ameren Missouri 2012 TRM, or the original Batch Tool.

A key step in the analysis process was acquiring PY14 Ameren Missouri program spending data: actual spending broken down into implementation, incentives, and administration costs. MMP applied these

[11] *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.* October 2001.

numbers at the program level, not the measure level. While applying incentives at the measure level proves useful for planning purposes, it is unnecessary for cost-effectiveness modeling, as results are based on the program overall.

As determined through a consensus building process with stakeholders, all cost-effectiveness results shown include the program's share of portfolio-level or indirect costs. Each program's share of these costs was determined using the present value of each program's UCT lifetime benefits (i.e., the present value of avoided generation costs as well as deferral of capacity capital and transmission and distribution capital costs). The residential portfolio summary report addresses this in greater detail.

Table 62 summarizes cost-effectiveness findings by test. Any benefit/cost score above 1.0 passed the test as cost-effective. In addition, the table includes the net present value (in 2013 dollars) of the UCT net lifetime benefits (net avoided costs minus program costs). As shown, the Efficient Products program passed the UCT, TRC, Societal and PART tests. The program produced UCT net lifetime benefits of more than $2.5M.

Table 62. Cost-Effectiveness Results (PY14)

	UCT	TRC	RIM	Societal	PART	UCT Net Lifetime Benefits
Efficient Products	2.50	1.80	0.55	2.15	4.22	$2,598,618

Appendix A. *Ex Post* Demand Reductions

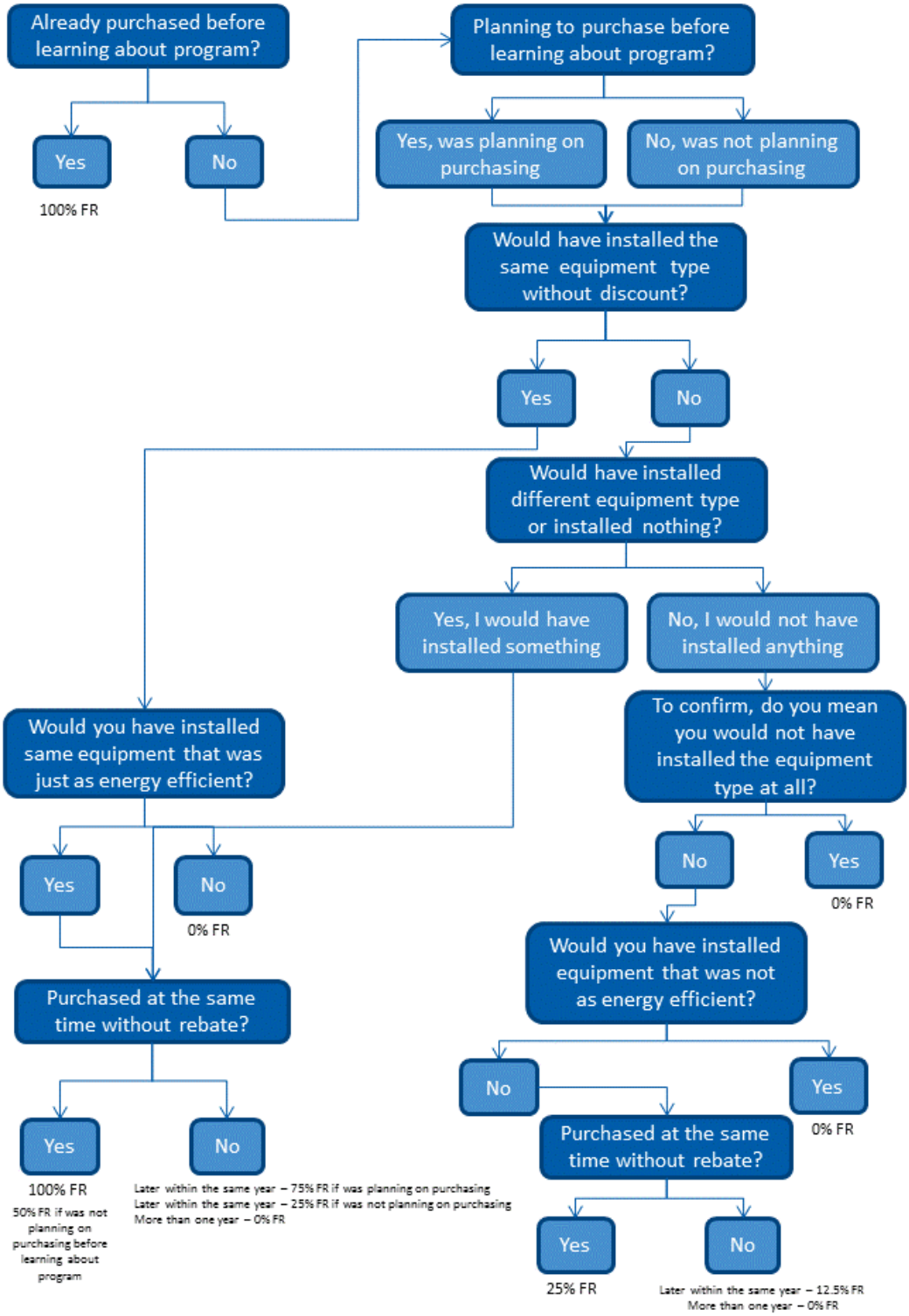
MMP determined *ex post* demand reductions using *ex post* energy savings estimated in this PY14 report and DSMore (using load shapes provided by Ameren Missouri).

Table 63. PY14 Summary: Net *Ex Post* Per-Unit Demand Reductions

Measure	PY14 Participation	Per-Unit Net *Ex Post* Demand Reduction (kW)	Total Net *Ex Post* Savings (kW)*
Equipment Rebates			
Electric Water Heaters	212	0.0185	1.8
Heat Pump Water Heaters	371	0.2835	94.6
RACs	372	0.0391	7.0
Programmable Thermostatd	1,464	0.0000	0.0
Variable-speed Pool Pumps	52	0.5211	29.7
Air Purifier	392	0.0993	42.7
Water Coolers	23	0.0185	0.5
Kit Measures – Single-Family (7,690 total kits)			
CFLs	48,932	0.0013	60.9
LEDs	10,837	0.0011	10.2
Advanced Power Strips, Load Sensing	3,782	0.0081	30.9
Faucet Aerators	16,688	0.0041	72.5
Low-Flow Showerheads	8,998	0.0235	208.7
Water Heater Pipe Wrap	7,690	0.0330	250.4
Kit Measures – Multifamily (2,114 total kits)			
CFLs	8,488	0.0013	10.6
LEDs	4,220	0.0011	4.0
Advanced Power Strips, Load Sensing	4	0.0081	0.0
Faucet Aerators	4,228	0.0040	18.0
Low-Flow Showerheads	2,114	0.0266	55.7
Water Heater Pipe Wrap	2,114	0.0096	20.0
Upstream Discounts – Online Store			
Advanced Power Strips, Load Sensing	1,196	0.0089	11.3

Measure	PY14 Participation	Per-Unit Net *Ex Post* Demand Reduction (kW)	Total Net *Ex Post* Savings (kW)*
Advanced Power Strips, Motion Sensing	47	0.0096	0.5
Total	**122,224**	**n/a**	**913**
*Accounts for line losses; total may not add to sum of measure-specific kW due to rounding			

Appendix B. Free Ridership Scoring Flow Chart



Appendix C. Free Ridership Scoring Tables

Table 64 illustrates how initial survey responses translate into whether the response is: "yes," "no," or "partially" indicative of free ridership (in parentheses).

Table 64. Raw Survey Responses Translation to Free Ridership Scoring Matrix Terminology

FR1. Had you already purchased your new [APPLIANCE] before hearing about the Ameren Act On Energy promotion?	FR1a. To confirm, you purchased your new [APPLIANCE] and then found out it qualified for an Ameren Act On Energy rebate program, is that correct?	FR2. Before learning about the Ameren rebate, were you already planning to purchase a [APPLIANCE]?	FR3. Would you have purchased the same make and model of [APPLIANCE] without the [INSERT INCENTIVE] rebate from Ameren?	FR4. Without the Ameren rebate, would you have purchased a different make and model [APPLIANCE], or would you have decided not to purchase one at all?	FR5. When you say you would have purchased the [APPLIANCE]] without the rebate from Ameren, would you have purchased one that was just as energy efficient?	FR6. Thinking about timing, without the Ameren Missouri rebate, would you have purchased the [APPLIANCE]…	FR7. To confirm, you indicated that without an Ameren rebate, you would not have purchased your [APPLIANCE] at all, is that correct?	FR8. Without the Ameren rebate, would you have purchased a [IAPPLIANCE] that was just as energy-efficient?	FR9. With respect to timing, would you have purchased the [APPLIANCE]
Yes (Yes)	Yes, that's correct (Yes)	Yes (Yes)	Yes (Yes)	I would have installed a different [APPLIANCE] (Yes)	Yes (Yes)	At the same time (Yes)	Yes (No)	Yes (No)	At the same time (Yes)
No (No)	No, that's not correct (No)	No (No)	No (No)	I would not have purchased one at all (No)	No (No)	Within the same year (Partial)	No (Partial)	No (Partial)	Within the same year (Partial)
Not sure (No)	Not sure (No)	Not sure (Partial)	Not sure (Partial)	Not sure (No)	Not sure (Partial)	One to two years out (No)	Not sure (Partial)	Not sure (Partial)	One to two years out (No)
						More than two years out (No)			More than two years out (No)
						Never (No)			Never (No)
						Not sure (Partial)			Not sure (Partial)

Table 65 shows how the string of responses from Table 64 translated into a free ridership score.

Table 65. Sample of Free Ridership Scores

FR1. Had you already purchased your new [APPLIANCE] before hearing about the Ameren Act On Energy promotion?	FR1a. To confirm, you purchased your new [APPLIANCE] and then found out it qualified for an Ameren Act On Energy rebate program, is that correct?	FR2. Before learning about the Ameren rebate, were you already planning to purchase a [APPLIANCE]?	FR3. Would you have purchased the same make and model of [APPLIANCE] without the [INSERT INCENTIVE] rebate from Ameren?	FR4. Without the Ameren rebate, would you have purchased a different make and model [APPLIANCE], or would you have decided not to purchase one at all?	FR5. When you say you would have purchased the [APPLIANCE]] without the rebate from Ameren, would you have purchased one that was just as energy efficient?	FR6. Thinking about timing, without the Ameren Missouri rebate, would you have purchased the [APPLIANCE]…	FR7. To confirm, you indicated that without an Ameren rebate, you would not have purchased your [APPLIANCE] at all, is that correct?	FR8. Without the Ameren rebate, would you have purchased a [IAPPLIANCE] that was just as energy-efficient?	FR9. With respect to timing, would you have purchased the [APPLIANCE]	FR Score
Yes	Yes	x	x	x	x	x	x	x	x	100%
Yes	No	Yes	Yes	x	x	Yes	x	x	x	100%
Yes	No	Yes	Yes	x	x	Partial	x	x	x	75%
Yes	No	Yes	Yes	x	x	No	x	x	x	0%
Yes	No	Yes	Yes	x	x	Partial	x	x	x	50%
Yes	No	Yes	Partial	Yes	Yes	Yes	x	x	x	75%
Yes	No	Yes	Partial	Yes	Yes	Partial	x	x	x	50%
Yes	No	Yes	Partial	Yes	Yes	No	x	x	x	0%
Yes	No	Yes	Partial	Yes	Partial	Yes	x	x	x	50%
Yes	No	Yes	Partial	Yes	Partial	Partial	x	x	x	25%
Yes	No	Yes	Partial	Yes	Partial	No	x	x	x	0%
Yes	No	Yes	Partial	Yes	No	x	x	x	x	0%
Yes	No	Yes	Partial	No	x	x	x	x	x	75%
Yes	No	Yes	Partial	No	x	Yes	x	x	x	75%
Yes	No	Yes	Partial	No	x	Partial	x	x	x	50%
Yes	No	Yes	Partial	No	x	No	x	x	x	0%
No	x	Yes	Yes	x	x	Yes	x	x	x	100%
No	x	Yes	Yes	x	x	Partial	x	x	x	75%
No	x	Yes	Yes	x	x	No	x	x	x	0%
No	x	Yes	Partial	Yes	Yes	Yes	x	x	x	75%
No	x	Yes	Partial	Yes	Yes	Partial	x	x	x	50%
No	x	Yes	Partial	Yes	Yes	No	x	x	x	0%
No	x	Yes	Partial	Yes	Partial	Yes	x	x	x	50%
No	x	Yes	Partial	Yes	Partial	Partial	x	x	x	25%
No	x	Yes	Partial	Yes	Partial	No	x	x	x	0%
No	x	Yes	Partial	Yes	No	x	x	x	x	0%
No	x	Yes	Partial	Yes	x	Yes	x	x	x	75%
No	x	Yes	Partial	Yes	x	Partial	x	x	x	50%
No	x	Yes	Partial	Yes	x	No	x	x	x	0%
No	x	Yes	Partial	No	x	x	x	x	x	0%
No	x	Yes	Partial	No	x	x	Yes	Yes	Yes	75%
No	x	Yes	Partial	No	x	x	Yes	Yes	Partial	50%
No	x	Yes	Partial	No	x	x	Yes	Yes	No	0%
No	x	Yes	Partial	No	x	x	Yes	Partial	Yes	50%
No	x	Yes	Partial	No	x	x	Yes	Partial	Partial	25%
No	x	Yes	Partial	No	x	x	Yes	Partial	No	0%
No	x	Yes	Partial	No	x	x	Yes	No	x	0%
No	x	Yes	Partial	No	x	x	No	x	x	0%
No	x	Yes	No	Yes	Yes	Yes	x	x	x	50%
No	x	Yes	No	Yes	Yes	Partial	x	x	x	25%
No	x	Yes	No	Yes	Yes	No	x	x	x	0%
No	x	Yes	No	Yes	Partial	Yes	x	x	x	25%
No	x	Yes	No	Yes	Partial	Partial	x	x	x	12.5%
No	x	Yes	No	Yes	Partial	No	x	x	x	0%
No	x	Yes	No	Yes	No	x	x	x	x	0%
No	x	Yes	No	Yes	x	Yes	x	x	x	50%
No	x	Yes	No	Yes	x	Partial	x	x	x	25%
No	x	Yes	No	Yes	x	No	x	x	x	0%

Each participant free ridership score started with 100%, which we decremented based on their responses to the nine questions, as shown in Table 66.

Table 66. Free Ridership Scoring Legend

Q#	Decrement
FR1	0% decrement for "No", Partial level not needed
FR2	100% FR if "Yes", "No" level not needed, "Partial" level not needed
FR3	50% decrement for "No", 25% decrement for "Partial"
FR4	50% decrement for "No", 25% decrement for "Partial"
FR5	0% decrement for "No", Partial level not needed
FR6	100% decrement for "No", 25% decrement for "Partial"
FR7	100% decrement for "No", 25% decrement for "Partial"
FR8	100% decrement for "No", 25% decrement for "Partial"
FR9	100% decrement for "No", 25% decrement for "Partial"
FR10	100% decrement for "No", 25% decrement for "Partial"

Below, we illustrate the unique response combinations from applicants answering the Rebate Savers online survey (actual responses mapped to “yes,” “no,” or “partial” as indicative of free ridership); the free ridership score assigned to each combination; and the number of responses.

Table 67 shows phone respondents.

Table 68 shows online survey respondents.

We calculated free ridership scores for each measure category, based on the distribution of scores within the matrix.

Table 67. Frequency of Free Ridership Scoring Combinations—Phone Results

FR1. Had you already purchased your new [APPLIANCE] before hearing about the Ameren Act On Energy promotion?	FR1a. To confirm, you purchased your new [APPLIANCE] and then found out it qualified for an Ameren Act On Energy rebate program, is that correct?	FR2. Before learning about the Ameren rebate, were you already planning to purchase a [APPLIANCE] ?	FR3. Would you have purchased the same make and model of [APPLIANCE] without the [INSERT INCENTIVE] rebate from Ameren?	FR4. Without the Ameren rebate, would you have purchased a different make and model [APPLIANCE] , or would you have decided not to purchase one at all?	FR5. When you say you would have purchased the [APPLIANCE] without the rebate from Ameren, would you have purchased one that was just as energy efficient?	FR6. Thinking about timing, without the Ameren Missouri rebate, would you have purchased the [APPLIANCE] ...	FR7. To confirm, you indicated that without an Ameren rebate, you would not have purchased your [APPLIANCE] at all, is that correct?	FR8. Without the Ameren rebate, would you have purchased a [APPLIANCE] that was just as energy-efficient?	FR9. With respect to timing, would you have purchased the [APPLIANCE] ...	FR Score	Frequency
Yes	Yes	x	x	x	x	x	x	x	x	100%	36
Yes	No	Yes	Yes	x	x	Yes	x	x	x	100%	2
Yes	No	Yes	Partial	Yes	No	x	x	x	x	0%	1
Yes	No	Yes	Partial	No	x	x	x	x	x	75%	1
No	x	Yes	Yes	x	x	Yes	x	x	x	100%	52
No	x	Yes	Yes	x	x	Partial	x	x	x	75%	14
No	x	Yes	Yes	x	x	No	x	x	x	0%	4
No	x	Yes	Partial	Yes	Yes	Yes	x	x	x	75%	9
No	x	Yes	Partial	Yes	x	Partial	x	x	x	50%	1
No	x	Yes	Partial	No	x	x	x	x	x	0%	5
No	x	Yes	No	Yes	Yes	Yes	x	x	x	50%	5
No	x	Yes	No	Yes	Yes	Partial	x	x	x	25%	1
No	x	Yes	No	Yes	Yes	No	x	x	x	0%	1
No	x	Yes	No	Yes	Partial	Yes	x	x	x	25%	1
No	x	Yes	No	Yes	Partial	Partial	x	x	x	13%	1
No	x	Yes	No	Yes	No	x	x	x	x	0%	5
No	x	Yes	No	Yes	x	Yes	x	x	x	50%	4
No	x	Yes	No	Yes	x	Partial	x	x	x	25%	1
No	x	Yes	No	Yes	x	No	x	x	x	0%	1
No	x	Yes	No	No	x	x	No	x	x	0%	6
No	x	Partial	Yes	x	x	Yes	x	x	x	75%	1
No	x	Partial	Yes	x	x	No	x	x	x	0%	1
No	x	Partial	No	No	x	x	No	x	x	0%	1
No	x	No	Yes	x	x	Yes	x	x	x	50%	12
No	x	No	Yes	x	x	Partial	x	x	x	25%	6
No	x	No	Yes	x	x	No	x	x	x	0%	4
No	x	No	Partial	Yes	Yes	Yes	x	x	x	25%	1
No	x	No	Partial	Yes	x	Yes	x	x	x	25%	2
No	x	No	Partial	Yes	x	No	x	x	x	0%	1
No	x	No	Partial	No	x	x	x	x	x	0%	6
No	x	No	No	Yes	Yes	No	x	x	x	0%	1
No	x	No	No	Yes	No	x	x	x	x	0%	5
No	x	No	No	Yes	x	Yes	x	x	x	13%	1
No	x	No	No	No	x	x	No	x	x	0%	12
No	x	Yes	No	No	x	x	x	x	x	0%	4
No	x	x	x	x	x	x	x	x	x	0%	2
No	x	No	No	No	x	x	x	x	x	0%	2

Table 68. Frequency of Free Ridership Scoring Combinations—Online Measures

FR1. Had you already purchased your new [APPLIANCE] before hearing about the Ameren Act On Energy promotion?	FR1a. To confirm, you purchased your new [APPLIANCE] and then found out it qualified for an Ameren Act On Energy rebate program, is that correct?	FR2. Before learning about the Ameren rebate, were you already planning to purchase a [APPLIANCE] ?	FR3. Would you have purchased the same make and model of [APPLIANCE] without the [INSERT INCENTIVE] rebate from Ameren?	FR4. Without the Ameren rebate, would you have purchased a different make and model [APPLIANCE] , or would you have decided not to purchase one at all?	FR5. When you say you would have purchased the [APPLIANCE] without the rebate from Ameren, would you have purchased one that was just as energy efficient?	FR6. Thinking about timing, without the Ameren Missouri rebate, would you have purchased the [APPLIANCE] …	FR7. To confirm, you indicated that without an Ameren rebate, you would not have purchased your [APPLIANCE] at all, is that correct?	FR8. Without the Ameren rebate, would you have purchased a [APPLIANCE] that was just as energy-efficient?	FR9. With respect to timing, would you have purchased the [APPLIANCE] …	FR Score	Frequency
Yes	Yes	x	x	x	x	x	x	x	x	100%	44
Yes	No	Yes	Partial	No	x	x	x	x	x	75%	1
No	x	Yes	Yes	x	x	Yes	x	x	x	100%	48
No	x	Yes	Yes	x	x	Partial	x	x	x	75%	6
No	x	Yes	Yes	x	x	No	x	x	x	0%	1
No	x	Yes	Partial	Yes	Yes	Yes	x	x	x	75%	1
No	x	Yes	Partial	Yes	Partial	Partial	x	x	x	25%	1
No	x	Yes	Partial	Yes	No	x	x	x	x	0%	1
No	x	Yes	Partial	No	x	x	x	x	x	0%	11
No	x	Yes	No	Yes	Yes	Yes	x	x	x	50%	4
No	x	Yes	No	Yes	Partial	Yes	x	x	x	25%	1
No	x	Yes	No	Yes	No	x	x	x	x	0%	4
No	x	Partial	Yes	x	x	Yes	x	x	x	75%	2
No	x	Partial	Yes	x	x	Partial	x	x	x	50%	2
No	x	Partial	Partial	No	x	x	No	x	x	0%	2
No	x	Partial	Partial	No	x	x	x	x	x	0%	7
No	x	Partial	No	Yes	No	x	x	x	x	0%	1
No	x	No	Yes	x	x	Yes	x	x	x	50%	4
No	x	No	Yes	x	x	Partial	x	x	x	25%	4
No	x	No	Yes	x	x	No	x	x	x	0%	2
No	x	No	Partial	Yes	Partial	Yes	x	x	x	12.5%	1
No	x	No	Partial	Yes	No	x	x	x	x	0%	1
No	x	No	Partial	No	x	x	No	x	x	0%	4
No	x	No	Partial	No	x	x	x	x	x	0%	11
No	x	No	No	Yes	Yes	Partial	x	x	x	0%	2
No	x	No	No	Yes	Partial	No	x	x	x	0%	1
No	x	No	No	Yes	No	x	x	x	x	0%	3
No	x	No	No	No	x	x	No	x	x	0%	20
No	x	Yes	Yes	x	x	Partial	x	x	x	75%	6
No	x	Yes	No	No	x	x	x	x	x	0%	2
No	x	x	x	x	x	x	x	x	x	0%	3
No	x	No	No	No	x	x	x	x	x	0%	2

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Appendix D. Stakeholder Interview Guide

Respondent name:_____

Respondent phone: _____

Interview date: _____ Interviewer initials: _____

For the PY14 evaluation, Cadmus will interview stakeholders annually. The interview will focus on PY14 program changes and identify recommendations for improving subsequent programs.

Introduction

1. What are your main responsibilities for Ameren Missouri's Efficient Products Program? Has this changed since PY13?
2. What percent of your time is dedicated to Efficient Products?
3. What tasks do you regularly spend the majority of your time on?

Program Design and Implementation

4. Can you provide a summary of how the program has changed since PY13?
    a. Program name? Why was this change made?
    b. New measures? How was this decision made?
    c. Any delivery changes to equipment rebates?
    d. Any delivery changes to single family kits?
    e. Any delivery changes to multifamily kits?
        i. Are these installed by contractor? Property managers?
        ii. Who is paying for the $4.95 powerstrip?
    f. Did these changes have the desired outcomes?
5. What would you say is working particularly well so far in PY14? Why is that?
6. Conversely, what is not working as well as anticipated? Why is that?

Program Goals

7. What are the program's participation and savings goals for PY14? By equipment type?
8. How were these goals determined?
9. In your opinion, how has the program performed so far in PY14 (in general, as well as savings/participation goals)?
10. Why do you think this is?
11. Are there benchmarks in place to monitor progress throughout the year?
12. Have you identified the triggers for contingency plans in case goals are not being met?

Measures

13. In your opinion, should any additional measures be considered for inclusion in future programs? If so, what measures?
14. Conversely, should any current measures be excluded?

Marketing Efforts

15. How has marketing changed since PY13?

Retailer Participation

16. How many retailers currently participate in the program?
17. Has the retailer participation process changed since PY13? (Probe: do they need to sign an agreement with APT, and what are their obligations?)

Rebate Processing and Data Management

18. Do you have a goal for rebate processing times?
19. Have there been any issues or difficulties with rebate processing so far?
20. How is the online rebate portal working? (Any issues?) (PROBE: What proportion of sales do you anticipate coming through this channel? Is there a goal?)
21. How is the Vision database working? (Any issues?)

Quality Control

22. In your own words, please explain how the program's quality control process works.
23. For the EEKits, are there systems in place to prevent participants from receiving more than one kit?
24. How does the program ensure EEKit items are installed?
25. Does Ameren Missouri perform any ride-alongs or independent quality control checks? Please explain.
26. Is there anything else you'd like us to know?

Appendix E. Participant Survey Instruments

The following survey instruments are attached:

- Efficient Products On-line Survey
- Home Energy Kit Participant Survey

CADMUS

Ameren Missouri Efficient Products On-line Survey

<SURVEY UPDATED IN CVENT ON 10/16/2014>

Researchable Questions	Survey Question Mapping
How do participants primarily learn about the Efficient Products program?	PA1
What are the reasons why customers are purchasing new equipment, and which factors influence the type of product they purchase?	PP1, PP3, PP4
From whom do participants purchase the eligible equipment, and how effective are these upstream actors in promoting the program?	PP2, RC1-RC2
Would the participant have purchased the product without the program? (Free ridership)	FR1-FR11
Did the Ameren program influence the participant to purchase any other energy-efficient equipment? (Spillover)	SO1-SO7
Participant Demographics	D1-D5

This survey is designed for participants who purchased program-eligible equipment and submitted the rebate form on-line. The final survey will be programmed into a web format using the online survey software CVENT. After completing the rebate form submission, participants will be redirected to the Welcome Page. NOTE: the online survey omits questions regarding measure installation verification and satisfaction, which will be asked during a phone survey. Instead, it focuses on decision-making, in-store experience, free ridership, and spillover.

Introduction

We would like to ask you a few questions about the product you just purchased. Your answers are confidential, and the information you provide will help Ameren Missouri improve its energy efficiency programs.

I1. First, please tell us which rebate you applied for.

1. Room air conditioner
2. Heat pump hot water heater
3. Electric storage hot water heater
4. Pool pump
5. Air purifier
6. Water cooler

Program Awareness

PA1. How did you first learn about Ameren Missouri's rebate program? **[MARK JUST ONE]**
[List will be randomized for each respondent]

1. Bill insert
2. Radio
3. Family, friend, co-worker
4. Representative at the store
5. Signage at the store
6. A brochure at the check-out
7. Online research
8. Ameren Missouri website
9. Ameren Missouri Personal Energy Report
10. Contractor or installer
11. Other. Please specify: ____
98. Don't know

Purchase Patterns and Decision-making

PP1. What was the primary reason for your purchase of the ***[INSERT APPLIANCE FROM I1]?***

[List will be randomized for each respondent]

1. To replace broken equipment
2. To replace aging equipment
3. To improve the comfort of my home
4. To improve the safety of my home
5. The purchase was part of a larger home renovation
6. The equipment is for a newly constructed home
7. To save money on energy costs
8. To help the environment
9. Other. Please specify: ___

PP2. Did you purchase the ***[INSERT APPLIANCE FROM I1]*** at a store, or from a contractor?

1. Store
2. Contractor
3. Other Please specify:_____

PP3. At what point did you determine the exact model and brand you wanted to buy?

1. I knew which type I wanted before going to the store or before calling a contractor
2. I decided at the store
3. I decided after my contractor provided me with options

PP4. Which factors were important in your decision to purchase the specific model and brand you selected? Please select all that apply.

[List will be randomized for each respondent]

1. Price
2. Quality/reputation
3. Energy efficiency/long term savings
4. The store representative recommended it to me
5. My contractor or installer recommended it to me
6. It qualified for an Ameren Missouri rebate
7. It had specific features I was looking for
8. It has the least impact on the environment
9. It was available when I needed it

[ASK IF PP4 RESPONSES >1]

PP4. And if you had to choose just one, which factor would you say was the *most* important in your decision to purchase the specific model and brand you selected?

[Answer list will be piped in from PP4 response. Question will be single-choice answer only.]

PP5. Did you or someone else in your household install the ***[INSERT APPLIANCE FROM I1]***, or did you have a contractor install it?

1. I installed it myself
2. A contractor installed it

Retailer and Contractor Program Promotion

RC1***. [ASK IF 0=1 AND PA1≠ 4]*** Did a store representative inform you the ***[INSERT APPLIANCE FROM I1]*** qualified for an Ameren Missouri Rebate?

1. Yes
2. No

RC2. ***[ASK IF 0=2 OR PP5=2 AND PA1 ≠ 9]*** Did your contractor inform you the ***[INSERT APPLIANCE FROM I1]*** qualified for an Ameren Missouri Rebate?

1. Yes
2. No

Free ridership Questions

FR1. Had you already purchased your new ***[INSERT APPLIANCE FROM I1]*** before hearing about the Ameren energy efficiency promotion?

1. Yes
2. No ***[SKIP TO FR2]***
98. Don't know ***[SKIP TO FR2]***

FR1a. To confirm, you purchased your new ***[INSERT APPLIANCE FROM I1]*** and *then* found out it qualified for an Ameren Act On Energy rebate, is that correct?

1. Yes, that's correct ***[SKIP TO 0]***
2. No, that's not correct
98. Don't know

FR2. Before learning about the Ameren's energy efficiency promotion, were you already planning to purchase a ***[INSERT APPLIANCE FROM I1]***?

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

FR3. Would you have purchased the same model of ***[INSERT APPLIANCE FROM I1]*** had you not heard about the Ameren promotion or the rebate?

1. Yes ***[SKIP TOFR6]***
2. No
98. Don't know

FR4. Without having heard of Ameren's energy efficiency promotion, would you have purchased a different model ***[INSERT APPLIANCE FROM I1]*****,** or would you have decided not to purchase one at all?

1. I would have purchased a different ***[INSERT APPLIANCE FROM I1][CONTINUE]***
2. I would not have purchased one at all ***[SKIP TO FR7]***
98. Don't know ***[SKIP TO 0]***

100% FREERIDER PATH

FR5. When you say you would have purchased a different ***[INSERT APPLIANCE FROM I1]*** without having heard of Ameren's energy efficiency promotion, would you have purchased one that was just as energy efficient?

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

FR6. Thinking about timing, without the Ameren's energy efficiency promotion, is it most likely that you would have purchased the ***[INSERT APPLIANCE FROM I1]***…

1. At the same time
2. Within the same year
3. One to two years out
4. More than two years out
5. Never
98. Don't know

[SKIP TO 0]

PARTIAL FREE RIDER PATH

FR7. To confirm, you indicated that *without* hearing of Ameren's energy efficiency promotion rebate, you would not have purchased your ***[INSERT APPLIANCE FROM I1]*** at all, is that correct?

1. Yes **[SKIP TO 0]**
2. No

FR8. Without the Ameren energy efficiency promotion, would you have purchased a ***[INSERT APPLIANCE FROM I1]*** that was just as energy-efficient?

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

FR9. With respect to timing, without the Ameren energy efficiency promotion, is it most likely that you would have purchased the ***[INSERT APPLIANCE FROM I1]***

1. At the same time
2. Within the same year
3. One to two years out
4. More than two years out
5. Never
98. Don't know

FR10. Please describe in your own words the process that led you to decide to purchase the more efficient option.

FR11. To summarize, how important was Ameren's energy efficiency promotion on your decision to purchase the ***[INSERT APPLIANCE FROM I1]***?

1. Important
2. Somewhat important
3. Not very important
4. Not important

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Spillover

SO1. Did you purchase any other energy-efficient products at the same time you purchased the ***[INSERT APPLIANCE FROM I1]*** or since purchasing the ***[INSERT APPLIANCE FROM I1]***? This could include things like ENERGY STAR appliances, compact fluorescent light bulbs (CFLs), installing home insulation, etc.

1. Yes
2. No **[SKIP TO D1]**

SO2. ***[ASK IF SO1=1]*** Please select the additional energy-efficient products that you purchased. Mark all that apply, and only choose those products that are *in addition* to the products for which you purchased and received a rebate. [List will be randomized for each respondent]

1. CFLs
2. LED light bulbs
3. ENERGY STAR light fixtures or ceiling fan
4. ENERGY STAR refrigerator
5. ENERGY STAR freezer
6. ENERGY STAR clothes washer
7. ENERGY STAR dishwasher
8. ENERGY STAR room air conditioner
9. ENERGY STAR electronics (e.g. TV, DVD, computer)
10. ENERGY STAR dehumidifier
11. ENERGY STAR pool pump
12. ENERGY STAR water heater
13. ENERGY STAR air purifier
14. ENERGY STAR water cooler
15. Central air conditioner
16. Air source heat pump
17. Geothermal heat pump
18. Heat pump hot water heater
19. Low-flow showerhead or faucet aerator_____
20. Programmable thermostat
21. Installed insulation?
22. Other. [SPECIFY VERBATIM] _____

SO3. ***[ASK FOR PRODUCT 1-3; 8-10; 14-15MENTIONED IN SO2, Do not ask SO3 if SO2 is 4-7; 11-117]*** How many ***[INSERT APPLIANCE FROM SO2]*** did you purchase?

SO4. ***[ASK if SO2=20]*** How many square feet of insulation did you purchase?
Square feet: ___
D. DON'T KNOW

SO5. ***[ASK if SO2=20]*** In what location in your home was the insulation installed?
Location: ___
D. DON'T KNOW

SO6. [ASK OF SO2=1,2, 3] WERE ANY OF THESE ***[INSERT APPLIANCE FROM SO2]*** DISCOUNTED BY AMEREN MISSOURI?

1. Yes
2. No
3. Don't know

SO5. [ASK FOR EACH PRODUCT MENTIONED IN SO2][SKIP IF SO2=1,2,3,4,5,6,7,9,10,18,20] Did you receive or apply for an Ameren Missouri rebate for ***[INSERT PRODUCT FROM SO2]***?
1. Yes
2. No

SO6. ***[ASK FOR EACH PRODUCT MENTIONED IN SO2]*** How important was the fact that your ***[INSERT APPLIANCE FROM I1]*** qualified for a rebate from Ameren Missouri in your decision to purchase ***[INSERT PRODUCT FROM SO2]***? Would you say it was:

1. Important
2. Somewhat Important
3. Not too Important
4. Not important

SO7. [ASK FOR EACH PRODUCT MENTIONED IN SO2] How important was Ameren Missouri's in-store advertising or educational information about energy efficiency in your decision to purchase ***[INSERT PRODUCT FROM SO2]***? Would you say it was:

1. Very Important
2. Somewhat Important
3. Not too Important
4. Not at all important
5. I did not see any Ameren information about energy efficiency

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Demographics

D1. Which of the following best describes your home/residence? **[READ LIST]**

1. Single-family home, detached construction [NOT A DUPLEX, TOWNHOME, OR APARTMENT; ATTACHED GARAGE IS OK]
2. Single-family home, factory manufactured/modular
3. Single-family, mobile home
4. Row house/townhome
5. Two or three family attached residence—traditional structure
6. Apartment (4+ families)—traditional structure
7. Condominium—traditional structure
8. Other (Specify):_____

D2. Do you own or rent this residence?

1. Own
2. Rent

D3. What is the highest level of education that you have completed so far?

1. Less than ninth grade
2. Ninth to twelfth grade; no diploma
3. High school graduate (includes GED)
4. Some college, no degree
5. Associates degree
6. Bachelor's degree
7. Graduate or professional degree

D4. Counting yourself, how many people normally live in your household on a full-time basis? Please include everyone who lives in your home, whether or not they are related to you, and exclude anyone just visiting or children who may be away at college or in the military.

[NUMBER OF PEOPLE] ___

D5. Is your home:

1. All electric
2. Gas and electric
3. Some other combination of energy sources

-99. NOT SURE

D6. Which category best represents your age?

1. 18-24
2. 25-34
3. 35-44
4. 45-54
5. 55-64
6. 65-74
7. 75 or older

D7. Which category best describes your total household income in 2012 before taxes?

1. $15,000 or less
2. $15,000 to $24,999
3. $25,000 to $49,999
4. $50,000 to $74,999
5. $75,000 to $99,999
6. $100,000 to $149,999
7. $150,000 to $199,999
8. $200,000 or more
9. I prefer not to answer this question.

Thank you for your time!

CADMUS

Ameren Missouri Home Energy Kit Participant Survey

October, 2014

Researchable Questions	Survey Question Mapping
How do participants primarily learn about the Home Efficiency Kit?	DM1
What are the reasons why customers request a kit?	DM2
How easy was it to participate and how useful was the instructional information in the kit?	P1-P3
What are the installation rates of the various measures?	IR1-IR12
How easy was the process of installing the measures?	IR13-IR15
Did the Ameren program influence the participant purchase any other energy-efficient equipment? (Spillover)	SO1-SO9
How satisfied were participants with the process and the products?	PS1-PS3
Are kit-users aware of other Ameren rebates?	PA1-PA2
Are participants using Advanced Strips correctly?	SS1-SS6
What would the participants purchased and installed without the program? (Free ridership)	FR1-6
Are participants satisfied with Ameren?	AM1-AM2
Participant Demographics	D1-D5

[Pull in EFI Kit Number from data for each respondent:
EFI Kit Number: IK.226
EFI Kit Number: IK.227
EFI Kit Number: IK.725
EFI Kit Number: IK.727]

INTRODUCTION

Hello. I'm [INSERT NAME], calling from _____ , on behalf of Ameren Missouri.

- [If name available] Can I speak with {INSERT NAME]?

(IF NEEDED) This phone call is designed to last no longer than 15 minutes.
Let me assure you this is not a sales call.
Your individual responses will be kept confidential.

Our records show that your household received an Efficient Products Kit containing energy saving items from Ameren Missouri, your electric utility.The kit included an energy efficient showerhead, compact fluorescent light bulbs, and other energy saving tools, which you requested from Ameren Missouri. We're talking with customers about the energy saving items provided in the kit they received so Ameren Missouri can improve the program. Are you the best person to talk with about this?

(ONCE CORRECT PERSON IS ON THE PHONE:)
S1. To confirm our records, did you receive a kit of energy saving items?

1. Yes [CONTINUE]
2. No [THANK AND TERMINATE]
98. (Don't Know) [ASK IF THERE IS SOMEONE ELSE TO SPEAK WITH WHO WOULD KNOW, OTHERWISE THANK AND TERMINATE]
99. (Refused) [THANK AND TERMINATE]

S2. Do you currently have an electric hot water heater?

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

DM. PARTICIPANT DECISION-MAKING

DM1. How did you hear about the Efficient Products Kit?

1. (Postcard in the mail)
2. (Friend, family, or colleague)
00. (Other) [SPECIFY:_____]
98. (Don't know)
99. (Refused)

DM2. What were the reasons you decided to request the kit? [MULTIPLE RESPONSE, UP TO 3]

1. (Interest in the kit items)
2. (Recommended by friend, relative, colleague)
3. (To reduce electric bill costs)
4. (To reduce water bill costs)
5. (To save water)
6. (To save energy)
7. (To reduce maintenance and operational costs)
8. (Easy/convenient)
9. (To protect the environment)
10. (To receive free items)
11. (To learn more about energy in my home)
00. (Other) [Specify: _____]
98. (Don't know)
99. (Refused)

P. PARTICIPATION PROCESS

P1. About how long did it take for you to receive your kit after you requested it? Was it…
[READ LIST, 98= Don't know, 99= Refused]

1. Less than one week
2. 1 to 2 weeks
3. 3 to 4 weeks
4. More than 4 weeks
98. (Don't know)
99. (Refused)

P1a. How satisfied were you with the process to request the kit? Would you say… [READ LIST]

1. Very satisfied
2. Somewhat satisfied
3. Not too satisfied
4. Not satisfied at all
98. (Don't know)
99. (Refused)

P2. Do you remember receiving written information in your kit on how to install the energy efficient items in your home?

1. (Yes)
2. (No) [SKIP TO IR1a]
98. (Don't know) [SKIP TO IR1]
99. (Refused) [SKIP TO IR1]

P3. How useful did you find the instructions that were provided in the kit? Would you say…[READ LIST]

1. Very useful
2. Useful
3. Not too useful, or
4. Not useful at all?
96. (Not applicable – respondent has not installed items yet).
98. (Don't know)
99. (Refused)

IR. INSTALLATION RATES

IR1. Have you had a chance to install any of the items from the kit yet?

1. (Yes) [SKIP TO IR4]
2. (No)
98. (Don't know) [SKIP TO SO1]
99. (refused) [SKIP TO SO1]

IR2. What has prevented you from installing the items?
[OPEN END]

IR3. Do you have plans to install any of the items in the kit?
[RECORD VERBATIM COMMENTS]

1. (Yes) [ASK WHICH ONES: _____] [SKIP TO SO1]
2. (No) [SKIP TO SO1]
98. (Don't know) [SKIP TO SO1]
99. (Refused) [SKIP TO SO1]

IR4a. Please tell me which of the each items you've had a chance to install in your home so far. IR4a. How many compact fluorescent light-bulb(s) did you install? [If NEEDED: CFLs are the Spiral or swirl shaped light-bulbs that came in your kit.]
[numeric open-end, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR4a>or=1]
IR4b. Are these bulbs still installed?

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

[IF IR4b=2]
IR4c. Why did you remove the bulb(s)?
[OPEN END]

IR5a. [ASK IF EFI KIT NUMBER = IK725 or IK727] How many LED light-bulb(s) did you install? [If NEEDED: LEDS are shaped like standard light-bulbs with the plastic base and they came in your kit.]
[numeric open-end, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR5a>or=1]
IR5b. Are these bulbs still installed?

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

[IF IR5b=2]
IR5c. Why did you remove the bulb(s)?
[OPEN END]

IR6a. How many faucet aerators did you install? [IF NEEDED, These are the small devices that screw into kitchen and bathroom faucets.]
[numeric open-end, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR6a>or=1]
IR6b. [Are the faucet aerators]/[is the faucet aerator] still installed?

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

[IF IR6b=2]
IR6c. Why did you remove the faucet aerator(s)?
[OPEN END]

[ASK IF EFI KIT NUMBER = IK226 or IK725 or IK727]
IR7a. Did you install the energy-efficient showerhead?
[1=YES, 2=NO, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR7a=1]
IR7b. Is the showerhead still installed?

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

[IF IR7b=2]
IR7c. Why did you remove the showerhead?
[OPEN END]

[ASK IF EFI KIT NUMBER = IK227]
IR8a. How many energy-efficient showerheads did you install?
[numeric open-end, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR8a>or=1]
IR8b. [Are the showerheads] [Is the showerhead] still installed?

1. (Yes)
2. (No) [record if one of them is installed]
98. (Don't know)
99. (Refused)

[IF IR8b=2]
IR8c. Why did you remove the showerhead(s)?
[OPEN END]

IR9a. Did you install the pipe wrap insulation?
[1=YES, 2=NO, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR9a=1]
IR9b. Is the pipe wrap still installed?

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

[IF IR9b=2]
IR9c. Why did you remove the pipe wrap?
[OPEN END]

IR10a. [ASK IF EFI KIT NUMBER = IK226 or IK227 or IK727] Did you install the Advanced Power Strip? [IF NEEDED: This device is a type of surge protector or power strip].
[1=YES, 2=NO, 98=DON'T KNOW, 99=REFUSED, 96= NOT APPLICABLE]

[IF IR10a=1]
IR10b. Is the Advanced Power Strip still installed?

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

[IF IR10b=2]
IR10c. Why did you remove the Advanced Power Strip?
[OPEN END]

[ASK IR11-IR12 IF:
ANY IR7a, IR9a, IR10a = 2; OR IF
EFI KIT NUMBER = IK226 OR IK227 AND IR5a<12; OR IF
EFI KIT NUMBER = IK725 OR IK727 AND IR5a<4; OR IF
EFI KIT NUMBER = IK226 OR IK725 OR IK727 AND IR6a<2; OR IF
EFI KIT NUMBER = IK227 AND IR6a<3; OR IF
EFI KIT NUMBER = IK227 AND IR8A<2
IR11. You mentioned that you may not have installed one of the items. What has prevented you from installing these items in the kit?
[OPEN END]

IR12. Do you have plans to install the remaining items?

1. (Yes) [ASK WHICH ONES: _____]
2. (No)
98. (Don't know)
99. (Refused)

IR13. Did you have any difficulty installing any of the items in the energy kit?

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

[ASK IF IR13=1]

IR14. Which items were difficult to install? [DO NOT READ; MARK ALL MENTIONED] [NOTE: IF RESPONDENT HAS ALREADY ANSWERED THE QUESTION, ASK IN A CONFIRMATORY WAY]

1. (Compact fluorescent light-bulb(s))
2. (LED light-bulb(s))
3. (Showerhead)
4. (Faucet Aerator)
5. (Pipe wrap)
6. (Advanced Power Strip)
98. (Don't know)
99. (Refused)

[ASK IF 1R14=1, 2, 3, 4, 5,6] [FOR EACH ITEM IDENTIFIED]

IR15. What was difficult about installing the [COMPACT FLUORESCENT LIGHT-BULB(S)][LED LIGHT-BULB(S)] [SHOWERHEAD] [FAUCET AERATOR] [PIPE WRAP] [ADVANCED POWER STRIP]?

[MULTIPLE RESPONSE, MARK ALL THAT APPLY]

1. (Did not fit)
2. (Did not like quality)
3. (Missing parts or equipment)
4. (Did not have proper tools for installation)
00. (Other) [SPECIFY: _____]
98. (Don't know)
99. (Refused)

SO. SPILLOVER

SO1. Have you or anyone in your household installed any other energy-efficient products since receiving the home energy kit? This could include things like ENERGY STAR appliances, additional efficient light bulbs , installing insulation, etc.

1. (Yes)
2. (No) [SKIP TO PS1D1]
98. (Don't know) [SKIP TO PS1]
99. (Refused) [SKIP TO PS1]

[ASK IF SO1=1]

SO2. Which additional energy-efficient products did you install?

[DO NOT READ] [MARK ALL THAT APPLY]

1. CFLs
2. LED light bulbs
3. ENERGY STAR light fixtures or ceiling fan
4. ENERGY STAR refrigerator
5. ENERGY STAR freezer
6. ENERGY STAR clothes washer
7. ENERGY STAR dishwasher
8. ENERGY STAR room air conditioner
9. ENERGY STAR electronics (e.g. TV, DVD, computer)
10. ENERGY STAR dehumidifier
11. ENERGY STAR air purifier
12. ENERGY STAR water cooler
13. ENERGY STAR water heater
14. ENERGY STAR pool pump
15. Central air conditioner
16. Air source heat pump
17. Geothermal heat pump
18. Heat pump water heater
19. Low-flow showerhead
20. Faucet aerator
21. Programmable thermostat
22. Installed insulation?
23. Efficient windows
24. Other. [SPECIFY VERBATIM] _____

[ASK FOR PRODUCT 1-3; 8-12, 14, 19-21 MENTIONED INSO2, DO NOT ASK SO3 IF SO2 IS 4-7; 13; 15-18]

SO3. How many ***[INSERT APPLIANCE FROM*** SO2***]*** did you purchase?

[ASK IF SO2***=22]***

SO4. How many square feet of insulation did you purchase?

[NUMERIC OPEN-END RESPONSE, 98=DON'T KNOW, 99= REFUSED]

[ASK IF SO2***=22]***

SO5. In what location in your home was the insulation installed?

[OPEN END, 98=DON'T KNOW, 99= REFUSED]

[ASK if SO2=1,2]

SO6. Were any of these [INSERT APPLIANCE FROM SO2] discounted by Ameren Missouri?

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

[ASK FOR EACH PRODUCT MENTIONED IN SO2***][SKIP IF SO2=1,2,3,4,5,6,7,9,10,19,20]***

SO7. Did you receive or apply for an Ameren Missouri rebate for ***[INSERT PRODUCT FROM*** SO2***]***?

1. (Yes)
2. (No)

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

[ASK FOR EACH PRODUCT MENTIONED IN SO2***]***

SO8. How important were the items and the information in the free home energy kit in your decision to purchase ***[INSERT PRODUCT FROM*** SO2***]***? Would you say it was:

1. Very Important
2. Somewhat Important
3. Not too Important
4. Not important

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

[ASK FOR EACH PRODUCT MENTIONED IN SO2***]***

SO9. How important was Ameren Missouri's advertising or educational information about energy efficiency in your decision to purchase ***[INSERT PRODUCT FROM*** SO2***]***? Would you say it was:

1. Very Important
2. Somewhat Important
3. Not too Important
4. Not important

96. (Did not see any Ameren information about energy efficiency)
98. (Don't know)
99. (Refused)

PS. PROGRAM SATISFACTION

Now I'd like to ask you a few questions about your experience with the kit items you have installed.

PS1. Please let me know if you are very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied with each of the products that I read to you. [1=very satisfied 2= somewhat 3= not too satisfied 4= not at all satisfied, 98=Don't know 99= Refused]

a. [SKIP IF IR4a= 0, 98,96] The CFLs? [IF NEEDED: Compact Flourescent Light bulbs]
b. [SKIP IF EFI KIT NUMBER IK226 OR IK227 OR IF IR5a=0,98,96] The LEDs? [IF NEEDED: Light Emitting Diode lights]
c. [SKIP IF IR6a=0,98,96] The faucet aerators?
d. [SKIP IF IR7a=2,98,96 or IR8a=0,98,96] The efficient showerheads?
e. [SKIP IF IR9a=2,98,96] The pipe wrap insulation?
f. [SKIP IF EFI KIT NUMBER IK725 OR IF IR10a=2,98,96] The Advanced Power Strip?

[ASK IF PS1a-e=3, 4 (DISSATISFIED)]
PS2. You indicated that you were dissatisfied about something with the [insert measure]. Could you please briefly explain why? [OPEN END]

PS3. Do you have any suggestions for improving the kit? [DO NOT READ] [MULTIPLE RESPONSE, MARK ALL THAT APPLY]

1. (More help filling out the forms)
2. (Provide more verbal instruction)
3. (Provide more written instruction)
4. (Provide in-person instruction)
5. (Provide materials and instruction in more languages)
6. (Add things to the kit) (Specify___)
7. (Install items for me)
96. (No suggestion)
00. (Other, record verbatim)
98. (Don't know)
99. (Refused)

PA. PROGRAM AWARENESS

Ameren is interested in learning more about other ways they can help customers save energy.

PA1. Are you aware of any other Ameren Missouri rebate programs that help customers save on energy costs?

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

[ASK IF PA1=1]
PA2. Which programs are you aware of? [MULTIPLE RESPONSE]

1. (Central Air Conditioning rebates)
2. (CFLs)
3. (LEDs)
4. (Occupancy sensors)
5. (Efficient product or appliance rebates)
6. (Refrigerator/Freezer recycling rebates)
7. (Low income housing upgrades)
8. (New construction/ENERGY STAR Homes)
9. (Home energy audits)
00. (Other) [SPECIFY: _____]
98. (Don't know)
99. (Refused)

[ASK SECTION IF IR10B=1]

SS. ADVANCED STRIP USAGE

Next, I have a few questions for you about the Advanced Power Strip you mentioned you are using.

SS1. Is the power strip plugged in and operating?

1. (Yes)
2. (No) [SKIP TO FR1]
98. (Don't know) [SKIP TO FR1]
99. (Refused) [SKIP TO FR1]

SS2a. I have a few questions for you about the types of equipment plugged into various outlets on the strip. If you need to put the phone down to look at the strip, that's fine, I will hold on. First, which device, or devices, are plugged into the black outlets labeled, "Always on"?
[MULTIPLE RESPONSE UP TO 2]

1. (TV)
2. Cable/dish box
3. (DVD Player)
4. (Media Player)
5. (Gaming System)
6. (Stereo system)
7. (Computer)
8. (Printer)
9. (Fax or scanner)
00. (Other [specify] _____)
96. (N/A)
98. (Don't know)
99. (Refused)

SS2b. And which device is plugged into the black outlet labeled, "Controller"? [IF RESPONDENT NEEDS TO PUT DOWN THE PHONE AGAIN, SAY: "Ok, no problem. While you're looking, in addition to looking at which device is plugged into the black outlet, I'll also need to know which devices are plugged into the green outlets labeled "switched." WHEN RESPONDENT GETS BACK ASK AGAIN: "Which device was plugged into the black outlet?"] [ALLOW ONLY ONE]

1. (TV)
2. Cable/dish box
3. (DVD Player)
4. (Media Player)
5. (Gaming System)
6. (Stereo system)
7. (Computer)
8. (Printer)
9. (Fax or scanner)
00. (Other [specify] _____)
96. (N/A)
98. (Don't know)
99. (Refused)

SS2c. And lastly, which device or devices are plugged into the green outlets, labeled "Switched"?
[MULTIPLE RESPONSE UP TO 4]

1. 1. (TV)
2. 2. Cable/dish box
3. (DVD Player)
4. (Media Player)
5. (Gaming System)
6. (Stereo system)
7. (Computer)
8. (Printer)
9. (Fax or scanner)
00. (Other [specify] _____)
96. (N/A)
98. (Don't know)
99. (Refused)

[ASK IF SS2a-c =7]
SS3. Is your computer a laptop or a desktop computer?

1. (Laptop)
2. (Desktop)
98. (Don't know)
99. (Refused)

[ASK IF SS2c=1]
SS4a. What type of television is plugged into the strip? Is it a… [READ LIST]

1. LED,
2. Plasma,
3. CRT,
4. LCD,
5. Rear Projection, or
6. Projector?
98. (Don't know)
99. (Refused)

[ASK IF SS2c=1]
SS4b. About how old is your TV?
[NUMERIC OPEN END, IN YEARS][ASK IF SS2c=1]

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

SS5. About what size is it? Your best estimate is fine.
[NUMERIC OPEN END, IN INCHES]

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

SS6. Using your best estimate, about how many hours a day is your [INSERT ANSWER FROM SS2b] turned on?
[OPEN END NUMERIC RESPONSE]
98. (Don't know)
99. (Refused)

FR. FREERIDERSHIP

Next, I'd like to ask you some questions about your decision to request the home energy kit from Ameren Missouri.

FR1. Would you have purchased and installed the items in the kit on your own, if you had not received them in your kit from Ameren Missouri?

1. (Yes) [CONTINUE TO FR2]
2. (No) [SKIP TO FR3]
3. (I would have purchased some items, but not all) [SKIP TO FR4]
98. (Don't know) [CONTINUE TO FR2]
99. (Refused) [CONTINUE TO FR2]

[If FR1=1,98,99]
FR2. Would have you have purchased the same type and number of each item in the kit?
1. (Yes) [SKIP TO FR5]
2. (No) [SKIP TO FR4]
98. (Don't know) [SKIP TO FR4]
99. (Refused) [SKIP TO FR6]

[IF FR1=2]
FR3. To confirm, you would not have purchased or installed any items at all, is that correct?
1. (Yes, correct) [SKIP TO FR6]
2. (No) [CONTINUE TO FR4]
98. (Don't know) [CONTINUE TO FR4]
99. (Refused) [SKIP TO FR6]

FR4. Which items would you have purchased and installed? [DO NOT READ; MARK ALL THAT APPLY]

1. (CFL(s))
2. (LED(s))
3. (Faucet aerator(s))
4. (Energy-efficient showerhead)
5. (Pipe wrap)
6. (Advanced power strip/smart strip)
00. (Other) [SPECIFY:_____]
98. (Don't know)
99. (Refused)

[IF FR4=1]
FR4a. The kit came with [IF EFI KIT NUMBER IK226 OR IK227]:12 CFLs [IF EFI KIT NUMBER IK725 OR IK727]: 4CFLS. How many would you have purchased and installed without the kit?
[NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

[IF FR4=2]
FR4b. The kit came with 2 LEDs. How many would you have purchased and installed without the kit?
[NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

[IF FR4=3]
FR4c. The kit came with either 2 or 3 faucet aerators for your kitchen and bathroom. How many would you have purchased and installed without the kit?
[NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

[IF FR4=4 AND EFI KIT NUMBER IK227]
FR4d. The kit came with two energy efficient showerheads. How many would you have purchased and installed without the kit?
[NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

FR5. And thinking about timing, without the free kit from Ameren Missouri, when would you most likely have purchased and installed the.

[IF FR2=1 OR FR4=1]
a. CFLs? Would you say…[READ LIST]

[IF FR2=1 OR FR4=2]
b. LEDs? Would you say…[READ LIST]

[IF FR2=1 OR FR4=3]
c. Faucet aerators? Would you say…[READ LIST]

[IF FR2=1 OR FR4=4]
d. Efficient showerhead? Would you say…[READ LIST]

[IF FR2=1 OR FR4=5]

e. Pipe wrap? Would you say…[READ LIST]

[IF FR2=1 OR FR4=6]

f. Advanced Power Strip? Would you say… [READ LIST]

[READ LIST FOR EACH FR5a-f. MARK ONLY ONE]

1. At the same time you received the kit,
2. Within the same year,
3. One to two years out,
4. More than two years out, or
5. Never?

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

FR6. Please describe in your own words the process that led you to request the home energy efficiency kit from Ameren Missouri.

[OPEN END]

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

AM. SATISFACTION WITH AMEREN MISSOURI

AM1. Generally speaking, how satisfied are you with your experience as an Ameren Missouri customer overall? Would you say… [READ LIST]

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

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

AM2. Based on your experience with the kit program, would you say your opinion of Ameren Missouri… [READ LIST]

1. Increased,
2. Stayed about the same, or
3. Decreased?

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

D. DEMOGRAPHICS

D1. Which of the following best describes your home/residence? **[READ LIST]**

1. Single-family home [NOT A DUPLEX, TOWNHOME, OR APARTMENT; ATTACHED GARAGE IS OK]
2. Manufactured or modular
3. Mobile home
4. Row house/townhome
5. Two or three family attached residence
6. Apartment with 4 units or greater
7. Condominium
8. (Other (Specify):_____)
98. (Don't know)
99. (Refused)

D2. Do you own or rent this residence?

1. (Own)
2. (Rent)
3. (Other (Specify):_____)
98. (Don't know)
99. (Refused)

D3. What is the highest level of education that you have completed so far?

1. (Less than ninth grade)
2. (Ninth to twelfth grade; no diploma)
3. (High school graduate (includes GED))
4. (Some college, no degree)
5. (Associates degree)
6. (Bachelor's degree)
7. (Graduate or professional degree)
8. (Other (Specify):_____)
98. (Don't know)
99. (Refused)

D4. Counting yourself, how many people normally live in your household on a full-time basis? Please include everyone who lives in your home, whether or not they are related to you, and exclude anyone just visiting or children who may be away at college or in the military.

[NUMERIC OPEN END]
98. (DON'T KNOW)
99. (REFUSED)

D5. Is your home's energy source: [READ LIST]

1. All electric
2. Natural gas and electric
3. Some other combination of energy sources
98. (DON'T KNOW)
99. (REFUSED)

D5a. Do you have an electric heat pump?

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

[IF D5a=1]
D5b. To the best of you knowledge, was the heat pump installed before 2006?

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

D5c. Do you have electric baseboard heating?

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

D5d. Do you have central air conditioning?

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

D6. In what year were you born?
[NUMERIC OPEN END]

D7. Which category best describes your total household income in 2012 before taxes? Please stop me when I read your category.

1. $15,000 or less
2. $15,000 to $24,999
3. $25,000 to $49,999
4. $50,000 to $74,999
5. $75,000 to $99,999
6. $100,000 to $149,999
7. $150,000 to $199,999
8. $200,000 or more

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

CLOSING

Thank you for your participation in this survey. Ameren Missouri appreciates your responses. Have a wonderful evening.
COMPLETE INTERVIEW.

Appendix F. Bibliography

The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures (UMP)

California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects. October 2001.